DEPARTMENT OF TRANSPORTATION

Pipeline and Hazardous Materials Safety Administration

49 CFR Parts 171, 172, 173, 174, and 179

[Docket No. PHMSA–2012–0082 (HM–251)]

RIN 2137–AE91

Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains

AGENCY: Pipeline and Hazardous Materials Safety Administration (PHMSA), Department of Transportation (DOT).

ACTION: Final rule.

SUMMARY: In this final rule, the Pipeline and Hazardous Materials Safety Administration (PHMSA), in coordination with the Federal Railroad Administration (FRA), is adopting requirements designed to reduce the consequences and, in some instances, reduce the probability of accidents involving trains transporting large quantities of flammable liquids. The final rule defines certain trains transporting large volumes of flammable liquids as ''high-hazard flammable trains'' (HHFT) and regulates their operation in terms of speed restrictions, braking systems, and routing. The final rule also adopts safety improvements in tank car design standards, a sampling and classification program for unrefined petroleum-based products, and notification requirements. These operational and safety improvements are necessary to address the unique risks associated with the growing reliance on trains to transport large quantities of flammable liquids. They incorporate recommendations from the National Transportation Safety Board (NTSB) and from the public comments, and are supported by a robust economic impact analysis.

DATES: *Effective Date:* This final rule is effective July 7, 2015.

Incorporation by reference Date: The incorporation by reference of the publication listed in this rule is approved by the Director of the Federal Register as of July 7, 2015.

ADDRESSES: You may find information on this rulemaking (Docket No. PHMSA–2012–0082) at Federal eRulmaking Portal: *http://www.regulations.gov*.

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SUPPLEMENTARY INFORMATION:

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I. Executive Summary

The Pipeline and Hazardous Materials Safety Administration (PHMSA), in coordination with the Federal Railroad Administration (FRA), is issuing this final rule, titled ''Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for HHFTs,'' in order to increase the safety of flammable liquid shipments by rail. The final rule is necessary due to the expansion in United States (U.S.) energy production, which has led to significant challenges for the country's transportation system. PHMSA published a notice of proposed rulemaking (NPRM) on August 1, 2014. See 79 FR 45015. This final rule addresses comments to the NPRM and amends the existing hazardous materials regulations (HMR; 49 CFR parts 171–180) pertaining to tank car designs, speed restrictions, braking systems, routing, sampling and classification, and notification requirements related to certain trains transporting large quantities of flammable liquids.

Expansion in oil production has resulted in a large volume of crude oil being transported to refineries and other transport-related facilities, such as transloading facilities throughout the country. With a growing domestic supply, rail transportation has emerged as a flexible alternative to transportation by pipeline or vessel, which have historically delivered the vast majority of crude oil to U.S. refineries. The volume of crude oil carried by rail increased 423 percent between 2011 and 2012.[1] [2] In 2013, the number of rail carloads of crude oil surpassed 400,000.[3] [4] Further, based on information provided by the Association of American Railroads (AAR), the U.S. Energy Information Administration (U.S. EIA) asserts the amount of crude oil and refined petroleum products moved by U.S. railroads continued to increase by nine percent during the first seven months of 2014, when compared with the same period in 2013.

[1] See U.S. Rail Transportation of Crude Oil: Background and Issues for Congress; *http://fas.org/sgp/crs/misc/R43390.pdf*.

[2] See Table 9 of EIA refinery report *http://www.eia.gov/petroleum/refinerycapacity/*.

[3] *http://www.stb.dot.gov/stb/industry/econ_waybill.html*.

[4] *http://www.eia.gov/todayinenergy/detail.cfm?id=17751*.

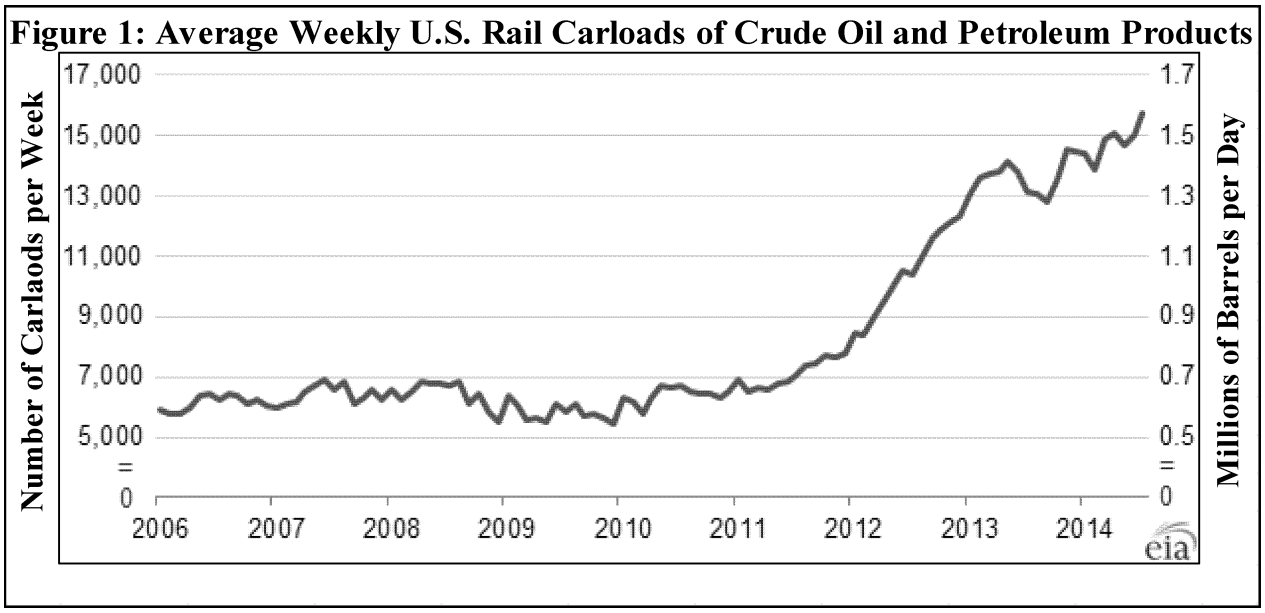


Figure 1 visually demonstrates the considerable increase in crude oil and petroleum shipments by rail.[5]

U.S. ethanol production has also increased considerably during the last 10 years and has generated similar growth in the transportation of ethanol by rail.[6] Ethanol constitutes 26 percent of the total number of rail hazardous materials shipments, and is 1.1 percent of all railroad shipments.[7]

Crude oil and ethanol comprise approximately 68 percent of the flammable liquids transported by rail. The inherent risk of flammability of these materials is compounded in the context of rail transportation because petroleum crude oil and ethanol are commonly shipped in large quantities, either as large blocks of material in a manifest train or as a single commodity train (commonly referred to as a ''unit train''). As detailed in the NPRM, in recent years, train accidents/incidents (train accidents) involving the release of a flammable liquid and resulting in fires and other severe consequences have occurred. See the Regulatory Impact Analysis, posted in the docket, for a detailed description of the accidents considered for this rulemaking.

Federal hazardous materials transportation law (49 U.S.C. 5101–5128) authorizes the Secretary of Transportation (Secretary) to ''prescribe regulations for the safe transportation, including security, of hazardous material in intrastate, interstate, and foreign commerce.'' The Secretary delegated this authority to PHMSA. 49 CFR 1.97(b). PHMSA is responsible for overseeing a hazardous materials safety program that minimizes the risks to life and property inherent in transportation in commerce. On a yearly basis the HMR provides safety and security requirements for more than 2.5 billion tons of hazardous materials (hazmat), valued at about $2.3 trillion, and hazmat was moved 307 billion miles on the nation's interconnected transportation network.[8] In addition, the HMR include operational requirements applicable to each mode of transportation. The Secretary also has authority over all areas of railroad transportation safety (Federal railroad safety laws, principally 49 U.S.C. chapters 201–213), and this authority is delegated to FRA. 49 CFR 1.89. FRA inspects and audits railroads, tank car facilities, and hazardous material offerors for compliance with both FRA and PHMSA regulations. FRA also has an extensive, well-established research and development program to enhance all elements of railroad safety, including hazardous materials transportation. As a result of the shared role in the safe and secure transportation of hazardous materials by rail, PHMSA and FRA work very closely when considering regulatory changes and the agencies take a system-wide, comprehensive approach consistent with the risks posed by the bulk transport of hazardous materials by rail.

This rulemaking is intended to reduce the likelihood of train accidents involving flammable liquids, and mitigate the consequences of such accidents should they occur. In this final rule, PHMSA is revising the HMR to establish requirements for any ''high-hazard flammable train'' (HHFT) that is transported over the U.S. rail network. Based on analysis of the risk of differing train compositions, this rule defines an HHFT as a train comprised of 20 or more loaded tank cars of a Class 3 flammable liquid in a continuous block or 35 or more loaded tank cars of a Class 3 flammable liquid across the entire train. For the purposes of advanced braking systems, this rule also defines a ''high-hazard flammable unit train'' (HHFUT) as a train comprised of 70 or more loaded tank cars containing Class 3 flammable liquids traveling speeds at greater than 30 mph. The rule ensures that the requirements are closely aligned with the risks posed by the operation of trains that are transporting large quantities of flammable liquids. As discussed further in this preamble and in the accompanying RIA, this rule primarily impacts trains transporting large quantities of ethanol and crude oil, because ethanol and crude oil are most frequently transported in high-volume shipments than when transported in a single train, and such trains would meet the definition of an HHFT. By revising the definition of HHFT from that which was proposed in the NPRM, we have clarified the scope of the final rule and focused on the highest-risk shipments, while not affecting lower-risk trains that

[5] *http://www.eia.gov/todayinenergy/detail.cfm?id=17751.*

[6] Association of American Railroads. 2013. Railroads and Ethanol. Available online at *https://www.aar.org/BackgroundPapers/Railroads%20and%20Ethanol.pdf.*

[7] *http://ethanolrfa.org/page/-/rfa-association-site/Industry%20Resources/RFA.Ethanol.Rail.Transportation.and.Safety.pdf?nocdn=1.*

[8] 2012 Commodity Flow Survey, Research and Innovative Technology Administration (RITA), Bureau of Transportation Statistics (BTS). See *http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=CFS_2012_00H01&prodType=table.*

are not transporting similar bulk quantities of Class 3 flammable liquids.[9]

PHMSA and FRA have used a variety of regulatory and non-regulatory methods to address the risks of the bulk transport of flammable liquids, including crude oil and ethanol, by rail. These efforts include issuing guidance, conducting rulemakings, participating in rail safety committees, holding public meetings, enhancing enforcement efforts, and reaching out to the public. All of these efforts are consistent with our system-wide approach.

PHMSA and FRA focus on prevention, mitigation and response to manage and reduce the risk posed to people and the environment by the transportation of hazardous materials by rail. When addressing these issues, PHMSA and FRA focus on solutions designed to reduce the probability of accidents occurring and to minimize the consequences of an accident should one occur.

In this final rule, we are revising the HMR to establish requirements specific to HHFTs. As described in greater detail throughout this document, the final rule takes a system-wide, comprehensive approach consistent with the risks posed by HHFTs. Specifically, Table 1 describes the regulatory changes implemented in this final rule and identifies entities affected by this final rule.

TABLE 1—AFFECTED ENTITIES AND REQUIREMENTS

Adopted requirement	Affected entity
Enhanced Standards for Both New and Existing Tank Cars Used in HHFTs	Tank Car Manufacturers, Tank Car Owners, Shippers/Offerors and Rail Carriers.
• New tank cars constructed after October 1, 2015 are required to meet enhanced DOT Specification 117 design or performance criteria.	
• Existing tank cars must be retrofitted in accordance with the DOT-prescribed retrofit design or performance standard.	
• Retrofits must be completed based on a prescriptive retrofit schedule and a retrofit reporting requirement is triggered if initial milestone is not achieved.	
More Accurate Classification of Unrefined Petroleum-Based Products	Offerors/Shippers of unrefined petroleum-based products.
• Develop and carry out sampling and testing program for all unrefined petroleum-based products, such as crude oil, to address:	
(1) Frequency of sampling and testing that accounts for any appreciable variability of the material.	
(2) Sampling prior to the initial offering of the material for transportation and when changes that may affect the properties of the material occur;	
(3) Sampling methods that ensures a representative sample of the entire mixture, as offered, is collected;	
(4) Testing methods that enable classification of the material under the HMR;	
(5) Quality control measures for sample frequencies;	
(6) Duplicate samples or equivalent measures for quality assurance;	
(7) Criteria for modifying the sampling and testing program;	
(8) Testing or other appropriate methods used to identify properties of the mixture relevant to packaging requirements.	
• Certify that program is in place, document the testing and sampling program outcomes, and make information available to DOT personnel upon request.	
Rail routing—Risk assessment	Rail Carriers, Emergency Responders.
• Perform a routing analysis that considers, at a minimum, 27 safety and security factors and select a route based on its findings. These planning requirements are prescribed in 49 CFR § 172.820.	
Rail routing—Notification.	
• Ensures that railroads notify State and/or regional fusion centers and State, local, and tribal officials who contact a railroad to discuss routing decisions are provided appropriate contact information for the railroad in order to request information related to the routing of hazardous materials through their jurisdictions. This replaces the proposed requirements to notify State Emergency Response Commissions (SERCs) or other appropriate state delegated entity about the operation of these trains through their States.	
Reduced Operating Speeds	Rail Carriers.
• Restrict all HHFTs to 50-mph in all areas.	
• Require HHFTs that contain any tank cars not meeting the enhanced tank car standards required by this rule operate at a 40-mph speed restriction in high-threat urban areas[10].	
Enhanced Braking	Rail Carriers.
• Require HHFTs to have in place a functioning two-way end-of-train (EOT) device or a distributed power (DP) braking system.	
• Require trains meeting the definition of a ''high-hazard flammable unit train'' (HHFUT)[11] be operated with an electronically controlled pneumatic (ECP) braking system by January 1, 2021, when transporting one or more tank cars loaded with a Packing Group I flammable liquid.	

[9] In the August 1, 2014, NPRM, an HHFT was defined as a train comprised of 20 or more carloads of a Class 3 flammable liquid. This rule defines an HHFT as a train comprised of 20 or more tank car loads of a Class 3 flammable liquid in a continuous block or 35 tank car loads of a Class 3 flammable liquid across the entire train.

[10] As defined the Transportation Security Administration's regulations at 49 CFR 1580.3—High Threat Urban Area (HTUA) means an area comprising one or more cities and surrounding areas including a 10-mile buffer zone, as listed in appendix A to 49 CFR Part 1580. The 50-mph maximum speed restriction for HHFTs is consistent with the speed restrictions that the AAR issued in Circular No. OT–55–N on August 5, 2013. The 40-mph builds on an industry imposed voluntary restriction that applies to any ''Key Crude Oil Train'' with at least one non-CPC 1232 tank car or one non-DOT specification tank car while that train travels within the limits of any high-threat urban area (HTUA) as defined by 49 CFR 1580.3.

[11] A ''high-hazard flammable unit train'' (HHFUT) means a train comprised of 70 or more loaded tank cars containing Class 3 flammable liquids traveling at greater than 30 mph.

TABLE 1—AFFECTED ENTITIES AND REQUIREMENTS—Continued

Adopted requirement	Affected entity
• Require trains meeting the definition of a HHFUT be operated with an ECP braking system by May 1, 2023, when transporting one or more tank cars loaded with a Packing Group II or III flammable liquid.	

PHMSA and FRA received over 3,200 public comments representing over 182,000 signatories in response to the NPRM and initial RIA. We carefully considered each comment and revised, as appropriate, the final rulemaking to reflect those comments. Table 2 below provides a high-level overview of what was originally proposed in the NPRM versus the amendments being adopted in this final rule.

TABLE 2—NPRM VS. FINAL RULE COMPARISON

Topic	NPRM proposal	Final rule amendment	Justification
Scope—High-Hazard Flammable Train.	High-hazard flammable train means a single train carrying 20 or more carloads of a Class 3 flammable liquid.	A continuous block of 20 or more tank cars loaded with a flammable liquid or 35 or more tank cars loaded with a flammable liquid dispersed through a train.	PHMSA and FRA modified the proposed definition to capture the higher-risk bulk quantities transported in unit trains, while excluding lower-risk manifest trains. This revision better captures the intended trains.
Tank Car—New Construction	Three options for new tank car standards (See table 13).	A modified version of Tank Car Option #2 from the NPRM.	These design enhancements will reduce the consequences of accidents involving an HHFT. These enhancements will improve puncture resistance and thermal survivability when exposed to fire. There will be fewer car punctures, fewer releases from the service equipment (top and bottom fittings). See RIA.
Tank Car—Existing Fleet	Consistent with proposed new tank car standards, the same three options for retrofitted tank car standards. It was proposed that both new and retrofitted cars would meet the same standard.	Tank Car Option #3 from the NPRM for retrofits.	Provides incremental safety benefit over the current fleet while minimizing cost. These design enhancements will reduce the consequences of a derailment of an HHFT. There will be fewer car punctures, and fewer releases from the service equipment (top and bottom fittings). See RIA.
Tank Car—Retrofit Timeline	A five-year retrofit schedule based solely on packing group.	A risk-based ten-year retrofit schedule based on packing group and tank car. A retrofit reporting requirement is triggered if initial milestone is not achieved.	Provides for greater risk reduction by focusing on the highest risk tank car designs and commodities first. Accounts for industry retrofit capacity.
Speed Restrictions	A 50 mph restriction across the board for HHFTs and three options for a 40 mph restriction in specific areas.	A 50 mph restriction across the board for HHFTs and a 40 mph restriction in HTUA.	Decreases the kinetic energy involved in accidents. Adopts the most cost-effective solution and limits the impact of rail congestion.
Braking	The scaling up of braking systems culminating in ECP braking for HHFTs or a speed limitation for those not meeting the braking requirements.	(1) Requires HHFTs to have in place a functioning two-way EOT device or a DP braking system. (2) Requires any HHFUT transporting at least one PG I flammable liquid be operated with an ECP braking system by January 1, 2021. (3) Requires all other HHFUTs be operated with an ECP braking system by May 1, 2023.	Provides a two-tiered, cost-effective and risk-based solution to reduce the number of cars and energy associated with train accidents. Focuses on the highest-risk train sets

TABLE 2—NPRM VS. FINAL RULE COMPARISON—Continued

Topic	NPRM proposal	Final rule amendment	Justification
Classification	A classification plan for mined liquids and gases.	A classification plan for unrefined petroleum products. Clarified the materials subject to a plan.	Addresses comments seeking clarity of requirements. We expect the requirements would reduce the expected damages and ensure that materials are properly classified in accordance with the HMR.
Routing	Require railroads operating HHFTs to conduct a routing analysis considering, at a minimum, 27 factors.	Require railroads operating HHFTs to conduct a routing analysis considering, at a minimum, 27 factors.	Track type, class, and maintenance schedule as well as training and skill level of crews are included in the 27 risk factors identified that need to be considered, at a minimum, in a route analysis. Evaluation of these factors could result in prevention of an accident due to either rail defects or human factors/errors.
Notification	Require trains carrying 1,000,000 gallons or more of Bakken Crude oil to notify SERCs.	Use the notification portion of the routing requirements (i.e. notification to state/regional fusion centers) to satisfy need for pertinent information.	Addresses concerns over security sensitive and confidential business information. Addresses the need for action in the form of additional communication between railroads and emergency responders to ensure that the emergency responders are aware of the appropriate contacts at railroads to discuss routing issues with.

With regard to the construction of new tank cars and retrofitting of existing tank cars for use in HHFTs, PHMSA and FRA are requiring new tank cars constructed after October 1, 2015 to meet the new design or performance standard, if those tank cars are used as part of an HHFT.[12] In addition, PHMSA and FRA have revised our retrofit timeline. In the NPRM, the retrofit timeline was based on a single risk factor, the packing group. In the final rule, the retrofit timeline is revised to focus on two risk factors, the packing group and differing types of DOT–111 and CPC–1232 tank car. This revision is based on comments to the NPRM and the development of a model to demonstrate industry capacity and learning rates. The revised timeline provides an accelerated risk reduction that more appropriately addresses the overall risk. PHMSA and FRA also modified the overall length of the retrofit to account for issues raised by commenters that were not considered in the NPRM stage. In this final rule, PHMSA is adopting a risk-based timeline for the retrofit of existing tank cars to meet an enhanced CPC–1232 standard (Option #3) when used as part of an HHFT. The timeline is provided in the following table:

TABLE 3—TIMELINE FOR CONTINUED USE OF DOT SPECIFICATION 111 (DOT–111) TANKS FOR USE IN HHFTS

Tank car type/service	Retrofit deadline
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 date would trigger a retrofit reporting requirement, and tank car owners of affected cars would have to report to DOT the number of tank cars that they own that have been retrofitted, and the number that have not yet been retrofitted.

** We anticipate these will be spread out throughout the 120 months and the retrofits will take place during normal requalification and maintenance schedule, which will likely result in fleet being retrofit sooner.

This final rule takes a system-wide, comprehensive approach to rail safety commensurate with the risks associated with HHFTs. Specifically, the requirements in this final rule address:

- Tank Car Specifications
- Advanced Brake Signal Propagation Systems
- Speed Restrictions
- Routing Requirements

[12] Other authorized tank specification as specified in part 173, subpart F will also be permitted however, manufacture of a DOT specification 111 tank car for use in an HHFT is prohibited.

- Notification Requirements
- Classification of unrefined petroleum-based products

In this final rule, the proposals in the NPRM have been revised in response to the comments received and the final RIA has been revised to align with the changes made to the final rule. Specifically, the RIA explains adjustments to the methodology used to estimate the benefits and costs resulting from the final rule.

The revised RIA is in the docket and supports the amendments made in this final rule. Table 4 shows the costs and benefits by affected section and rule provision over a 20-year period, discounted at a 7% rate. Table 4 also shows an explanation of the comprehensive benefits and costs (*i.e.,* the combined effects of individual provisions), and the estimated benefits, costs, and net benefits of each amendment.

Please also note that, given the uncertainty associated with the risks of HHFT shipments, Table 4 contains a range of benefits estimates. The low-end of the range of estimated benefits estimates risk from 2015 to 2034 based on the U.S. safety record for crude oil and ethanol from 2006 to 2013, adjusting for the projected increase in shipment volume over the next 20 years. The upper end of the range of estimated benefits is the 95th percentile of a Monte Carlo simulation.

TABLE 4—20 YEAR COSTS AND BENEFITS BY STAND-ALONE REGULATORY AMENDMENTS 2015–2034 [13]

Affected section [14]	Provision	Benefits (7%)	Costs (7%)
49 CFR § 172.820	Rail Routing +	Cost effective if routing were to reduce risk of an incident by 0.41%.	$8.8 million.
49 CFR § 173.41	Classification Plan	Cost effective if this requirement reduces risk by 1.29%.	$18.9 million.
49 CFR § 174.310	Speed Restriction: 40 mph speed limit in HTUA *.	$56 million–$242 million **	$180 million.
	Advanced Brake Signal Propagation Systems.	$470.3 million–$1,114 million **	$492 million.
49 CFR part 179	Existing Tank Car Retrofit/Retirement	$426 million–$1,706 million **	$1,747 million.
	New Car Construction	$23.9 million–$97.4 million **	$34.8 million.
Cumulative Total		$912 million–$2,905 million **	$2,482 million.

"*" indicates voluntary compliance regarding crude oil trains in high-threat urban areas (HTUA)
"+" indicates voluntary actions that will be taken by shippers and railroads
"**" Indicates that the low end of the benefits range is based solely on lower consequence events, while the high end of the range includes benefits from mitigating high consequence events.

II. Background and Approach to Rail Safety

As noted above the HMR provide safety and security requirements for shipments valued at more than $2.3 trillion annually.[15] The HMR are designed to achieve three goals: (1) To ensure that hazardous materials are packaged and handled safely and securely during transportation; (2) to provide effective communication to transportation workers and emergency responders of the hazards of the materials being transported; and (3) to minimize the consequences of an incident should one occur. The hazardous material regulatory system is a risk management system that is prevention-oriented and focused on identifying a safety or security hazard, thus reducing the probability and quantity of a hazardous material release.

Under the HMR, hazardous materials are categorized by analysis and experience into hazard classes and, for some classes, packing groups based upon the risks that they present during transportation. The HMR specify appropriate packaging and handling requirements for hazardous materials based on such classification, and require an offeror to communicate the material's hazards through the use of shipping papers, package marking and labeling, and vehicle placarding. The HMR also require offerors to provide emergency response information applicable to the specific hazard or hazards of the material being transported. Further, the HMR (1) mandate training for persons who prepare hazardous materials for shipment or who transport hazardous materials in commerce, and (2) require the development and implementation of plans to address the safety and security risks related to the transportation of certain types and quantities of hazardous materials in commerce.

The HMR also include operational requirements applicable to each mode of transportation and the FRA inspects and audits railroads, tank car facilities, and offerors of hazardous materials for compliance with PHMSA regulations as well as its own rail safety regulations. Additionally FRA's research and development program seeks to enhance all elements of railroad safety, including hazardous materials transportation.

To address our shared concerns regarding the risks associated with rail carriage of flammable liquids, and the large volumes of flammable liquids transported in HHFTs, PHMSA and FRA are focusing on three areas: (1) Proper classification and characterization; (2) operational controls to lessen the likelihood and consequences of accidents; and (3) improvements to tank car integrity. This approach is designed to minimize the occurrence of train accidents and mitigate the damage caused should an accident occur.

This overview section provides a general discussion of the major regulations currently in place that affect the safe transportation of hazardous materials by rail. These regulations pertain to issues such as: (1) Braking; (2) speed restrictions; (3) routing; (4) notification requirements; (5) oil spill response planning; (6) classification; and (7) packaging requirements.

A. Braking

The effective use of braking on a freight train can result in accident avoidance. In addition, the effective use of braking on a freight train can potentially lessen the consequences of an accident by diminishing in-train forces, which can reduce the likelihood of a tank car being punctured and

[13] All costs and benefits are in millions over 20 years, and are discounted to present value using a seven percent rate and rounded.

[14] All affected sections of the Code of Federal Regulations (CFR) are in Title 49.

[15] 2012 Commodity Flow Survey, RITA, BTS. See *http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=CFS_2012_00H01&prodType=table.*

decrease the likelihood of a derailment. The FRA has promulgated brake system safety standards for freight and other non-passenger trains and equipment in 49 CFR part 232. Specifically, part 232 provides requirements for (1) general braking, (2) inspection and testing, (3) periodic maintenance and testing, (4) end-of-train (EOT) devices, (5) introduction of new brake system technologies and (6) electronically controlled pneumatic braking (ECP) systems.

FRA's brake system safety standards incorporate longstanding inspection and maintenance requirements related to a train's braking systems—air brakes and handbrakes—that have been in existence for well over 100 years. However, FRA's brake system safety standards also anticipate and allow for new technology. See 49 CFR part 232, subpart F. In 1996, FRA published regulations establishing requirements pertaining to the use and design of two-way EOT devices. 62 FR 278 (Jan. 2, 1997). In 2008, FRA published subpart E to part 232, which established design, inspection, maintenance, and training standards for railroads implementing ECP brake system technology. 73 FR 61512 (Oct. 16, 2008). Two-way EOT devices and ECP braking systems have the potential to provide enhanced braking during emergency braking and ECP brakes allow for enhanced braking and better train control during normal operational brake applications. Moreover, in recent years, certain railroads, particularly those in the western half of the U.S., have shifted to using distributed power (DP), to move longer trains. While DP is technically not a braking system, it can provide some enhanced braking during an emergency braking application over conventional braking systems because it provides an additional signal source to speed the application of air brakes.

Three types of braking systems relevant to this rulemaking, two-way end-of-train (EOT) devices, distributed power (DP) systems, and electronically controlled pneumatic (ECP) braking systems, and briefly introduced below. They are discussed in greater detail in the ''Advanced Braking Signal Systems'' section of this rulemaking.

Two-way EOT devices include two pieces of equipment linked by radio that initiate an emergency brake application command from the front unit located in the controlling (''lead'') locomotive, which then activates the emergency air valve at the rear of the train within one second. The rear unit of the device sends an acknowledgment message to the front unit immediately upon receipt of an emergency brake application command. A two-way EOT device is slightly more effective than conventional air brakes because the rear cars receive the emergency brake command more quickly in an engineer induced emergency brake application.

DP systems use multiple locomotives positioned at strategic locations within the train consist (often at the rear of the train) to provide additional power and train control in certain operations. For instance, a DP system may be used to provide power while climbing a steep incline and to control the movement of the train as it crests the incline and begins its downward descent. The DP system works through the control of the rearward locomotives by command signals originating at the lead locomotive and transmitted to the remote (rearward) locomotives. While distributed power technically is not a braking system, the additional power source in or at the rear of the train consist do provide enhanced braking for a train. The addition of a DP locomotive allows for the braking effort to be distributed throughout the train and allows for a more uniform braking effort than with a conventional air brake system.

ECP brake systems simultaneously send an electronic braking command to all equipped cars in the train, reducing the time before a car's pneumatic brakes are engaged compared to conventional air brakes. They can be installed as an overlay to a conventional air brake system or replace it altogether; however, FRA regulations do require that ECP brake systems be interoperable pursuant to the AAR S–4200 standard, which allows for interchange among the Class I railroads. 49 CFR 232.603.

The simultaneous application of ECP brakes on all cars in a train also significantly improves train handling by substantially reducing stopping distances as well as buff and draft forces within the train, which under certain conditions can result in a derailment. Because ECP brakes do not rely on changes in air pressure passing from car to car, there are no delays related to the depletion and recharging of a train's air brake system. These factors provide railroads with the ability to decrease congestion or to increase volume by running longer trains closer together.

B. Speed Restrictions

High speeds can increase the kinetic energy involved in and the associated damage caused by an accident. With respect to operating speeds, FRA has developed a system of classification that defines different track classes based on track quality. The track classes include Class 1 through Class 9 and ''excepted track.'' See 49 CFR 213.9 and 213.307. Freight trains transporting hazardous materials currently operate at track speeds associated with Class 1 through Class 5 track and, in certain limited instances, at or below ''excepted track'' speed limits. Section 213.9 of the FRA regulations on Track Safety Standards provides the ''maximum allowable operating speed'' for track Class 1 through Class 5 and ''excepted track.'' The speed limits range from 10 mph or less up to 80 mph; however, AAR design specifications effectively limit most freight equipment to a maximum allowable speed of 70 mph.

In addition, the rail industry, through the AAR, implements a detailed protocol on recommended operating practices for the transportation of hazardous materials. This protocol, set forth in AAR Circular OT–55–N includes a 50-mph maximum speed for any ''key train,'' including any train with 20 car loads of ''any combination of hazardous material.'' In February 2014, by way of Secretary Foxx's *Letter to the Association of American Railroads,* AAR's Railroad Subscribers further committed to a 40-mph speed limit for certain trains carrying crude oil within the limits of any High-Threat Urban Area (HTUA), as defined by TSA regulations (49 CFR 1580.3).

C. Track Integrity, Securement, Engineer and Conductor Certification, Crew Size and the Safety of Freight Railroad Operations

FRA carries out a comprehensive railroad safety program pursuant to its statutory authority. FRA's regulations promulgated for the safety of railroad operations involving the movement of freight address: (1) Railroad track; (2) signal and train control systems; (3) operating practices; (4) railroad communications; (5) rolling stock; (6) rear-end marking devices; (7) safety glazing; (8) railroad accident/incident reporting; (9) locational requirements for the dispatch of U.S. rail operations; (10) safety integration plans governing railroad consolidations, mergers, and acquisitions of control; (11) alcohol and drug testing; (12) locomotive engineer and conductor certification; (13) workplace safety; (14) highway-rail grade crossing safety; and other subjects.

Train accidents are often the culmination of a sequence of events that are influenced by a variety of factors and conditions. Broken rails or welds, track geometry, and human factors such as improper use of switches are leading causes of derailments. Rail defects have caused major accidents involving HHFTs, including accidents in New

Brighton, PA, Arcadia, OH and Lynchburg, VA.

While this final rule does not directly address regulations governing the inspection and maintenance of track, securement, and human factors, it does indirectly address some of these issues through the consideration of the 27 safety and security factors as part of the routing requirements. For a summary of on-going FRA related action, including track integrity, securement, crew size, and positive train control, please see the ''Recent Regulatory Actions Addressing HHFTs'' portion of this rulemaking.

D. Routing

Careful consideration of a rail route with regard to a variety of risk factors can mitigate risk of an accident. For some time, there has been considerable public and Congressional interest in the safe and secure rail routing of security-sensitive hazardous materials (such as chlorine and anhydrous ammonia). The Implementing Recommendations of the 9/11 Commission Act of 2007 directed the Secretary, in consultation with the Secretary of Homeland Security, to publish a rule governing the rail routing of security-sensitive hazardous materials. On December 21, 2006, PHMSA, in coordination with FRA and the Transportation Security Administration (TSA) of the U.S. Department of Homeland Security (DHS), published an NPRM proposing to require rail carriers to compile annual data on specified shipments of hazardous materials, use the data to analyze safety and security risks along rail routes where those materials are transported, assess alternative routing options, and make routing decisions based on those assessments. 71 FR 76834.

In that NPRM, we proposed that the route analysis requirements would apply to certain hazardous materials that PHMSA, FRA and TSA believed presented the greatest transportation safety and security risks. Those hazardous materials included certain shipments of explosives, materials poisonous by inhalation (PIH materials), and highway-route controlled quantities of radioactive materials. We solicited comment on whether the proposed requirements should also apply to flammable gases, flammable liquids, or other materials that could be weaponized, as well as hazardous materials that could cause serious environmental damage if released into rivers or lakes. Commenters who addressed this issue indicated that rail shipments of Division 1.1, 1.2, and 1.3 explosives; Poison Inhalation Hazard (PIH) materials; and highway-route controlled quantities of radioactive materials pose significant rail safety and security risks warranting the enhanced security measures proposed in the NPRM and adopted in a November 26, 2008, final rule. 73 FR 20752. Commenters generally did not support enhanced security measures for a broader list of materials than were proposed in the NPRM.

The City of Las Vegas, Nevada, did support expanding the list of materials for which enhanced security measures are required, to include flammable liquids, flammable gases, certain oxidizers, certain organic peroxides, and 5,000 pounds or greater of pyrophoric materials. While DOT and DHS agreed that these materials pose certain safety and security risks in rail transportation, the risks were not as great as those posed by the explosive, PIH, and radioactive materials specified in the NPRM, and PHMSA was not persuaded that they warranted the additional safety and security measures. PHMSA did note, however, that DOT, in consultation with DHS, would continue to evaluate the transportation safety and security risks posed by all types of hazardous materials and the effectiveness of existing regulations in addressing those risks and would consider revising specific requirements as necessary.

In 2008 PHMSA, in consultation with FRA, issued the final route analysis rule. 73 FR 72182. That rule, now found at 49 CFR 172.820, requires rail carriers to select a practicable route posing the least overall safety and security risk to transport security-sensitive hazardous materials. The route analysis final rule requires rail carriers to compile annual data on certain shipments of explosive, PIH, and radioactive materials; use the data to analyze safety and security risks along rail routes where those materials are transported; assess alternative routing options; and make routing decisions based on those assessments. In accordance with § 172.820(e), the carrier must select the route posing the least overall safety and security risk. The carrier must retain in writing all route review and selection decision documentation. Additionally, the rail carrier must identify a point of contact on routing issues involving the movement of covered materials and provide that contact information to the appropriate State, local, and tribal personnel.

Rail carriers must assess available routes using, at a minimum, the 27 factors listed in appendix D to part 172 of the HMR to determine the safest, most secure routes for the transportation of covered hazardous materials.

TABLE 5—MINIMUM FACTORS TO BE CONSIDERED IN THE PERFORMANCE OF THE SAFETY AND SECURITY RISK ANALYSIS REQUIRED BY 49 CFR § 172.820

Volume of hazardous material transported	Rail traffic density	Trip length for route.
Presence and characteristics of railroad facilities	Track type, class, and maintenance schedule.	Track grade and curvature.
Presence or absence of signals and train control systems along the route (''dark'' versus signaled territory).	Presence or absence of wayside hazard detectors.	Number and types of grade crossings.
Single versus double track territory	Frequency and location of track turnouts.	Proximity to iconic targets.
Environmentally sensitive or significant areas	Population density along the route	Venues along the route (stations, events, places of congregation).
Emergency response capability along the route	Areas of high consequence along the route, including high-consequence targets.	Presence of passenger traffic along route (shared track).
Speed of train operations	Proximity to en-route storage or repair facilities.	Known threats, including any threat scenarios provided by the DHS or the DOT for carrier use in the development of the route assessment.
Measures in place to address apparent safety and security risks	Availability of practicable alternative routes.	Past accidents.
Overall times in transit	Training and skill level of crews	Impact on rail network traffic and congestion.

The HMR require carriers to make conscientious efforts to develop logical and defendable systems using these factors.

FRA enforces the routing requirements of § 172.820 and is authorized, after consulting with PHMSA, TSA, and the Surface Transportation Board, to require a railroad to use an alternative route other than the route selected by the railroad if it is determined that the railroad's route selection documentation and underlying analysis are deficient and fail to establish that the route chosen poses the least overall safety and security risk based on the information available. 49 CFR 209.501.

On January 23, 2014, in response to its investigation of the Lac-Mégantic accident, the NTSB issued three recommendations to PHMSA and three similar recommendations to FRA. Recommendation R–14–4 requested PHMSA work with FRA to expand hazardous materials route planning and selection requirements for railroads to include key trains transporting flammable liquids as defined by the AAR Circular No. OT–55–N. Additionally, where technically feasible, NTSB recommended that rerouting be required to avoid transportation of such hazardous materials through populated and other sensitive areas.

E. Notification

Notification of hazardous materials routes to appropriate personnel, such as emergency responders, of certain hazardous materials can aid in emergency preparation and in some instances emergency response, should an accident occur. As mentioned previously, in accordance with the routing requirements in § 172.820 of the HMR, a rail carrier must identify a point of contact for routing issues that may arise involving the movement of covered materials and provide the contact information to the following:

1. State and/or regional fusion centers that have been established to coordinate with state, local, and tribal officials on security issues within the area encompassed by the rail carrier's rail system; [16] and

2. State, local, and tribal officials in jurisdictions that may be affected by a rail carrier's routing decisions and who have contacted the carrier regarding routing decisions.

This serves as the current notification procedure for what have historically been known as the most highly hazardous materials transported by rail. In addition, an emergency order (Docket No. DOT–OST–2014–0067 [17]) published on May 7, 2014, requires all railroads that operate trains containing one million gallons or more of Bakken crude oil to notify SERCs about the operation of these trains through their States.

F. Oil Spill Response Planning

PHMSA's regulations, see 49 CFR part 130, prescribe prevention, containment, and response planning requirements applicable to transportation of oil [18] by motor vehicles and rolling stock. The purpose of a response plan is to ensure that personnel are trained and available and equipment is in place to respond to an oil spill, and that procedures are established before a spill occurs, so that required notifications and appropriate response actions will follow quickly when there is a spill. PHMSA and FRA are addressing the issue of oil spill response plans in a separate rulemaking action. For a detailed description of PHMSA's oil spill response plan requirements, search for docket ''PHMSA–2014–0105'' at *www.regulations.gov*.

G. Classification

An offeror's responsibility to classify and describe a hazardous material is a key requirement under the HMR. In accordance with § 173.22 of the HMR, it is the offeror's responsibility to properly ''class and describe a hazardous material in accordance with parts 172 and 173 of the HMR.'' For transportation purposes, classification is ensuring the proper hazard class, packing group, and shipping name are assigned to a particular material. The HMR do not prescribe a specific test frequency to classify hazardous materials. However, the HMR clearly intend for the frequency and type of testing to be based on an offeror's knowledge of the hazardous material, with specific consideration given to the nature of hazardous material involved, the variety of the sources of the hazardous material, and the processes used to handle and prepare the hazardous material. Section 173.22 also requires offerors to identify all relevant properties of the hazardous material to comply with complete hazard communication, packaging, and operational requirements in the HMR. While the HMR do not prescribe specific requirements to quantify properties relevant to packaging selection, the offeror must follow the general packaging requirements in part 173, subpart B. For example, as indicated in § 173.24(e), even though certain packagings are authorized for a specific HMR entry, it is the responsibility of the offeror to ensure that each packaging is compatible with its specific lading. In addition, offerors must know the specific gravity of the hazardous material at certain temperatures to ensure that outage is considered when loading a rail tank car or cargo tank motor vehicle per § 173.24b(a).

Once an offeror has classified and described the material; selected the appropriate packaging; loaded the packaging; and marked, labeled, and placarded the packaging and/or transport vehicle in accordance with the HMR, the offeror must ''certify'' the shipment per § 172.204 of the HMR. The certification statement indicates the HMR were followed and that all requirements have been met. As such, the offeror is responsible for certifying its material has been properly classified and all packaging requirements have been met. Improper classification can have significant negative impacts on transportation safety as a material may be offered for transportation in an inappropriate package.

The physical and chemical properties of unrefined petroleum-based products are complex and can vary by region, time of year, and method of extraction. Heating, agitation, and centrifugal force are common methods of separation for the initial treatment of unrefined petroleum to reduce the range of values of the physical and chemical properties. These methods eliminate much of the gaseous hydrocarbons, sediments, and water from the bulk material. Blending crude oil from different sources is the most common method to achieve a uniform material. However, there may still be considerable variation between mixtures where separation or blending has occurred at different times or locations. While blending may generate a uniform profile for an individual mixture of the material, it does not eliminate the gaseous hydrocarbons or the related hazards. The separation and blending methods both create a new product or additional byproducts that may result in the need to transport flammable gases in addition to flammable liquids. Manufactured goods and refined products, by definition, are at the other end of the spectrum from unrefined or raw materials. This means that the physical and chemical

[16] *http://www.dhs.gov/fusion-center-locations-and-contact-information.*

[17] See *http://www.dot.gov/briefing-room/emergency-order.*

[18] For purposes of 49 CFR part 130, *oil* means oil of any kind or in any form, including, but not limited to, petroleum, fuel oil, sludge, oil refuse, and oil mixed with the wastes other than dredged spoil. 49 CFR 130.5. This includes non-petroleum oil such as animal fat, vegetable oil, or other non-petroleum oil.

properties are more predictable as they are pure substances or well-studied mixtures.

Crude oil transported by rail is extracted from different sources and is most often blended in large storage tanks before being loaded into rail tank cars at transloading facilities. In rare cases, the crude oil is transferred directly from a cargo tank to a rail car which may result in more variability of properties among the rail tank cars. PHMSA and FRA completed audits of crude oil loading facilities, prior to the issuance of the February 26, 2014, Emergency Restriction/Prohibition Order, indicated that the classification of crude oil being transported by rail was often based solely on a Safety Data Sheet (SDS). The information is usually generic and provides only basic data and offers a wide range of values for a limited number of material properties. The flash point and initial boiling point ranges on SDS referenced during the audits crossed the packaging group threshold values making it difficult to determine the proper packing group assignment. In these instances, it is likely no validation of the information is performed at an interval that would allow for detection of variability in material properties.

In the case of a flammable liquid (excluded from being defined as a gas per § 171.8 of the HMR), the proper classification is based on the flash point and initial boiling point. See § 173.120 of the HMR. The offeror may additionally need to identify properties such as corrosivity, vapor pressure, specific gravity at loading and reference temperatures, and the presence and concentration of specific compounds (*e.g.* sulfur) to further comply with complete packaging requirements.

In addition to the regulations detailing the offeror's responsibility, the rail and oil industry, along with PHMSA's input, have developed a recommended practice (RP) designed to improve the crude oil rail safety through proper classification and loading practices. This effort was led by the API and resulted in the development of American National Standards Institute (ANSI) recognized recommend practice, see ANSI/API RP 3000, ''*Classifying and Loading of Crude Oil into Rail Tank* Cars.'' This recommend practice, which, during its development, went through a public comment period in order to be designated as an American National Standard, addresses the proper classification of crude oil for rail transportation and quantity measurement for overfill prevention when loading crude oil into rail tank cars. This recommended practice was finalized in September 2014, after the NPRM was published. The development of this recommended practice demonstrates the importance of proper classification.

The NTSB also supports routine testing for classification of hazardous materials, such as petroleum crude oil. On January 23, 2014, as a result of its investigation of the Lac-Mégantic accident, the NTSB issued three recommendations to PHMSA and FRA. Safety Recommendation R–14–6 [19] requested that PHMSA 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. This and other NTSB Safety Recommendations are discussed in further detail in the ''NTSB Safety Recommendations'' portion of this document.

H. Packaging/Tank Car

As mentioned previously, in the classification section, proper classification is essential when selecting an appropriate packaging for the transportation of hazardous materials. The HMR provides a list of authorized packagings for each hazardous material. The hazardous materials table (HMT) of § 172.101 provides the list of packagings authorized for use by the HMR based on the shipping name of a hazardous material. For each proper shipping name, bulk packaging requirements are provided in Column (8C) of the HMT.

The offeror must select a packaging that is suitable for the properties of the material and based on the packaging authorizations provided by the HMR. With regard to package selection, the HMR require in § 173.24(b) that each package used for the transportation of hazardous materials be ''designed, constructed, maintained, filled, its contents so limited, and closed, so that under conditions normally incident to transportation . . . there will be no identifiable (without the use of instruments) release of hazardous materials to the environment [and] . . . the effectiveness of the package will not be substantially reduced.'' Under this requirement, offerors must consider how the properties of the material (which can vary depending on temperature and pressure) could affect the packaging.

The packaging authorizations are currently indicated in the HMT and part 173, subpart F. DOT Specification 111 tank cars are authorized for low, medium, and high-hazard liquids and solids (equivalent to Packing Groups III, II, I, respectively). Packing groups are designed to assign a degree of danger presented within a particular hazard class. Packing Group I poses the highest danger (''great danger'') and Packing Group III the lowest (''minor danger'').[20] In addition, the general packaging requirements prescribed in § 173.24 provide additional consideration for selecting the most appropriate packaging from the list of authorized packaging identified in column (8) of the HMT.

For most flammable liquids, the authorized packaging requirements for a PG I material are provided in § 173.243 and for PGs II and III in § 173.242. The following table is provided as a general guide for the packaging options for rail transport provided by the HMR for flammable liquids.

TABLE 6—TANK CAR OPTIONS [21]

Flammable liquid, PG I	Flammable liquid, PG II and III
DOT 103	DOT 103.
DOT 104	DOT 104.
DOT 105	DOT 105.
DOT 109	DOT 109.
DOT 111	DOT 111.
DOT 112	DOT 112.
DOT 114	DOT 114.
DOT 115	DOT 115.
DOT 120	DOT 120.
	AAR 206W.

Note 1. Sections 173.241, 173.242, and 173.243 authorize the use of the above tank cars.

Note 2. DOT 103, 104,105, 109, 112, 114, and 120 tank cars are pressure tank cars (HMR; Part 179, subpart C).

Note 3. DOT 111 and 115 tank cars are non-pressure tank cars (HMR; Part 179, subpart D).

Note 4. AAR 203W, AAR 206W, and AAR 211W tank cars are non-DOT specification tank cars that meet AAR standards. These tank cars are authorized under § 173.241 of the HMR (see Special Provision B1, as applicable).

Note 5. DOT 114 and DOT 120 pressure cars are permitted to have bottom outlets and, generally, would be compatible with the DOT 111.

The DOT Specification 111 tank car is one of several cars currently authorized

[19] NTSB Recommendation 14–6 .*http://phmsa.dot.gov/PHMSA/Key_Audiences/Hazmat_Safety_Community/Regulations/NTSB_Safety_Recommendations/Rail/ci.R-14-6,Hazmat.print.*

[20] Packing groups, in addition in indicating risk of the material, can trigger levels of varying requirements. For example, packing groups can indicate differing levels of testing requirements for a non-bulk packaging or the need for additional operational requirements, such as security planning requirements.

[21] Additional information on tank car specifications is available at the following URL: *http://www.bnsfhazmat.com/refdocs/1326686674.pdf.*

by the HMR for the rail transportation of many hazardous materials, including ethanol, crude oil, and other flammable liquids. For a summary of the design requirements of the DOT Specification 111 tank car, see Table 13 in the tank car portion of the discussion of comments.

In published findings from the June 19, 2009, incident in Cherry Valley, Illinois, the NTSB indicated that the DOT Specification 111 tank car can almost always be expected to breach in the event of a train accident resulting in car-to-car impacts or pileups.[22] In addition, PHMSA received numerous petitions encouraging rulemaking, and both FRA and PHMSA received letters from members of Congress urging prompt, responsive actions from the Department. The AAR created the T87.6 Task Force on July 20, 2011, to consider several enhancements to the DOT Specification 111 tank car design and rail carrier operations to enhance rail transportation safety. Simultaneously, FRA conducted research on long-standing safety concerns regarding the survivability of the DOT Specification 111 tank cars designed to current HMR standards and used for the transportation of ethanol and crude oil, focusing on issues such as puncture resistance and top fittings protection. The research indicated that special consideration is necessary for the transportation of ethanol and crude oil in DOT Specification 111 tank cars, especially in HHFTs.

In addition, PHMSA and FRA reviewed the regulatory history pertaining to flammable liquids transported in tank cars. Prior to 1990, the distinction between material properties that resulted in different packaging, for flammable liquids in particular, was described in far more detail in § 173.119. Section 173.119 indicated that the packaging requirements for flammable liquids are based on a combination of flash point, boiling point, and vapor pressure. The regulations provided a point at which a flammable liquid had to be transported in a tank car suitable for compressed gases, commonly referred to as a ''pressure car'' (*e.g.,* DOT Specifications 105, 112, 114, 120 tank cars).

In 2011, the AAR issued Casualty Prevention Circular (CPC) 1232, which outlines industry requirements for certain DOT Specification 111 tanks ordered after October 1, 2011, intended for use in ethanol and crude oil service (construction approved by FRA on January 25, 2011).[23] The CPC–1232 requirements are intended to improve the crashworthiness of the tank cars and include a thicker shell, head protection, top fittings protection, and pressure relief valves with a greater flow capacity.

Despite these improvements of the CPC–1232 on April 6, 2015 the NTSB issued additional recommendations related to legacy DOT Specification 111 tank cars as well as the newer CPC–1232 tank cars. These recommendations, R–15–14 and R–15–15, requested that PHMSA 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 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.

III. Recent Regulatory Actions Addressing Rail Safety

The August 1, 2014 NPRM extensively detailed the regulatory actions of PHMSA and FRA that were relevant to the transportation of large quantities of flammable liquids by rail. Specifically, the NPRM detailed regulatory actions that addressed prevention, mitigation, and response through risk reduction. For a description of the PHMSA and FRA regulatory actions that were taken prior to the August 1, 2014 NPRM please refer to the ''*Regulatory Actions*'' section of the NPRM. We provide a brief summary below of regulatory actions taken by PHMSA and FRA concurrently with, and after the August 1, 2014 NPRM. In addition we highlight some additional regulatory actions not discussed in the NPRM.

A. Rulemaking Actions

On August 1, 2014, in conjunction with its NPRM—''Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains (2137–AE91)'', PHMSA, in consultation with the FRA, published an Advanced Notice of Proposed Rulemaking (ANPRM) that sought comment on potential revisions to its regulations that would expand the applicability of comprehensive oil spill response plans (OSRPs) to high-hazard flammable trains (HHFTs) based on thresholds of crude oil that apply to an entire train consist (See Docket PHMSA–2014–0105).

On August 9, 2014, FRA published an NPRM that proposed amendments to strengthen the requirements relating to the securement of unattended equipment. Specifically, FRA proposed to codify many of the requirements already included in its Emergency Order 28, Establishing Additional Requirements for Attendance and Securement of Certain Freight Trains and Vehicles on Mainline Track or Mainline Siding Outside of a Yard or Terminal. FRA proposed to amend existing regulations to include additional securement requirements for unattended equipment, primarily pertaining to trains transporting PIH materials or large volumes of Division 2.1 (flammable gases), Class 3 (flammable or combustible liquids, including crude oil and ethanol), and Division 1.1 or 1.2 (explosives) hazardous materials. For these trains, FRA proposed requiring attendance on all mainline and sidings that are outside of and not adjacent to a yard unless the railroad has determined it would be appropriate to leave the equipment unattended at the specific location and included the location in its securement plan. FRA also proposed requirements relating to job briefings and communication with qualified railroad personnel to verify equipment has been properly secured before leaving it unattended. Attendance would be required for any equipment not capable of being secured in accordance with the proposed and existing requirements. FRA's NPRM also proposed to require railroads to verify securement in instances where they have knowledge that emergency responders accessed unattended equipment. Finally, FRA proposed a new requirement that all locomotives left unattended outside of a yard be equipped with an operative exterior locking mechanism. *See* 75 FR 53356 (Sept. 9, 2014).

In addition to the regulatory initiatives concerning oil spill response and railroad equipment securement discussed above, PHMSA and FRA are committed to clarifying and improving our existing regulations through active and future rulemakings. As a result PHMSA and FRA continue to work with the regulated community and general public to implement existing regulations and improve safety through regulatory action. PHMSA and FRA have many initiatives underway to address freight

[22] NTSB, *Railroad Accident Report—Derailment of CN Freight Train U70691–18 With Subsequent Hazardous Materials Release and Fire, http://www.ntsb.gov/investigations/AccidentReports/Reports/RAR1201.pdf* (February 2012).

[23] See ''Background'' section of the August 2014 NPRM for information regarding a detailed description of PHMSA and FRA actions to allow construction under CPC–1232.

rail safety. Key regulatory actions are outlined below:

TABLE 7—PHMSA AND FRA SAFETY INITIATIVES

Safety initiative	Project summary	Current status
Risk Reduction Program (2130–AC11).	FRA is developing an NPRM that will consider appropriate contents for Risk Reduction Programs by Class I freight railroads and how they should be implemented and reviewed by FRA. A Risk Reduction Program is a structured program with proactive processes and procedures developed and implemented by a railroad to identify hazards and to mitigate, if not eliminate, the risks associated with those hazards on its system. A Risk Reduction Program encourages a railroad and its employees to work together to proactively identify hazards and to jointly determine what action to take to mitigate or eliminate the associated risks.	ANPRM was published on December 8, 2010, and the comment period ended on February 7, 2011. Public hearings regarding this rule were held on July 19, 2011, in Chicago, IL on July 21, 2011, in Washington, DC. The NPRM was published on February 27, 2015 and the comment period ended April 27, 2015.
Track Safety Standards: Improving Rail Integrity (2130–AC28).	FRA's final rule prescribes specific requirements for effective rail inspection frequencies, rail flaw remedial actions, minimum operator qualifications, and requirements for rail inspection records. The bulk of this regulation codifies current good practices in the industry. In addition, it removes the regulatory requirements concerning joint bar fracture reporting. Section 403(c) of the Rail Safety Improvement Act of 2008 (RSIA) (Pub. L. 110–432, 122 Stat. 4848 (October 16, 2008)) (49 U.S.C. 20142 note)) mandated that FRA review its existing regulations to determine if regulatory amendments should be developed that would revise, for example, rail inspection frequencies and methods and rail defect remedial actions and consider rail inspection processes and technologies.	FRA published this rule on January 24, 2014 (79 FR 4234). The final rule became effective on March 25, 2014.
Positive Train Control (PTC) (multiple rulemakings).	PTC is a processor-based/communication-based train control system designed to prevent train accidents. The RSIA mandates that PTC be implemented across a significant portion of the Nation's rail system by December 31, 2015. See 49 U.S.C. 20157. With limited exceptions and exclusions, PTC is required to be implemented on Class I railroad main lines (i.e., lines with over 5 million gross tons annually) over which any PIH or toxic inhalation hazard (TIH) materials are transported; and, on any railroad's main lines over which regularly scheduled passenger intercity or commuter operations are conducted. It is currently estimated this will equate to approximately 70,000 miles of track and will involve approximately 20,000 locomotives. PTC technology is capable of automatically controlling train speeds and movements should a train operator fail to take appropriate action for the conditions at hand. For example, PTC can force a train to a stop before it passes a signal displaying a stop indication, or before diverging on a switch improperly lined, thereby averting a potential collision. PTC systems required to comply with the requirements of Subpart I must reliably and functionally prevent: Train-to-train collisions; Overspeed derailments; Incursion into an established work zone; and Movement through a switch in the wrong position.	FRA published the most recent PTC systems final rule on August 22, 2014 (79 FR 49693), addressing the *de minimis* exception, yard movements, en route failures, and other issues. The final rule became effective on October 21, 2014.
Securement	The new measures proposed in the securement NPRM would require: (1) Crew members leaving equipment carrying specified hazardous materials unattended in certain areas to follow certain additional procedures to ensure proper securement. (2) Railroads to develop a plan identifying such locations or circumstances. (3) Railroads to verify securement using qualified persons; and ensure that locks on locomotive cab are secure. Include securement requirements in job briefings. (4) Railroads to perform additional inspections by qualified persons when emergency responders have been on equipment. (5) Railroads to install locking mechanisms on locomotive doors and repair them in a timely manner. The proposed rule covers equipment containing poisonous by inhalation (PIH) materials and those defined as Division 2.1 (flammable gas), Class 3 (flammable or combustible liquid), Class 1.1 or 1.2 (explosive) materials,[24] or a hazardous substance listed in 49 CFR § 173.31(f)(2). This includes most crude oil moved in the United States.	The NPRM was published on September 9, 2014, and the comment closed on November 10, 2014.
Crew Size	FRA has initiated a rulemaking to address the appropriate oversight to ensure safety related train crew size.	Developing Rulemaking.
Retrospective Regulatory Review 49 CFR part 174—Carriage by Rail (78 FR 42998).	As part of a retrospective regulatory review PHMSA and FRA reviewed the part 174 ''Carriage by Rail'' section of our regulations in an effort to identify areas which could be revised to improve clarity. On August 27–28, 2013 as part of this comprehensive review of operational factors that impact the transportation of hazardous materials by rail PHMSA and FRA held a public meeting.	PHMSA and FRA have evaluated the comments from the public meeting and intend to move forward with revisions to part 174.

TABLE 7—PHMSA AND FRA SAFETY INITIATIVES—Continued

Safety initiative	Project summary	Current status
Oil Spill Response Plans for High-Hazard Flammable Trains (PHMSA–2014–0105).	In this ANPRM, PHMSA, in consultation with FRA, sought comment on potential revisions to its regulations that would expand the applicability of comprehensive oil spill response plans (OSRPs) to high-hazard flammable trains (HHFTs) based on thresholds of crude oil that apply to an entire train consist.	Published ANPRM on August 1, 2014 and the comment closed on September 30, 2014. Developing follow-up NPRM.

B. Emergency Orders

The Department has the authority to issue emergency orders in certain instances and take action on safety issues that constitute an imminent hazard to the safe transportation of hazardous materials. Railroad transportation of hazardous materials in commerce is subject to the authority and jurisdiction of the Secretary of Transportation (Secretary), including the authority to impose emergency restrictions, prohibitions, recalls, or out-of-service orders, without notice or an opportunity for hearing, to the extent necessary to abate the imminent hazard. 49 U.S.C. 5121(d). Therefore, an emergency order can be issued if the Secretary has found that an unsafe condition or an unsafe practice is causing or otherwise constitutes an imminent hazard to the safe transportation of hazardous materials.

The NPRM extensively detailed the departmental actions taken, in the form of emergency orders prior to August 1, 2014. Please refer to the ''*Emergency Orders and Non-Regulatory Actions*'' section of August 1, 2014 NPRM for a detailed description of emergency orders issued by the Department that are relevant to the transportation by rail of large quantities of flammable liquids. The table below briefly summarizes those orders and the additional emergency order issued since the NPRM publication.

TABLE 8—EMERGENCY ORDERS ISSUED RELATED TO RAIL TRANSPORT OF FLAMMABLE LIQUIDS

Emergency order	Date issued	Action taken
Emergency Order 28 (78 FR 48218)[25] Issued by FRA.	August 7, 2013	Addressed securement and attendance issues related to securement of certain hazardous materials trains; specifically, trains with:
	.....	(1) Five or more tank carloads of any one or any combination of materials poisonous by inhalation as defined in Title 49 CFR § 171.8, and including anhydrous ammonia (UN1005) and ammonia solutions (UN3318); or
	.....	(2) 20 rail carloads or intermodal portable tank loads of any one or any combination of materials listed in (1) above, or, any Division 2.1 flammable gas, Class 3 flammable liquid or combustible liquid, Class 1.1 or 1.2 explosive,[26] or hazardous substance listed in 49 CFR 173.31(f)(2).
Docket No. DOT–OST–2014–0025.[27]	February 25, 2014; revised and amended Order on March 6, 2014.	Required those who offer crude oil for transportation by rail to ensure that the product is properly tested and classified in accordance with Federal safety regulations.[28] The March 6, 2014 Amended Emergency Restriction/Prohibition Order required that all rail shipments of crude oil that are properly classed as a flammable liquid in Packing Group (PG) III material be treated as PG I or II material, until further notice. The amended emergency order also instructed that PG III materials be described as PG III for the purposes of hazard communication.
Docket No. DOT–OST–2014–0067.	May 7, 2014	Required all railroads that operate trains containing one million gallons or more of Bakken crude oil to notify SERCs about the operation of these trains through their States. Specifically, identify each county, or a particular state or commonwealth's equivalent jurisdiction (e.g., Louisiana parishes, Alaska boroughs, Virginia independent cities), in the state through which the trains will operate.
FRA Emergency Order No. 30.	April 27, 2015	Mandated that trains affected by this order not exceed 40 miles per hour (mph) in high-threat urban areas (HTUAs) as defined in 49 CFR Part 1580. Under the order, an affected train is one that contains: (1) 20 or more loaded tank cars in a continuous block, or 35 or more loaded tank cars, of Class 3 flammable liquid; and, (2) at least one DOT Specification 111 (DOT–111) tank car (including those built in accordance with Association of American Railroads (AAR) Casualty Prevention Circular 1232 (CPC–1232)) loaded with a Class 3 flammable liquid.

On June 30, 2014 FRA published an information collection request (ICR) notice in the **Federal Register**, 79 FR 36860 with a 60-day comment period soliciting comments on the May 7, 2014 emergency order.[29]

On August 29, 2014, FRA received a joint comment from the AAR and the American Short Line and Regional Railroad Association (ASLRRA) raising three main points. First, AAR and ASLRRA asserted that the crude oil routing information in the May 7, 2014 emergency order requires railroads to provide to SERCs sensitive information from a security perspective and the information should only be available to persons with a need-to-know for the

[24] Should have read ''Division'' instead of ''Class.''

[25] See *http://www.gpo.gov/fdsys/pkg/FR-2013-08-07/pdf/2013-19215.pdf.*

[26] Should have read ''Division'' instead of ''Class.''

[27] See *http://www.dot.gov/sites/dot.gov/files/docs/Amended%20Emergency%20Order%20030614.pdf.*

[28] See Docket No. DOT–OST–2014–0025. See also *http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Amended_Emergency_Order_030614.pdf.*

[29] See *http://www.gpo.gov/fdsys/pkg/FR-2014-06-30/html/2014-15174.htm.*

information (*e.g.,* emergency responders and emergency response planners). Second, AAR and ASLRRA asserted that the same information is commercially sensitive information that should remain confidential and not be publically available. Finally, AAR and ASLRRA asserted that the emergency order is not serving a useful purpose as the information required by the emergency order to be provided to the SERCs is already provided to emergency responders through AAR Circular OT–55–N. See AAR, ''Circular OT–55–N: Recommended Railroad Operating Practices For Transportation of Hazardous Materials,'' Aug. 5, 2013 (OT–55).

On October 3, 2014, FRA published a 30-day ICR notice in the **Federal Register**, 79 FR 59891–59893 to extend the current emergency ICR supporting the crude oil train routing reporting requirements of the May 7, 2014 emergency order. In this notice, FRA addressed the security sensitive claim by noting that the information does not fall under any of the fifteen enumerated categories of sensitive security information (SSI) set forth in 49 CFR 15.5 or § 1520.5. The ICR goes on to describe the nature of the information collection and its expected burden.

On April 17, 2015 FRA issued Emergency Order (80 FR 23321) to require that certain trains transporting large amounts of Class 3 flammable liquid through certain highly-populated areas adhere to a maximum authorized operating speed limit.[30] Under Emergency Order, an affected train is one that contains (1) 20 or more loaded tank cars in a continuous block, or 35 or more loaded tank cars, of a Class 3 flammable liquid; and (2) at least one DOT–111 tank car (including those built in accordance with CPC–1232) loaded with a Class 3 flammable liquid. Affected trains must not exceed 40 mph in HTUAs as defined in 49 CFR 1580.3.

FRA issued Emergency Order in the interest of public safety to dictate that an appropriate speed restriction be placed on trains containing large quantities of a flammable liquid, particularly in areas where a derailment could cause a significant hazard of death, personal injury, or harm to the environment until the provisions of this final rule were issued and become effective. Further, by limiting speeds for certain higher risk trains, FRA also hopes to reduce in-train forces related to acceleration, braking, and slack action that are sometimes the cause of derailments.

Emergency Order not only applies to legacy DOT–111 tank cars but newer tank cars built to the CPC–1232 standard. While CPC–1232 tank cars have more robust protections than do legacy DOT–111 tank cars, recent accidents have shown that those cars may still release hazardous material when involved in derailments. Derailments in 2015 in Mt. Carbon, WV, Dubuque, IA, and Galena, IL involved CPC–1232 cars and resulted in the release of hazardous materials from those cars.

Analysis of certain speed restrictions below 40 mph indicated that such restrictions could potentially cause harmful effects on interstate commerce, and actually increase safety risks. Increased safety risks could occur if speed restrictions cause rail traffic delays resulting in trains stopping on main track more often and in trains moving into and out of sidings more often requiring more train dispatching. FRA believes the restrictions in Emergency Order will address an emergency situation while avoiding other safety impacts and harm to interstate commerce and the flow of necessary goods to the citizens of the United States. FRA and DOT will continue to evaluate whether additional action with regard to train speeds is appropriate.

IV. Non-Regulatory Actions Addressing Rail Safety

The August 1, 2014, NPRM extensively detailed non-regulatory actions taken to address the risks associated with rail shipment of large quantities of flammable liquids prior to the publication of that document. These non-regulatory actions included but were not limited to: (1) Safety Alerts and Advisories, (2) Operation Classification, (3) the DOT Secretary's Call to Action, and (4) PHMSA and FRA outreach and education efforts. Please refer to the ''*Emergency Orders and Non-Regulatory Actions*'' section of August 1, 2014 NPRM or the PHMSA Web site [31] for a description these non-regulatory efforts that are relevant to rail shipment of large quantities of flammable liquids. Below is a brief description of PHMSA and FRA efforts since the publication of the August 1, 2014 NPRM.

A. Safety Alerts and Advisories

Safety advisories are documents published in the **Federal Register** that inform the public and regulated community of a potential dangerous situation or issue. In addition to safety advisories, PHMSA and FRA may also issue other notices, such as safety alerts. Please refer to the ''*Emergency Orders and Non-Regulatory Actions*'' section of the August 1, 2014, NPRM for a description of safety alerts and advisories that are relevant to rail shipment of large quantities of flammable liquids issued prior to the publication of the NPRM.

On April 17, 2015 PHMSA issued a notice (Notice No. 15–7; 80 FR 22781) to remind hazardous materials shippers and carriers of their responsibility to ensure that current, accurate and timely emergency response information is immediately available to emergency response officials for shipments of hazardous materials, and such information is maintained on a regular basis.[32] This notice outlined existing regulatory requirements applicable to hazardous materials shippers (including re-offerors) and carriers found in the HMR, specifically in Subpart G of Part 172.

PHMSA Notice 15–7 emphasized that the responsibility to provide accurate and timely information is a shared responsibility for all persons involved in the transportation of hazardous materials. It is a shipper's responsibility to provide accurate emergency response information that is consistent with both the information provided on a shipping paper and the material being transported. Likewise, re-offerors of hazardous materials must ensure that this information can be verified to be accurate, particularly if the material is altered, mixed or otherwise repackaged prior to being placed back into transportation. In addition, carriers must ensure that emergency response information is maintained appropriately, is accessible and can be communicated immediately in the event of a hazardous materials incident.

Also issued on April 17, 2015 was a joint FRA and PHMSA safety advisory notice (FRA Safety Advisory 2015–02; PHMSA Notice No. 15–11; 80 FR 22778). This joint safety advisory notice was published to remind railroads operating an HHFT, defined as a train comprised of 20 or more loaded tank cars of a Class 3 flammable liquid in a continuous block, or a train with 35 or more loaded tank cars of a Class 3 flammable liquid across the entire train, as well as the offerors of Class 3 flammable liquids transported on such trains, that certain information may be

[30] See *http://www.phmsa.dot.gov/pv_obj_cache/pv_obj_id_2DA43BA3704E57F1958957625273D89A29FF0B00/filename/EO_30_FINAL.pdf.*

[31] See detailed chronology of PHMSA efforts at *http://phmsa.dot.gov/hazmat/osd/chronology.*

[32] See: *http://www.gpo.gov/fdsys/pkg/FR-2015-04-23/pdf/2015-09436.pdf.*

required by PHMSA and/or FRA personnel during the course of an investigation immediately following an accident.

Following recent derailments involving HHFTs, FRA and PHMSA conducted several post-accident investigations and sought to ensure that stakeholders were fully aware of each agency's investigative authority and cooperated with agency personnel conducting such investigations, where time is of the essence in gathering evidence. Therefore, PHMSA and FRA issued the joint safety advisory notice to remind railroads operating HHFTs, and offerors of Class 3 flammable liquids being transported aboard those trains, of their obligation to provide PHMSA and FRA, as expeditiously as possible, with information agency personnel need to conduct investigations immediately following an accident or incident.

FRA issued a safety advisory notice 2015–01 (80 FR 23318) on April 17, 2015 to make recommendations to enhance mechanical safety of tank cars in HHFTs.[33] Recent derailments have occurred involving trains transporting large quantities of petroleum crude oil and ethanol. Preliminary investigation of the Galena, IL derailment involving a crude oil train indicates that a mechanical defect involving a broken tank car wheel may have caused or contributed to the incident. Safety Advisory 2015–01 recommended that railroads use highly qualified individuals to conduct the brake and mechanical inspections and recommends a reduction to the impact threshold levels the industry currently uses for wayside detectors that measure wheel impacts to ensure the wheel integrity of tank cars in those trains.

B. Operation Classification

As part of PHMSA and FRA's overall rail safety efforts, the administration launched a testing and sampling program (*Operation Classification)* in August 2013 to verify that crude oil is being properly classified in accordance with Federal regulations. Early indications from the July 6, 2013, derailment in Lac-Mégantic were that the crude oil involved in that accident was misclassified. Specifically, the product was assigned a PG III classification (lowest hazard), despite meeting the criteria for PG II. Therefore, its hazards were not correctly identified. This was later confirmed by the Transportation Safety Board of Canada's (TSB) in Railway Investigation Report R13D0054 (Aug. 19, 2014).[34]

Operation Classification continues today, and activities include unannounced inspections, data collection, and sampling at strategic terminal and loading locations for crude oil. PHMSA investigators test samples from various points along the crude oil transportation chain: From cargo tanks that deliver crude oil to rail loading facilities, from storage tanks at the facilities, and from pipelines connecting storage tanks to rail cars that would move the crude across the country. Concurrently, with the publication of the August 1, 2014 NPRM, PHMSA issued an update on the results of PHMSA's sampling and testing effort. See Operation Safe Delivery Update.[35] Based upon the results obtained from sampling and testing, the majority of crude oil analyzed displayed characteristics consistent with those of a Class 3 flammable liquid, PG I or II, with predominance to PG I, the most dangerous Packing Group of Class 3 flammable liquids with lower flash points and initial boiling points than packing groups II and III.

Since the issuance of PHMSA's ''Operation Safe Delivery Update,'' PHMSA has continued its testing and sampling activities and refined the collection methods. PHMSA has purchased closed syringe-style cylinders and is collecting all samples using these cylinders. Utilizing these types of cylinders minimizes the opportunity for any dissolved gases to be lost to the air during collection, thus providing increased accuracy. In addition, PHMSA has taken samples at other shale play locations around the United States to compare their characteristics to that of crude oil from the Bakken region. PHMSA plans to provide subsequent updates of its testing and sampling activities as we move forward and to work with the regulated community to ensure the safe transportation of crude oil across the nation.

As mentioned previously the primary intent of PHMSA's sampling and analysis of crude oil is to determine if shippers are properly classifying crude oil for transportation. PHMSA also uses this data to quantify the range of physical and chemical properties of crude oil. While the information and data obtained from the sampling and analysis helped quantify the range of physical and chemical properties of crude oil, this data did not inform the regulatory amendments in the August 1, 2014, NPRM or this rulemaking.

C. Call to Action

On January 9, 2014, the Secretary issued a ''Call to Action'' to actively engage all the stakeholders in the crude oil industry, including CEOs of member companies of API and CEOs of the railroads. In a meeting held on January 16, 2014, the Secretary and the Administrators of PHMSA and FRA requested that offerors and carriers identify prevention and mitigation strategies that can be implemented quickly. As a result of this meeting, the rail and crude oil industries agreed to voluntarily consider or implement potential improvements, including speed restrictions in high consequence areas, alternative routing, the use of distributive power to improve braking, and improvements in emergency response preparedness and training. On January 22, 2014, the Secretary sent a letter to the attendees recapping the meeting and stressing the importance of this issue.[36] The August 1, 2014, NPRM provided a detailed listing of all voluntary actions the crude oil and rail industry agreed to take. *See* ''Emergency Orders and Non-Regulatory Actions'', 79 FR at 45031. Since the publication of the August 1, 2014, NPRM the following items [37] related to the call to action have been completed.

- Recommended Practice 3000 (RP 3000)—API published a new set of recommended practices for testing and classifying crude oil for rail shipment and loading it into rail tank cars. These guidelines were the product of extensive work and cooperation between the oil and gas industry, the freight rail industry, and PHMSA to ensure crude shipments are packaged appropriately, and emergency responders have the right information. RP 3000 provides guidance on the material characterization, transport classification, and quantity measurement for overfill prevention of petroleum crude oil for the loading of rail tank cars. RP 3000 identifies criteria for determining the frequency of sampling and testing of petroleum crude oil for transport classification. It discusses how to establish a sampling and testing program, and provides an example of such a program.

[33] See: *http://www.gpo.gov/fdsys/pkg/FR-2015-04-27/pdf/2015-09612.pdf.*

[34] See *http://www.tsb.gc.ca/eng/rapports-reports/rail/2013/r13d0054/r13d0054.pdf.*

[35] See *http://phmsa.dot.gov/pv_obj_cache/pv_obj_id_8A422ABDC16B72E5F166FE34048CCCBFED3B0500/filename/07_23_14_Operation_Safe_Delivery_Report_final_clean.pdf.*

[36] *http://phmsa.dot.gov/pv_obj_cache/pv_obj_id_AAFF3C0BBA4D0B46209E5528662AC5427B6F0700/filename/Letter_from_Secretary_Foxx_Follow_up_to_January_16.pdf.*

[37] This is not a comprehensive list. These items simply highlight some of the recently completed call to action items.

• Transportation Technology Center Inc. (TTCI) Training—AAR and Railroad Subscribers committed considerable resources to develop and provide a hazardous material transportation training curriculum applicable to petroleum crude oil transport for emergency responders. This training was completed in the summer of 2014 and continues to be refined.

• Speed Reduction—Railroads began operating certain trains at 40 mph on July 1, 2014. This voluntary restriction applies to any HHFT with at least one non-CPC 1232 tank car loaded with crude oil or one non-DOT specification tank car loaded with crude oil while that train travels within the limits of any high-threat urban area (HTUA) as defined by 49 CFR 1580.3.

D. Stakeholder Outreach

PHMSA and FRA are taking a focused approach to increase community awareness and preparedness for response to incidents involving bulk transport of crude oil and other high-hazard flammable shipments by rail such as ethanol. Specific efforts have taken place to develop appropriate response outreach and training tools to mitigate the impact of future incidents. The following are some of the actions taken to by PHMSA to enhance emergency response to rail crude oil incidents over the past year.

In February 2014, PHMSA hosted a stakeholder meeting with participants from the emergency response community, the railroad industry, Transport Canada and Federal partners FRA, and FMCSA. The objective was to discuss emergency preparedness related to incidents involving transportation of crude oil by rail. The discussion topics included: Current state of crude oil risk awareness and operational readiness/capability; familiarity with bulk shippers of crude oil, emergency response plans and procedures; available training resources (sources, accessibility, gaps in training); and the needs of emergency responders/public safety agencies.

In May 2014, in conjunction with the Virginia Department of Fire Programs, PHMSA hosted a ''Lessons Learned'' Roundtable forum that consisted of a panel of fire chiefs and emergency management officials from some of the jurisdictions that experienced a crude oil or ethanol rail transportation incident. The purpose of this forum was to share firsthand knowledge about their experiences responding to and managing these significant rail incidents. In attendance were public safety officials from Aliceville, AL, Cherry Valley, IL, Cass County, ND, and the Lynchburg, VA fire department. Based on the input received from the forum participants, PHMSA published a ''*Crude Oil Rail Emergency Response Lessons Learned Roundtable Report''* outlining the key factors that were identified as having a direct impact on the successful outcome of managing a crude oil transportation incident.[38]

In June 2014, in partnership with FRA and the U.S. Fire Administration (USFA), PHMSA hosted a stakeholder meeting with hazardous materials response subject matter experts from the public safety, railroads, government, and industry to discuss best practices for responding to a crude oil incident by rail. In coordination with the working group, PHMSA drafted the ''*Commodity Preparedness and Incident Management Reference Sheet.''* This document contains incident management best practices for crude oil rail transportation emergency response operations that include a risk-based hazardous materials emergency response operational framework. The framework provides first responders with key planning, preparedness, and response principles to successfully manage a crude oil rail transportation incident. The document also assists fire and emergency services personnel in decision-making and developing an appropriate response strategy to an incident (*i.e.,* defensive, offensive, or non-intervention).[39] In partnership with the USFA's, National Fire Academy (NFA), a series of six coffee break training bulletins were published and widely distributed to the emergency response community providing reference to the response document.[40]

In October 2014, to further promote the ''*Commodity Preparedness and Incident Management Reference Sheet,''* PHMSA contracted with the Department of Energy, Mission Support Alliance-Hazardous Materials Management and Emergency Preparedness (MSA–HAMMER) to develop the *Transportation Rail Incident Preparedness and Response (TRIPR) for Flammable Liquid Unit Trains* training modules. These modules along with three table-top scenarios offer a flexible approach to increasing awareness of emergency response personnel on the best practices and principles related to rail incidents involving hazard class 3 flammable liquids. A key component of this initiative is to learn from past experiences and to leverage the expertise of public safety agencies, rail carriers, and industry subject matter experts in order to prepare first responders to safely manage rail incidents involving commodities such as crude oil and ethanol. These modules are not intended to be a stand alone training program, but are offered to supplement existing programs. Estimated delivery for this project is May 2015.

In December 2014, PHMSA re-engaged the emergency response stakeholder group to allow all parties Federal government, the railroad industry and the response community to provide updates on the various emergency response related initiatives aimed to increase community awareness and preparedness for responding to incidents involving crude oil and other high-hazard flammable shipments by rail.

In addition to PHMSA's efforts mentioned above, in January 2015, The National Response Team (NRT), led by Environmental Protection Agency (EPA), conducted a webinar titled ''*Emerging Risks, Responder Awareness Training for Bakken Crude Oil''* to educate responders on Bakken Crude Oil production and transportation methods along with the health and safety issues facing first responders. In addition to the training webinar, the NRT also intends to conduct a large scale exercise scenario in 2015, to assess federal, state, and local response capabilities to a crude oil incident.

Also in January 2015, the Environmental Protection Agency (EPA) along with other Federal partners including FEMA, USCG, DOE, DOT, and DHS hosted conference calls with state officials and representatives from the appropriate offices, boards, or commissions (emergency response and planning, environmental cleanup, energy, and transportation) that play a role in preparing or responding to an incident involving crude-by-rail. The purpose of these discussions was to gain better understanding of how states are preparing to respond to incidents involving crude oil by rail and to identify key needs from each state. Questions centered on what actions (planning, training, exercises, etc.) have been planned or conducted in the state and/or local communities, what communities or areas have the greatest risk, regional actions or activities states have participated in, and any other related concerns states would like to discuss.

[38] See *http://www.phmsa.dot.gov/pv_obj_cache/pv_obj_id_0903D018579BF84E6914C0BB932607F5B3F50300/filename/Lessons_Learned_Roundtable_Report_FINAL_070114.pdf.*

[39] This document has been widely distributed throughout the emergency response community and is also available on the PHMSA Operation Safe Delivery Web site at *http://www.phmsa.dot.gov/hazmat/osd/emergencyresponse.*

[40] See *http://www.usfa.fema.gov/training/coffee_break/hazmat_index.html.*

Complementing the Federal government's efforts, the railroad industry has also taken on the challenge to address crude oil response. API has built new partnerships between rail companies and oil producers. At the request of FRA, the API is currently developing an outreach program to deliver training to first responders throughout the U.S., particularly in states that have seen a rise in crude oil by rail. This includes working with oil and rail industry members to identify where existing training initiatives and conferences can be utilized to provide the training to as many responders as possible. Lastly, the AAR and API are working together to produce a crude oil by rail safety training video through their partnership with Transportation Community Awareness and Emergency Response (TRANSCAER).

Moving forward, both the railroad industry and the Federal government will continue their efforts to increase preparedness for responding to not only crude oil, but all high-hazard flammable shipments by rail. The stakeholder group will aim to meet again in the spring of 2015 under the unified goal to provide first responders with the key information needed to effectively prepare for and manage the consequences incidents involving bulk shipments of energy products by rail.

In the meantime, PHMSA will continue its efforts to increase community awareness and emergency preparedness through public outreach to state and local emergency responder communities, sustained engagement with experts from emergency response and industry stakeholder groups, and participating on interagency working groups.

V. NTSB Safety Recommendations

As previously discussed, in addition to the efforts of PHMSA and FRA, the NTSB has taken a very active role in identifying the risks posed by the transportation of large quantities of flammable liquids by rail. The NPRM for this rulemaking detailed the actions and recommendations of the NTSB. Since the publication of the August 1, 2014 NPRM, the NTSB has issued additional rail-related safety recommendations. The table below provides a summary of the rail-related NTSB Safety Recommendations and identifies the effect of this action on those recommendations, including those issued to PHMSA and FRA after the issuance of the August 1, 2014 NPRM. It should be noted that although some of these recommendations are not addressed in this rulemaking they are being addressed through other actions, for example, development of guidance materials, outreach to the regulated community, and conducting research projects. Further, some are being considered for other future rulemaking action.

TABLE 9—RAIL-RELATED NTSB SAFETY RECOMMENDATIONS

NTSB Recommendation	Summary	Addressed in this rule?
R–07–4, Issued April 27, 2007 ..	Recommends that PHMSA, with the assistance of FRA, require that railroads immediately provide to emergency responders accurate, real-time information regarding the identity and location of all hazardous materials on a train.	No.
R–12–5, Issued March 2, 2012	Recommends that PHMSA 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.	Yes.
R–12–6, Issued March 2, 2012	Recommends that PHMSA 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.	Yes.
R–12–7, Issued March 2, 2012	Recommends that PHMSA require all newly manufactured and existing tank cars authorized for transportation of hazardous materials have center sill or draft sill attachment designs that conform to the revised AAR design requirements adopted as a result of Safety Recommendation R–12–9.	No.*
R–12–8, Issued March 2, 2012	Recommends that PHMSA inform pipeline operators about the circumstances of the accident and advise them of the need to inspect pipeline facilities after notification of accidents occurring in railroad rights-of-way.	Closed.**
R–14–1, Issued January 23, 2014.	Recommends that FRA work with PHMSA to expand hazardous materials route planning and selection requirements for railroads under the HMR 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.	Yes.
R–14–2, Issued January 23, 2014.	Recommends that FRA develop a program to audit response plans for rail carriers of petroleum products to ensure that adequate provisions are in place to respond to and remove a worst-case discharge to the maximum extent practicable and to mitigate or prevent a substantial threat of a worst-case discharge.	No.***
R–14–3, Issued January 23, 2014.	Recommends that FRA audit shippers and rail carriers of crude oil to ensure they are using appropriate hazardous materials shipping classifications, have developed transportation safety and security plans, and have made adequate provision for safety and security.	Closed.
R–14–4, Issued January 23, 2014.	Recommends that PHMSA 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.	Yes.
R–14–5, Issued January 23, 2014.	Recommends that PHMSA revise the spill response planning thresholds contained in Title 49 Code of Federal Regulations Part 130 to require comprehensive response plans to effectively provide for the carriers' ability to respond to worst-case discharges resulting from accidents involving unit trains or blocks of tank cars transporting oil and petroleum products.	No.***
R–14–6, Issued January 23, 2014.	Recommends that PHMSA 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.	Yes.

TABLE 9—RAIL-RELATED NTSB SAFETY RECOMMENDATIONS—Continued

NTSB Recommendation	Summary	Addressed in this rule?
R–14–14, Issued January 23, 2014.	Recommends that PHMSA 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.	Partially.
R–14–18, Issued August 22, 2014.	Recommends that PHMSA take action to ensure that emergency response information carried by train crews is consistent with and is at least as protective as existing emergency response guidance provided in the Emergency Response Guidebook.	No.
R–14–19, Issued August 22, 2014.	Recommends that PHMSA require railroads transporting hazardous materials to develop, implement, and periodically evaluate a public education program similar to Title 49 Code of Federal Regulations Parts 192.616 and 195.440 for the communities along railroad hazardous materials routes.	No.
R–14–20, Issued August 22, 2014.	Recommends that PHMSA collaborate with FRA and ASLRRA and Regional Railroad Association to develop a risk assessment tool that addresses the known limitations and shortcomings of the Rail Corridor Risk Management System software tool.	No.
R–14–21, Issued August 22, 2014.	Recommends that PHMSA collaborate with FRA and ASLRRA and Regional Railroad Association to conduct audits of short line and regional railroads to ensure that proper route risk assessments that identify safety and security vulnerabilities are being performed and are incorporated into a safety management system program.	No.
R–15–14, Issued April 6, 2015 ..	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.	Yes.
R–15–15, Issued April 6, 2015 ..	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.	Yes.
R–15–16, Issued April 6, 2015 ..	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.	Partially.
R–15–17, Issued April 6, 2015 ..	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.	Partially.

* Under R–12–9, NTSB recommends that AAR: Review the design requirements in the AAR Manual of Standards and Recommended Practices C–III, ''Specifications for Tank Cars for Attaching Center Sills or Draft Sills,'' and revise those requirements as needed to ensure that appropriate distances between the welds attaching the draft sill to the reinforcement pads and the welds attaching the reinforcement pads to the tank are maintained in all directions in accidents, including the longitudinal direction. These design requirements have not yet been finalized by the AAR.

** On July 31, 2012, PHMSA published an advisory bulletin in the **Federal Register** to all pipeline operators alerting them to the circumstances of the Cherry Valley derailment and reminding them of the importance of assuring that pipeline facilities have not been damaged either during a railroad accident or other event occurring in the right-of-way. 77 FR 45417. This recommendation was closed by NTSB on September 20, 2012. This action is accessible at the following URL: *http://phmsa.dot.gov/pipeline/regs/ntsb/closed.*

*** On August 1, 2014, PHMSA in consultation with FRA published an ANPRM, 79 FR 45079, which was responsive to these recommendations.

The Department believes this comprehensive rulemaking significantly improves the safety of trains carrying flammable liquids and addresses many on NTSB's rail related recommendations. Following the publication of this rulemaking, PHMSA will issue a formal response to NTSB regarding the recommendations above and how the provisions of this rulemaking address those recommendations.

In addition to the NTSB recommendations above, the Government Accountability Office (GAO), in August 2014, issued a report entitled ''Department of Transportation is Taking Actions to Address Rail Safety, but Additional Actions Are Needed to Improve Pipeline Safety.'' [41] While the primary GAO recommendations of this report were related to pipeline safety, PHMSA and FRA believes this rulemaking addresses rail related issues raised in this report.

VI. Incorporation by Reference Discussion Under 1 CFR Part 51

The American Association of Railroads (AAR) Manual of Standards and Recommended Practices, Section C—Part III, Specifications for Tank Cars, Specification M–1002, (AAR Specifications for Tank Cars) reference is available for interested parties to purchase in either print or electronic versions through the parent organization Web site. The price charged for this standard helps to cover the cost of developing, maintaining, hosting, and accessing this standard. This specific standard is discussed in greater detail in the following analysis.

VII. Summary and Discussion of Public Comments

In the August 1, 2014, NPRM, PHMSA solicited public comment on whether the potential amendments would enhance safety and clarify the HMR with regard to rail transport as well as the cost and benefit figures associated with these proposals. PHMSA received 3,209 submissions representing more than 181,500 individuals. Comments were received from a broad array of stakeholders, including trade organizations, railroads, intermodal carriers, logistic companies, rail

[41] See *http://www.gao.gov/assets/670/665404.pdf.*

customers, tank car manufacturers, parts suppliers, consultants, law firms, environmental groups, labor organizations, non-government or advocacy organizations, local government organizations or representatives, tribal governments, state governments, Members of Congress, and other interested members of the public. Several organizations attached the views of some of their individual members: Credo Action (71,900 attached comments), Forest Ethics (5,817 attached comments) and Center for Biological Diversity (22,981 attached comments), for example. Other organizations submitted a comment with attached membership signatures, such as: the Sierra Club (61,998 signatures), Forest Ethics petition (8,820 signatures), Public Citizen (3,080 signatures), for example. All comments and corresponding rulemaking materials received may be viewed on the *www.regulations.gov* Web site, docket ID PHMSA–2012–0082.

Many comments received in response to the NPRM are: (1) General statements of support or opposition; (2) personal anecdotes or general statements that do not address a specific aspect of the proposed changes; (3) comments that are beyond the scope or authority of the proposed regulations; or (4) identical or nearly identical letter write-in campaigns sent in response to comment initiatives sponsored by different organizations. The remaining comments reflect a wide variety of views on the merits of particular sections of the proposed regulations. Many include substantive analyses and arguments in support of or in opposition to the proposed regulations. The substantive comments received on the proposed regulations are organized by topic, and discussed in the appropriate section, together with the PHMSA's response to those comments.

TABLE 10—OVERALL COMMENTER BREAKDOWN [42]

Commenter background	Docket IDs	Signatories	Description and example of category
Non-Government Organization	58	171,602	Primarily environmental groups, but includes other Non-Governmental Organizations (NGOs) such as hobby, labor, safety organization, etc.
Individuals	2,695	9,364	Public submissions not directly representing a specific organization.
Industry stakeholders	286	318	Trade organizations, railroads, intermodal carriers, logistic companies, rail customers, tank car manufacturers, parts suppliers, consultants, etc.
Government organizations or representatives.	170	238	Local, state, tribal governments or representatives, NTSB, U.S. Congress members, etc.
Total	3,209	181,522	

Resolution of the comments are discussed within each appropriate section of the final rule (*e.g.* tank car, speed, braking, etc.)

A. Miscellaneous Relevant Comments

1. Harmonization

Almost unanimously, commenters on all sides of the issues stressed the need to introduce harmonized standards for the rail transport of flammable liquids. Rail transport is a cross-border issue. Flammable liquids regularly cross the U.S./Canadian border using an interconnected rail network.[43] It is essential to have a harmonization approach. In addition, as substantial capital investment will be required to retrofit existing cars and manufacture new cars both the U.S. DOT and Transport Canada have worked diligently to ensure our standards are compatible and do not create barriers to movement.

Staff at Transport Canada, PHMSA, and FRA have traditionally interacted on a frequent basis to ensure harmonized efforts. In light of the significant rulemaking efforts underway in the past year in both countries, this interaction has expanded regarding rail safety efforts and the technical aspects of the rulemakings.

In addition to informal staff level discussion, the DOT and Transport Canada have held more formal discussions through the Regulatory Cooperation Council with regard to improvements to rail safety. Further, leadership at both DOT and Transport Canada have met frequently to discuss harmonization efforts. Finally, Secretary Foxx and Transport Minister Lisa Riatt have met on multiple occasions to specifically discuss the topics addressed in this rulemaking.

Conclusion

PHMSA and FRA believe these discussions have led to the development of a harmonized final rulemaking that will not create any barriers to cross border transportation. To the extent possible, the amendments proposed by PHMSA and FRA in this final rule have been harmonized with Canadian regulatory requirements. The table below provides a summary of the areas covered by this rule and corresponding Canadian efforts.

TABLE 11—UNITED STATES AND CANADA HARMONIZED EFFORTS

Issue	U.S. position	Canadian position	Harmonization impacts
Scope	A continuous block of 20 or more tank cars or 35 or more cars dispersed through a train loaded with a flammable liquid.	Tank Car Provisions apply to a single tank car.	Not Harmonized—Due to cost implications in using a risk-based standard of one car.
New Tank Car Specification.	See Table 18 as Canada and U.S. are harmonized fully on this issue.	See Table 18 as Canada and U.S. are harmonized fully on this issue.	Fully Harmonized.

[42] It should be noted that there may be some double-counting as individuals may have submitted comments individually and as signatories to NGO or industry stakeholder comments.

[43] Flammable liquids cross the U.S./Mexican border by rail to a considerably lesser extent than U.S./Canada shipments. Furthermore, the HMR requires all shipments to/from Mexico must be in full conformance with U.S. Regulations.

TABLE 11—UNITED STATES AND CANADA HARMONIZED EFFORTS—Continued

Issue	U.S. position	Canadian position	Harmonization impacts
Existing Tank Car Specification.	See Table 19—Enhanced CPC–1232 ..	See Table 19—Enhanced CPC–1232 ..	Fully Harmonized.
Retrofit Timeline	See Table 21. Requires a retrofitting progress report provided initial milestone is not met.	Except for the first phase of the retrofit schedule Transport Canada and the U.S. have harmonized retrofit schedules and similar retrofit reporting requirements. Transport Canada also includes a retrofitting progress report.	Harmonized except for first phase.
Braking	(1) Requires HHFTs to have in place a functioning two-way EOT device or a DP braking system. (2) Requires any HHFUT transporting at least one PG I flammable liquid be operated with an ECP braking system by January 1, 2021. (3) Requires all other HHFUTs be operated with an ECP braking system by May 1, 2023.	Requires a Two-way End of Train Device (EOT) as per the Railway Freight and Passenger Train Brake Inspection and Safety Rules. A two-way EOT may be a Sense Braking Unit (SBU) or a locomotive functioning as distributive braking power, as per the U.S. definition. Transport Canada will continue to work with Canadian industry in order to determine a harmonized Canadian braking requirement.	Not Currently Harmonized—Transport Canada and the United States will continue to work towards harmonized approach on braking.
Routing	HHFT carriers must perform a routing analysis that considers a minimum of 27 safety and security factors. The carrier must select a route based on findings of the route analysis.	Transport Canada required carriers to complete a risk assessment within six months of the issuance of an emergency directive to assess the risk associated with each ''Key Route'' a ''Key Train'' operates.	Harmonized to the extent needed—While the applicability of the requirements and specifics of the risk analysis on both sides of the border are different, they generally focused on the same types of shipments and cover the same overarching aspects.
Notification	Notification requirements are already included in the routing requirements; therefore a stand-alone provision is unnecessary.	Transport Canada issued a Protective Direction 32 directing rail companies to share information with municipalities to help emergency response planning, risk assessment and first responder training.	Harmonized to the extent needed—While harmonization is not essential on this issue, DOT and Transport Canada are fundamentally aligned on the principles of notification.
Speed	A 50-mph maximum speed restriction for all HHFTs. A 40-mph speed restriction for HHFTs operating in a HTUA unless all flammable liquid tank cars meet the new or retrofitted tank car standards.	Transport Canada issued an Emergency Directive requiring all companies not operate a Key Train at a speed that exceeds 50 mph and not in excess of 40 mph in Census Metropolitan Areas.	Harmonization not essential—This operational issue can be handled separately on either side of the border.
Classification	A classification program for unrefined petroleum-based products.	Transport Canada has adopted a requirements to: (1) Provide a proof of classification, on reasonable notice by the Minister for any dangerous goods; and (2) Classify petroleum crude oil and petroleum products on the basis of sampling and make available to the Minister of Transport, the sampling procedures and conditions of any given shipment.	Harmonized to extent needed—DOT and TC are fully aligned with regard to shipper's certifications. With regard to sampling plans TC is considering adoption of a classification plan similar to DOT.

2. Definition of High-Hazard Flammable Train

In the September 6, 2013, ANPRM we asked several questions regarding AAR Circular No. OT–55–N including if we should incorporate the ''key train'' requirements into the HMR, or if it should be expanded to include trains with fewer than 20 cars. Several commenters indicated that additional operational requirements should be based upon the definition for a ''key train'' as provided by AAR Circular No. OT–55–N. Further, Appendix A to Emergency Order No. 28 mirrors the definition for a ''key train'' as provided by AAR Circular No. OT–55–N.

While Appendix A to Emergency Order No. 28 and the revised definition of a ''key train'' under AAR Circular No. OT–55–N both include Division 2.1 (flammable gas) materials and combustible liquids, PHMSA did not propose to include them in the definition of a ''high-hazard flammable train'' in the August 1, 2014, NPRM. Rather, PHMSA and FRA proposed to define a high-hazard flammable train to mean a single train carrying 20 or more carloads of a Class 3 flammable liquid. PHMSA and FRA asked for specific comment on this definition in the August 1, 2014, NPRM.

In response to the proposed amendments to routing, we received a variety of comments representing differing viewpoints. Specifically, we received comments representing 62,882 signatories regarding the definition of an HHFT. The definition of a ''high-hazard flammable train'' is a critical aspect for this rulemaking as many of the requirements are tied to that threshold. The table below details the types and amounts of commenters on the HHFT definition.

TABLE 12—COMMENTER COMPOSITION: HHFT COMMENTS

Commenter type	Signatories
Non-Government Organization	62,038
Individuals	549
Industry stakeholders	200
Government organizations or representatives	95
Totals	62,882

Below are some examples from commenters that demonstrate the range of opinions on the HHFT definition as it relates specifically to operational controls.[44]

Comments from the concerned public, local government, tribal communities, towns and cities voiced concern with the 20-car threshold, and that the 20-car threshold is an arbitrary number that is not justified in the NPRM. With regard to alternative scopes for this rulemaking, this group of commenters had varied opinions. Some even suggested that a train consisting of one or more tank cars carrying crude oil or any other hazardous material should be classified as an HHFT.

Tribal communities, such as the Quinault Indian Nation and the Prairie Island Indian Community felt the proposed threshold was sufficient but could be even more stringent. Specifically, the Prairie Island Indian Community supported, ''designating trains carrying more than 20 tank cars of flammable liquids as ''high-hazard flammable train (HHFT).'' The Quinault Indian Nation preferred a threshold of a single tank car.

Environmental Groups such as the Sierra Club, Environmental Advocates of New York, Earthjustice, the Natural Resources Defense Council, Forest Keepers, and Oil Change had strong opinions about this threshold and the need to be more stringent. The Sierra Club noted that there are known risks associated with trains transporting less than 20 tank cars loaded with crude oil, particularly in legacy DOT–111 tank cars. The Environmental Advocates of New York suggested eliminating the combustible liquid exception for rail transportation to capture those materials. Finally, a joint comment from Earthjustice, Sierra Club, the Natural Resources Defense Council, Forest Keepers, and Oil Change suggested in addition to lowering the threshold for defining an HHFT, ensuring that diluted bitumen (''dilbit'') is included in any amount towards this definition. Overall environmental groups supported a threshold below 20 tank cars loaded with Class 3 (flammable liquid) materials.

The NTSB suggested using a pre-existing industry standard for route planning, but does not support the use of the 20 tank car threshold for other purposes. Specifically, their proposal was to align the HHFT definition to the OT–55N ''Key Train'' definition (20 tank cars loaded with any combination of hazardous materials) for Routing. With regard to tank car specifications and retrofits, the NTSB supports a single tank car approach.

Industry stakeholders took issue with the term ''high-hazard flammable train'' and the term's connotation. The hazmat shipping industry provided a variety of suggestions with most of them indicating that there would be difficulty in determining if a train would meet the proposed definition of an HHFT prior to shipment. The hazmat shipping industry had issues with the ambiguity of the definition for HHFT. Most in the hazmat shipping industry thought the definition would inadvertently include manifest trains that did not pose as high a risk as unit trains. It was also noted that in many situations it would be difficult to pre-determine when an HHFT would be used. The Dangerous Goods Advisory Council (DGAC) stated that the term ''HHFT'' is not in use within the industry and may be confused with other terminology such as ''unit train,'' ''manifest train,'' or ''key train.'' Proposed definitions from the hazmat shipping industry included:

- Trains consisting of 20 or more tank cars loaded with crude oil or ethanol originating from one consignee to one consignor without intermediate handling.
- A train carrying a continuous block of 20 or more cars of crude oil or ethanol.
- A unit or block train transporting only loaded crude oil and/or ethanol tank cars shipped from a single point of origin to a single destination without being split up or stored en route.

Amongst the rail industry, there was wide agreement that the HHFT definition proposed at the NPRM stage is not a workable definition. The rail industry had issues with the ambiguity of the definition for HHFT. Like the shipping industry, most in the rail industry thought the definition would inadvertently include manifest trains that did not pose as high a risk as unit trains. The rail industry noted that in many situations it would be difficult to pre-determine when an HHFT would be used. There were many comments from the tank car construction and rail industries suggesting the construction of tank cars not be tied to the definition of an HHFT. Specifically, those comments noted the HHFT definition should only be applied to operational requirements. Some claimed this would shift the scope of the requirements to ''unit trains'' as opposed to capturing ''manifest trains.'' Finally, AAR estimated (based on Class I railroads reports) that 20 to 60 percent of their trains containing 20 or more tank cars of flammable liquids are in fact ''manifest trains.'' It was also noted that the emphasis of the NPRM and other voluntary agreements has been on crude oil and ethanol. AAR provided the following suggested definition as a prospective solution: ''20 or more tank cars in block or 35 tank cars across the train consist loaded with a flammable liquid.'' AAR claimed this definition would focus on the unit train risk while eliminating the inadvertent inclusion of manifest trains.

PHMSA and FRA agree with many comments regarding this issue and the need to refine the definition. Therefore, in this final rule, PHMSA and FRA are adopting a revised definition for a high-hazard flammable train. The adopted definition of an HHFT is as follows:

> A *High-Hazard Flammable Train* means a single train transporting 20 or more loaded tank cars containing Class 3 flammable liquid in a continuous block or a single train carrying 35 or more loaded tank cars of a Class 3 flammable liquid throughout the train consist.

This revision is based on further justification of the threshold, the intent of the definition, and operational concerns raised by commenters. Each of these will be discussed further below.

With regard to the inclusion of all hazardous materials as opposed to just flammable liquids in the definition of an HHFT, PHMSA and FRA proposed to limit the definition to Class 3 Flammable liquids in the August 1, 2014, NPRM. Because the NPRM limited the definition to Class 3 Flammable liquids, we feel expanding the definition to include all hazardous materials is beyond the scope of the NPRM and thus we are unable to include all hazardous materials in this final rule. Further, as evidenced with the incidents detailed in the RIA, we believe the risk posed by the bulk shipments of flammable liquids in DOT specification 111 tank cars should be included in this final rule but a similar risk has not currently been identified with other hazardous materials.

PHMSA and FRA did not intend the proposed definition in the NPRM to include lower risk manifest trains and

[44] Other comments/commenters have expressed stances on the HHFT definition as it applies specifically to tank car enhancements that may differ from those discussed in reference to operational controls.

had crafted the definition with the idea of capturing the higher risk associated with bulk shipments. This rulemaking action is focused on the risks associated with large blocks of hazardous materials. Flammable liquids, specifically crude oil and ethanol, are the only type of commodity frequently transported in this configuration. The risk of flammability is compounded in the context of rail transportation because petroleum crude oil and ethanol are commonly shipped in large blocks or single commodity trains (unit trains). In recent years, train accidents/incidents (train accidents) involving a flammable liquid release and resulting fire with severe consequences have occurred with increasing frequency (*i.e.,* Arcadia, OH; Plevna, MT; Casselton, ND; Aliceville, AL; Lac-Mégantic, Quebec; Lynchburg, VA, Tiskilwa, IL, Columbus, OH, New Brighton, PA, Mount Carbon, WV, Galena, IL, Dubuque, IA, Timmins, Ontario, and Gogama, Ontario).[45] As we were focused on this particular type of risk, we will continue in this final rulemaking to limit our focus to Class 3 Flammable Liquids.

One commenter suggested the 20-car threshold was arbitrary and not founded on data. As detailed in the August 1, 2014, NPRM the 20-car threshold was derived from the ''key train'' requirements contained in AAR Circular No. OT–55–N. The proposed definition in the August 1, 2014, NPRM used the key train definition as a starting point because it is a threshold used in existing railroad practices, and served as a means to separate the higher-risk trains that carry large volumes of flammable liquids. In response to comments from both the September 6, 2013, ANPRM and the August 1, 2014, NPRM the definition has been revised to focus on the specific risks which are the topic of this final rule. Commenters also suggested the revised threshold being adopted in this rulemaking, as it would eliminate the inclusion of most manifest trains and focus on unit trains.

Based on FRA modeling and analysis, 20 tank cars in a continuous block loaded with a flammable liquid and 35 tank cars loaded with a flammable liquid dispersed throughout a train display consistent characteristics as to the number of tank cars likely to be breached in a derailment. The operating railroads commented that this threshold would exclude manifest trains and focus on higher risk unit trains. FRA completed an analysis of a hypothetical train set consisting of 100 cars. The analysis assumes 20 cars derailed. The highest probable number of cars losing containment in a derailment involving a train with a 20-car block (loaded with flammable liquid) located immediately after the locomotive and buffer cars would be 2.78 cars. In addition, the most probable number of cars losing containment in a derailment involving a manifest train consisting of 35 cars containing flammable liquids spread throughout the train would be 2.59 cars. Therefore, 20 tank cars in a block and 35 tank cars or more spread throughout a train display consistent characteristics. If the number of flammable liquid cars in a manifest train were increased from 40 or 45, the most likely number of cars losing containment would be 3.12 and 3.46 cars, respectively. This serves as one basis for the selection of the revised HHFT definition.

Many commenters highlighted the potential for logistical issues when dealing with the proposed definition. Many called it unworkable and ambiguous. PHMSA and FRA have resolved the ambiguity in the definition by further clarifying the types of trains to be included. Furthermore, AAR, who represents the Class 1 railroads in the U.S., provided the basis for the revised definition. AAR suggested this definition would ''exclude manifest trains and focus on higher risk unit trains.'' Many commenters suggested that we apply the requirements of this rulemaking to a single tank car for simplicity. PHMSA and FRA are not doing so for numerous reasons. First, this revision would include single tank car shipments of flammable liquids which could have a significant impact on small entities that do not transport large amounts of flammable liquids. Second, while we acknowledge applying the requirements to a single tank car may resolve some logistical issues, such a solution would not be cost justified given the number of tank cars affected and the associated risk with manifest trains verses the risk of an HHFT. Third, we feel through fleet management the rail industry will be able to determine the need for cars that will be part of an HHFT. This could potentially limit the number of retrofitted cars. Lastly, as the definition of an HHFT in the August 1, 2014, NPRM specifically provided a 20-car threshold we feel it would be beyond the scope of this rulemaking to change the applicability of the requirements so drastically without notice and comment.

Conclusion

Therefore, based on the above justification, PHMSA and FRA are adding a definition for high-hazard flammable trains in § 171.8. Specifically a *High-Hazard Flammable Train* will be defined as a continuous block of 20 or more tank cars or 35 or more cars dispersed through a train loaded with a flammable liquid. This definition will serve as the applicable threshold of many of the requirements in this rulemaking.

3. Crude Oil Treatment

In the NPRM, 79 FR 45062 PHMSA asked whether exceptions for combustible liquids or PG III flammable liquids would incentivize producers to reduce the volatility of crude oil, and what the impacts on costs and safety benefits for degasifying to these levels. The majority of commenters from all backgrounds provided general support for pre-treatment of crude oil prior to transportation. For example, Quantum Energy supported pre-treatment, but stated that the current exceptions for combustible liquids (see § 172.102 Special provisions B1) are not sufficient to incentivize pre-treatment of petroleum crude oil. It further suggested adding a definition for ''stabilized crude oil'' and providing several exceptions for ''stabilized crude oil'' throughout the rule.

Some industry stakeholders did not support incentivizing pre-treatment of crude oil. AFPM provided results from a survey of its members on data regarding the characteristics of Bakken crude and cited other studies on the stabilization of crude oil. It stated that the treatment process used in the Bakken region is unlikely to result in Bakken crude's reclassification as a combustible liquid. AFPM stated treated crude should not be regulated differently than non-treated crude because, ''[o]nce ignited, the burning intensity of unstabilized and stabilized crude would not substantially differ.''

Commenters also expressed differing views on the role of packing group-based exceptions. Some commenters suggested more stringent packing group-based requirements, such as restricting use of PG III for crude oil. Other commenters recommended various packing group-based exceptions not proposed in the rulemaking.

Conclusion

As with any hazardous material put into transportation by any mode, safety is the Department's top priority, and we will continue to conduct inspections or bring enforcement actions to assure that

[45] Please note that the last five accidents listed occurred in 2015 are not included in our supporting analysis for this rulemaking as the information from those incidents is preliminary and not finalized.

shippers comply with their responsibilities to properly characterize, classify, and package crude oil regardless of how it is treated prior to transport. We also continue to work with various stakeholders to understand best practices for testing and classifying crude oil. For further discussion on Crude Oil treatment see ''E. Classification'' section of this document.

4. Scope of Rulemaking

Some commenters requested the proposals in the NPRM to be expanded beyond just flammable liquids to include all hazardous materials. This request covered all topics in the rulemaking. The operational controls addressed in this rule are aimed at reducing the risk and consequences of incidents involving rail shipments of Class 3 flammable liquids. The analyses, data, and relevant factors considered in developing this rule are specific to these materials. Information has not been provided to support expanding these restrictions to all hazardous materials or to justify the associated negative impacts on rail fluidity and costs.

B. Tank Car Specification

Below is a discussion of the amendments relating to tank car construction and retrofitting. This topic is broken down into four areas: new tank car construction, retrofit standard, performance standard, and an implementation timeline.

1. New Tank Car Construction

In the September 6, 2013 ANPRM, PHMSA requested comments pertaining to new construction requirements for DOT Specification 111 (DOT–111) tank cars used in flammable liquid service. See 78 FR 54849. On August 1, 2014, PHMSA, in consultation with FRA, issued an NPRM in response to comments submitted to the ANPRM. See 79 FR 45015. In the NPRM, we proposed three options for newly manufactured tank cars that would address the risks associated with the rail transportation of Class 3 flammable liquids in HHFTs. Though commenters differed on the applicability of new construction requirements for the rail transportation of Class 3 flammable liquids, all support prompt action to address construction standards for tank cars.

Tank cars built to the new standards as adopted in this final rule will be designated ''DOT Specification 117'' (DOT–117). In addition, we are adopting a performance standard compliance alternative for the design and construction of new tank cars or retrofitting of existing tank cars equivalent to the prescribed DOT Specification 117 standards. Thus, a new or retrofitted tank car meeting the performance criteria will be designated as ''DOT Specification 117P'' (See ''Performance Standard'' section). In addition, we are adopting a retrofit standard for existing tank cars meeting the DOT Specification 111 or CPC–1232 standard. Thus, a tank car meeting the retrofit standard will be designated as ''DOT Specification 117R'' (See ''Retrofit Standard'' section). In this final rule, we are adopting the requirement that new tank cars constructed after October 1, 2015, used to transport Class 3 flammable liquids in an HHFT, meet either the prescriptive standards for the DOT Specification 117 tank car or the performance standards for the DOT Specification 117P tank car. Other authorized tank car specifications, as specified in part 173, subpart F, will also be permitted; however, use of a DOT specification 111 tank car in an HHFT is prohibited.

The prescribed specifications and the performance standards adopted in this rule were developed to provide improved crashworthiness when compared to the legacy DOT Specification 111 tank car. In addition to adopting revisions to part 179 of the HMR to include the new DOT Specification 117, 117P and 117R tank car standards, we are adopting revisions to the bulk packaging authorizations in §§ 173.241, 173.242, and 173.243 to include the DOT Specification 117, 117P, and 117R tank cars as an authorized packaging for those hazardous materials. We noted that, as stated in the introductory text to §§ 173.241, 173.242, and 173.243, each person selecting a packaging must also consider the requirements of subparts A and B of part 173 of the HMR and any special provisions indicated in column (7) of the HMT.

Lastly, we are incorporating by reference, in § 171.7, appendix E 10.2.1 of the 2010 version of the AAR Manual of Standards and Recommended Practices, Section C—Part III, Specifications for Tank Cars, Specification M–1002, (AAR Specifications for Tank Cars). Appendix E provides requirements for top fittings protection for certain tank car options.

Replacing the current standard for the DOT Specification 111 tank car is not a decision that the Department takes lightly. New construction and retrofit standards will have considerable safety and economic consequences. Consequently, the DOT Specification 117 tank car would be phased in over an aggressive but realistic timeline. We limit our discussion to new tank car standards in this section, but we will separately discuss the retrofit standard, performance standard and implementation timeline in the subsequent sections. We seek to ensure that the car selected will have the greatest net social benefits, with benefits primarily generated from the mitigation of accident severity. We are also aware of, and account for, the large economic effects associated with regulatory changes of this scale, as tank cars are a long-term investment. For these reasons, we proposed in the NPRM three separate DOT Specification 117 options and requested comments on each of them.

The options proposed in the NPRM were designed to enhance the survivability of the tank car and to mitigate the damages of rail accidents with design features. Specifically, the tank car options incorporate several enhancements to increase tank head and shell puncture resistance; thermal protection to extend lading containment while in a pool fire environment; and improved top fitting and bottom outlet protection during a derailment. Under all options, the proposed system of design enhancements will reduce the consequences of a derailment of tank cars transporting flammable liquids in an HHFT. There will be fewer tank car punctures, fewer releases from service equipment (top and bottom fittings), and improved containment of flammable liquid from the tank cars through the use of pressure relief devices and thermal protection systems. The following table summarizes the tank car options proposed in the August 1, 2014, NPRM. Please note the shaded cells in the following table indicate design traits that are the same for more than one proposed option.

Table 13: Safety Features by Tank Car Options Proposed in the NPRM

Tank Car	Bottom Outlet Handle	GRL (lbs.)	Head Shield Type	Pressure Relief Valve	Shell Thickness	Jacket	Tank Material*	Top Fittings Protection **	Thermal Protection System	Braking
Option 1: PHMSA and FRA Designed Tank Car	Bottom outlet handle removed or designed to prevent unintended actuation during a train accident	286k	Full-height, 1/2 inch thick head shield	Reclosing pressure relief device	9/16-inch minimum	Minimum 11-gauge jacket constructed from A1011 steel or equivalent. The jacket must be weather-tight	TC-128 Grade B, normalized steel	TIH Top fittings protection system and nozzle capable of sustaining, without failure, a rollover accident at a speed of 9 mph	Thermal protection system in accordance with § 179.18	ECP brakes
Option 2: AAR 2014 Tank Car	Bottom outlet handle removed or designed to prevent unintended actuation during a train accident	286k	Full-height, 1/2 inch thick head shield	Reclosing pressure relief device	9/16-inch minimum	Minimum 11-gauge jacket constructed from A1011 steel or equivalent. The jacket must be weather-tight	TC-128 Grade B, normalized steel	Equipped per AAR Specifications for Tank Cars, Appendix E paragraph 10.2.1	Thermal protection system in accordance with § 179.18	DP or Two-way EOT devices
Option 3: Enhanced CPC-1232 Tank Car	Bottom outlet handle removed or designed to prevent unintended actuation during a train accident	286k	Full height 1/2 inch thick head shield	Reclosing pressure relief device	7/16-inch-minimum	Minimum 11-gauge jacket constructed from A1011 steel or equivalent. The jacket must be weather-tight	TC-128 Grade B, normalized steel	Equipped per AAR Specifications for Tank Cars, Appendix E paragraph 10.2.1	Thermal protection system in accordance with § 179.18	DP or Two-way EOT devices
DOT 111A100W1 Specification (Currently Authorized)	Bottom outlets are optional	263K	Optional; bare tanks half height; jacket tanks full height	Reclosing pressure relief valve	7/16-inch-minimum	Jackets are optional	TC-128 Grade B, normalized steel*	Not required, but when equipped per AAR Specifications for Tank Cars, Appendix E paragraph 10.2.1	Optional	EOT device (See 49 CFR part 232)

* For the purposes of this figure, TC-128 Grade B normalized steel is used to provide a consistent comparison to the proposed options. Section 179.200-7 provides alternative materials which are authorized for the DOT Specification 111.

** Please note that the PHMSA did not propose to require additional top fittings protection for retrofits

In support of this final action, PHMSA and FRA have revised the analysis to account for public comments and further research. The revisions resulted in modified effectiveness rates which can be viewed in the final RIA for this rulemaking, which has been placed into the docket. The final RIA also describes the baseline accidents, model inputs, and the assumptions that were used to develop the effectiveness rates for each tank car option.

Based on the aforementioned, in this final rule, PHMSA and FRA are adopting Option 2 for new construction of tank cars used in a HHFT subject to the enhanced braking requirements addressed in the ''Advanced Brake Propagation Systems'' section of this rulemaking. The following table lists the design features of the adopted DOT Specification 117 Tank Car:

TABLE 14—ADOPTED DOT–117 SPECIFICATION TANK CAR

Tank car feature	Description
Capacity	286,000 lbs. GRL tank car that is designed and constructed in accordance with AAR Standard S286.
Thickness	Wall thickness after forming of the tank shell and heads must be a minimum of 9/16 inch constructed from TC–128 Grade B, normalized steel.

TABLE 14—ADOPTED DOT–117 SPECIFICATION TANK CAR—Continued

Tank car feature	Description
Thermal Protection	Thermal protection system in accordance with § 179.18, including a reclosing pressure relief device in accordance with § 173.31(b)(2).
Jacketing	Minimum 11-gauge jacket constructed from A1011 steel or equivalent. The jacket must be weather-tight as required in § 179.200–4.
Head Shield	Full-height, ½-inch thick head shield meeting the requirements of § 179.16(c)(1).
Bottom outlet	Bottom outlet handle removed or designed to prevent unintended actuation during a train accident.
Braking	Braking systems determined by operational conditions, see ''Advanced Brake Signal Propagation System'' section.
Top fittings	Top fittings protection in accordance with AAR Specifications Tank Cars, appendix E paragraph 10.2.1. The adopted option excludes the TIH Top fittings protection system.

In response to tank car-related proposals in the NPRM, we received comments representing many differing viewpoints. In sum, we received comments representing approximately 172,000 signatories.

TABLE 15—COMMENTER COMPOSITION: TANK CAR CONSTRUCTION COMMENTS

Commenter type	Signatories
Non-Government Organization	162,776
Individuals	9,004
Industry stakeholders	119
Government organizations or representatives	140
Totals	172,039

Overall, the vast majority of commenters support PHMSA's efforts to adopt enhanced standards for non-pressure tank cars used to transport flammable liquids. For example, there were nearly 168,700 signatories from the general public, NGOs, and government organizations who requested that PHMSA prohibit the continued use of the existing legacy DOT Specification 111 tank car fleets. There were, however, 1,878 signatories that supported the proposals in the rulemaking. Moreover, there were approximately 159,000 signatories that felt the proposed new tank car standards do not go far enough, including three entities representing tribal communities, the Tulalip Tribes, the Prairie Island Indian Community, and the Quinault Indian Nation. Lastly, there were approximately 40 substantive comments in support of the notion that alignment with Canada is critical for new construction and retrofit designs, as well as retrofit timelines. Below, we discuss the comments specific to each tank car option proposed in the NPRM.

Option 1

Proposed tank car Option 1 received the least support from the regulated industry (railroads, shippers, offerors, etc.) however it was fully supported by the NTSB, concerned public, environmental groups, local communities, and cities. These groups all requested the most robust tank car specifications be adopted but gave very little consideration to the costs of such standards.

Option 1 is the most robust design proposed; it also is the most costly. The comments of API, Railway Supply Institute Committee on Tank Cars (RSI–CTC), and many others in the rail and shipping industry, do not support Option 1. U.S. Congressman Kurt Schrader echoed many of these commenters concerns when he stated that, ''Option 1 appears to introduce controversy, complexity, and additional expense without any meaningful increase in safety.'' In his comments, U.S. Congressmen Peter DeFazio stated ''. . . the rail industry has major concerns with the viability and effectiveness of ECP brakes and certain roll-over protections that were included in Option l. If the addition of those protections appears likely to significantly delay the rulemaking, I would encourage PHMSA to move forward with Option 2 . . .''

While Option 1 was the most robust tank car proposed in the August 1, 2014, NPRM, the Tulalip Tribes did not believe the design was robust enough. Specifically, the Tulalip Tribes noted that while, ''proposed new standards for rail car designs are an improvement,'' they are ''far from providing an acceptable risk from tank rupture allowing leakage or an explosion.'' The Tulalip Tribes continued stating that the:

> DOT–111 tanks are only safe from collisions for speeds up to 9 miles per hour. Option one only improves the safe speed for collisions up to 12.3 miles per hour for the shell of the tank. Of the thirteen major crude oil/ethanol train accidents in the U.S. listed in the August 1, 2014 **Federal Register** notice that this letter is in response to, the proposed new tank car standard would have only prevented one of them from spilling contents from a damaged rail car. The rest of the accidents were from trains travelling from 23 to 48 miles per hour, well above the safe speeds for the new proposed tank designs.''

The Tulalip Tribes concluded that ''[t]he rail cars need to be designed in a way that the damages caused by a derailment are minimized and speed limits are set at or below the maximum speed that a tanker car can survive without a spill.

In general terms, the arguments against Option 1 typically noted the overall cost of the tank car, weight issues associated with increased safety features, the lack of a substantial increase in safety when compared to other options, and the inclusion of ECP braking and TIH top fittings protection. The typical arguments in support of Option 1 were that it was the most robust tank car option, and the incremental safety benefit is justified given recent accident history.

Option 2

The Option 2 tank car has most of the safety features as the Option 1 tank car, including the same increase in shell thickness, jacket requirement, thermal protection requirement, and head shield requirement. However, it does not require TIH top fittings protection and the requirement of ECP brake equipment of Option 1. Installation of ECP brake equipment largely makes up the cost differential between the Option 1 and 2 tank cars, and the differences in estimated effectiveness are also largely a result of ECP brakes. Proposed tank car Option 2 received more support than option 1 from the regulated industry, albeit with a variation in shell and head thickness for newly constructed tank cars. Many commenters in the rail industry supported this option with an 8/16-inch thick shell as opposed to the proposed 9/16-inch shell.

In their comments, U.S. Congressman Dave Reichert and Congresswoman Lynn Jenkins state ''we strongly encourage PHMSA to consider Option 2 identified in the NPRM.'' Another commenter, Bridger, LLC (Bridger) stated ''Bridger strongly recommends

that PHMSA promulgate a final rule adopting the Option 2 or the Option 3 tank car design.'' GBW Railcar, a railcar manufacturer, asserted ''that PHMSA adopt Option 2 as the standard for the new tank cars.''

Amsted Rail Company, Inc. (Amsted Rail) fully supports Option 2 as does the State of Minnesota which stated that ''Minnesota and its agencies support the safety features and performance level represented by the Option 2.'' RSI–CTC also supports Option 2 for new tank car requirements but only for those tank cars transporting crude oil and ethanol.

Many commenters were opposed to both Options 1 and 2. AFPM represented many of these sentiments when it stated that, ''numerous procedural and substantive flaws of PHMSA's cost-benefit analysis make it clear that Options 1 and 2 would cost far more and provide little in the way of additional safety improvements.''

The arguments against Option 2 were primarily from the NTSB, concerned public, environmental groups, local communities, cities, and towns who, as stated above, supported Option 1. In addition some in the regulated industry expressed their opposition for both options 1 and 2. These entities typically noted the overall cost of the tank car, weight issues associated with increased safety features, and the lack of a substantial increase in safety when compared to other options.

In summary, the arguments in support of Option 2 were provided by a wide range of commenters from the regulated industry. These commenters supported exclusion of ECP braking and TIH top fittings protection. Finally, it should be stressed that many in the regulated industry supported this option with the caveat that the shell thickness be 8/16-inch and not 9/16-inch.

Option 3

Proposed tank car Option 3 received the most support from the regulated industry for both new construction and retrofitted tank car requirements and the least support from the NTSB, concerned public, environmental groups, local communities, and cities. Option 3 is similar to the jacketed CPC–1232 tank car standard. The option revises the CPC–1232 standards by requiring improvements to the bottom outlet handle and pressure relief valve. It also removes options (1) to build a tank car with the alternative (ASTM A516–70) steel type but with added shell thickness or (2) to build a tank car with a thicker shell but no jacket.

This tank car is a substantial safety improvement over the current DOT Specification 111 but does not achieve the same level of safety as the Option 1 or Option 2 tank cars. This tank car requirement calls for a 7/16-inch shell, which is thinner than Option 1 or Option 2 tank cars. Similar to the Option 2 tank car, this tank car lacks TIH top fittings protection and ECP brake equipment. This standard is the tank car configuration PHMSA believes will be built for HHFT service in absence of regulation, based on commitments from one of the largest rail car manufacturers/leasers—Greenbrier, Inc. and the Railway Supply Institute (consisting of the majority of the tank car manufacturing industry).[46] Accordingly, PHMSA assumes no costs or benefits from Option 3 for new tank cars. Below are a few selected comments that represent the larger overall support from the regulated industry.

In its comments, Honeywell Performance Materials and Technologies asserted, ''[n]ew car construction, as proposed with CPC–1232, is the most efficient way to enhance safety of the fleet.''

The Dow Chemical Company (Dow) stated that ''Dow believes that Option 3 will be the most feasible for the crude oil and ethanol industries . . .'' Dow estimated ''that Option 3 will achieve a more optimal balance between safety features (resulting in increased tare weight) and lading quantity, thus reducing the extra number of cars (or trains) that would need to be put on the rails compared to Options 1 and 2. The size of the Option 3 car also makes it less likely to negatively affect loading/unloading rack dimensions or fall protection systems.'' Further, Dow ''strongly encourages PHMSA to incorporate into the HMR enhanced specifications—as described in CPC–1232—for new DOT Specification 111 builds for Class 3 materials (other than those covered by HM–251).''

U.S. Congressman Rep. Kevin Cramer supports the CPC–1232 standard because the analysis leading to its design has been ''fully contemplated.''

In its comments, DGAC stated that it ''encourages Option #3 (Enhanced CPC–1232) with jacket and full height headshield.'' The Independent Fuel Terminal Operators Association also supports the adoption of Option 3, but only for newly constructed cars built after October 1, 2015. Biggs Appraisal Service LLC offers mixed support for new tank car requirements. It believes this is the option that best fits their interest, but this option still has features that it thinks is unnecessary. It argues that 7/16″ is sufficient thickness and that ''the amount of thickness strength that an additional 1/16 of an inch will afford is negligible.''

As mentioned previously, some commenters proposed an alternative tank car that would fall somewhere between the proposed Options 2 and 3. Specifically, in their comments, AAR/API and Hess propose a new tank car design standard with an 8/16-inch shell; jacket; insulation; full-height head shields; low pressure actuation/high flow pressure relief device; bottom valve operating handle modification; and top fittings protection. In their recommendations, they state, ''[t]he Hess and AAR/API recommendation reflects a joint oil and rail industry agreement that balances the enhanced safety from increasing shell thickness against the risk that additional carloads will be required to move the same volume of product due to a decrease in useable tank car capacity (maximum weight constraint).''

Hess continues its support for Option 3 with a thicker shell, stating:

The AAR/API endorsed standard mirrors PHMSA's Options 2 and 3 in all respects, except that the design would require an 8/16-inch minimum shell thickness, instead of a 9/16-inch shell (Option 2) or a 7/16-inch (Option 3) shell. Adopting this standard improves upon the 7/16-inch minimum shell in Option 3 by reducing the likelihood of a release in the event of an incident. At the same time, it balances the extra protection from the additional steel with the associated reduction in tank car capacity due to the increased car weight. Tank car weight and capacity limitations are a concern with both of PHMSA's 9/16-inch car proposals.

In opposition, Greenbrier does not support Option 3 and it noted a fear of having to again revisit this issue in the future if the correct tank car is not selected. Further, the NTSB asserted that the 7/16-inch″ shell and head thickness is too thin.

In summary, the arguments against Option 3 were primarily from the NTSB, concerned public, environmental groups, local communities, cities, and towns and a rail car manufacturer. These arguments were primarily based on the desire to choose the most effective tank car that has the largest increase in benefit over the existing fleet. In addition, these commenters noted the need to adopt the most appropriate tank car now and avoid revisiting the issue in the future. The arguments in support of Option 3 were more widespread amongst the regulated industry. This support was primarily due to the concerns of the weight of tank car, and the lack of the inclusion of ECP braking and TIH top fittings

[46] Greenbrier: *http://www.regulations.gov/#!documentDetail;D=PHMSA-2012-0082-0155* RSI: *http://www.regulations.gov/#!documentDetail;D=PHMSA-2012-0082-0156*

protection. Many in the regulated industry supported this option with the caveat that the shell thickness should be 8⁄16-inch rather than 9⁄16-inch. Lastly, the regulated community consistently supported either Options 2 or 3.

Tank Car Component Comments

To address comments more effectively, we have arranged our discussion by tank car component. The following is an overview of the requirements and a discussion of the comments in support and opposed to certain proposed requirements.

Bottom Outlet Valve Protection

The bottom outlet valve (BOV) protection ensures that the BOV does not open during a train accident. The NTSB in recommendation R–12–6 recommends that PHMSA ''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.'' PHMSA and FRA see this issue as one that can be cost-effectively resolved and in general commenters agreed.

Overall the comments with regard to BOV protection were supportive by both the regulated industry and public stakeholders. For example, Earthjustice, the environmental group, stated that it, ''urge[s] PHMSA to take further steps to reduce the risks posed by bottom outlet valves.'' The regulated industry also supports this proposal as is evident in Growth Energy's comment that it, ''support[s] CPC–1232 design with PRD and BOV protection.'' Further, R.L. Banks & Associates, Inc. (RLBA) also supports the requirement to develop better lower product discharge valves and valve protectors and would like to see the development of a performance-based specification for lower discharge openings to ensure that the system meets minimum desired requirements.

Although there was widespread support, some commenters were opposed to BOV improvements. Dow stated that, ''in trying to optimize the bottom outlet valve (BOV) for derailments causing the BOV to open, which is a somewhat rare occurrence in terms of total number of derailments, design features that make the valve less safe for loading/unloading operations have the potential to be introduced . . . we believe it is premature to mandate such BOV enhancements.'' This was generally the minority opinion as most support changes to the BOV.

PHMSA and FRA disagree with those commenters who oppose improvements to the current BOV designs. Protection of the BOV is currently a regulatory requirement and is invaluable in an accident scenario as it limits the likelihood of a release of lading which could potentially result in a pool fire. A BOV designed to prevent actuation or opening in a derailment is a necessary enhancement. In this final rule, PHMSA is requiring other design enhancements—such as improved puncture resistance and top fittings protection—that will reduce the volume of lading loss from a tank car that is involved in a derailment. Preventing opening of the BOV during a derailment will further reduce the volume lost, thereby mitigating environmental damage as well as the likelihood of a pool fire or the severity of the fire and environmental damage. 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. Therefore, in this final rule, for new construction of the DOT–117 tank car, we are adopting as proposed in the NPRM that all bottom outlet handles either be removed or be designed with protection safety system(s) to prevent unintended actuation during train accident scenarios.

Head Shields

Currently, the HMR do not require head shields on tank cars used to transport Class 3 flammable liquids. Further, the CPC–1232 standard currently in effect only requires half-height head shields for newly constructed non-jacketed tank cars. In the August 1, 2014 NPRM, PHMSA and FRA proposed a range of tank car options, each of which included a full-height, ½-inch thick head shield.

Commenters who addressed the issue in their comments overwhelmingly support full-height head shield on jacketed tank cars subject to the new standard. For example, the NTSB noted in its comments, ''[t]he top half of tank car heads are subject to damage and punctures during train derailments and half height head shields fail to provide the protection needed.'' RLBA supports the use of full-height head shields for the heads. A concerned public individual, William A. Brake, urged that the new standard require tank cars to be ''equipped with ½ full-head shields.''

PHMSA and FRA agree with the commenters who support the inclusion of a ½ inch full-head shields on new constructions of DOT–117 tank cars. A full-height head shield protects the entire tank car head and can decrease the likelihood of a puncture at the top half of a tank car should a train derail. In fact, half of all the punctures that occurred in the derailments considered in this rulemaking occurred in the head of the tank. Further, half of the head punctures occurred in the top half of the head. As the Transportation Safety Board (TSB) of Canada noted in its' report on the Lac-Mégantic accident ''a full-head shield would have been beneficial, as half-head shields protect only the bottom portion of the head.'' TSB continued that ''all but 4 of the 63 derailed cars exhibited some form of impact damage (for example, denting or breach) in the top portion of at least one head'' and about ''half of the tank cars (31) released product due to damage to the tank car head.'' [47] This report gives further credence to the importance of a ½ inch full-head shield. Given the overwhelming support, we are adopting in this final rule the proposal that all DOT Specification 117 tank cars must include a one-half inch thick, full-height head shield on new construction.

Thermal Protection Systems/Pressure Relief Device

Pressure relief devices (PRD) vent gases or vapors under high pressure in order to reduce the risk of a ruptured tank car. The HMR limit the allowable start-to-discharge (STD) pressure of the PRD to approximately one-third of the burst pressure to provide a factor of safety against at tank rupture. In a pool fire, a loaded tank is exposed to extreme heat which results in both an increase in tank pressure as the lading is heated and a reduction in strength of the tank material commensurate with the increasing material temperature. When a tank car is exposed to a pool fire the PRD will maintain a low pressure in the tank and potentially extend the time before a tank car would thermally rupture.

In the Arcadia derailment there were three high-energy thermal failures. In two of the three cases the tank fractured into two pieces and those pieces were thrown from the derailment area. In the third case, the tank was nearly fractured around the entire circumference. The AAR T87.6 task force considered the possibility that the PRDs did not have adequate flow capacity to expel the rapidly increasing pressure and start to discharge pressure rating (STD). Currently, the PRDs on tank car used in Class 3 service have a STD pressure of 75 or 165 psi. The PRD maintains the

[47] Railway Investigation Report R13D0054 *http://www.tsb.gc.ca/eng/rapports-reports/rail/2013/r13d0054/r13d0054.asp.*

internal pressure at or below the STD pressure. When a tank bursts as a result of exposure to fire conditions, the lower the STD pressure, and therefore internal pressure, the less energetic the failure will be. The PRD in combination with the thermal protection system will provide the appropriate sized pressure relief valve and enhance the lading containment of the tank car.

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 STD 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 delay the release of the lading through the PRD. Based on the results of simulations using the Affect of Fire on Tank Cars (AFFTAC) model, an approved thermal protection delays rupture of a tank until most of the lading has been expelled through the PRD. This results in a lower energy available at the time of rupture.

Most commenters support a redesigned PRD because they consider it as a cost-effective solution that provides considerable safety benefit. Some commenters argue that for a CPC–1232 compliant tank car, any new requirements should be limited to a redesigned PRD and bottom outlet valve protection only. Eighty-Eight Oil LLC stated in its comments, ''Eighty-Eight supports allowing the CPC–1232 jacketed fleet to operate for its full useful life with a potential retrofit limited to an enhanced BOV handle and a larger pressure relief valve.'' Further, in their comments, Growth Energy and many others support the CPC–1232 design with PRD and BOV protection.

There are currently high flow capacity, reclosing PRD available that are relatively low cost and generally easy to install on new or retrofitted tank cars. Based on these facts and comments received in support of reclosing PRDs, PHMSA is adopting the installation of reclosing PRD as proposed on new construction of DOT–117 specification tank cars.

Thermal protection is intended to limit the heat flux into the lading when exposed to fire. Thermal protection will extend the tank car lading retention for a certain period of time in pool fire conditions. Thermal protection will prevent rapid temperature increase of the lading and a commensurate increase in vapor pressure in the tank. The thermal protection system, by reducing the heat flow rate from the fire to the liquid, lowers the liquid evaporation rate, allows the evaporated vapor to be discharged through the pressure relieve valve without significant tank pressure increase and considerably reduces the possibility of dangerous over pressurization of the tank.

All three DOT Specification 117 options proposed in the NPRM required a thermal protection system sufficient to meet the performance standard of § 179.18 of the HMR, and must include a reclosing pressure release valve. Section 179.18 requires that a thermal protection system be capable of preventing the release of any lading within the tank car, except release through the pressure release device, when subjected to a pool fire for 100 minutes and a torch fire for 30 minutes. Typically, tank cars with thermal protection are equipped with a weather-tight 11-gauge jacket. There was general support for this requirement as there are existing technologies that can vastly improve the thermal survivability of the existing fleet. We have summarized a few selected comments below to provide some idea of the overall comments.

In its comments, RLBA agrees that thermal insulation around the shell and a steel jacket over the thermal insulation will be highly beneficial in protecting the shell from structural thermal damage during a derailment fire and over pressure damage due to cargo expansion thanks to shell heating.

While many commenters echoed the above comments, some commenters such as PBF Energy and the Renewable Fuels Association (RFA) do not think jacketing is necessary. In its opposition, DGAC ''believes that an across-the-board requirement for thermal protection and jacketing on all flammable liquid tank cars is not supported by incident data, and may also have unintended consequences detrimental to safety . . . such as making corrosion under the insulation more difficult to detect.''

PHMSA and FRA disagree with commenters opposing the thermal protection requirements as proposed in the NPRM. Furthermore, on April 6, 2015 NTSB issued emergency recommendations stressing the importance of thermal protection in light of the Mount Carbon, WV and Galena, IL derailments. In the train accidents previously discussed, approximately 10 percent of tank car breaches were attributed to exposure to fire conditions. Consistent with current minimum industry standards and Federal regulations for pressure cars for Class 2 materials, the T87.6 Task Force agreed that a survivability time of 100-minutes in a pool fire should be used as a benchmark for adequate performance. The 100-minute survival time is the existing performance standard for pressure tank cars equipped with a thermal protection system and was established to provide emergency responders with adequate time to assess a derailment, establish perimeters, and evacuate the public as needed, while also giving time to vent the hazardous material from the tank and prevent an energetic failure of the tank car.

With regard to the claim that addition of thermal protection and a jacket could have ''unintended consequences detrimental to safety . . . such as making corrosion under the insulation more difficult to detect'' PHMSA and FRA disagree. In accordance with the current requirements, the owner of the tank car has to develop a requalification program. This program would include an inspection method to check for corrosion to the tank. This is currently done for jacketed and insulated tank cars.

The thermal protection prolongs the survivability of the tank by delaying the moment when pressure in the tank exceeds the start to discharge of the pressure relief valve, thus delaying the release of flammable liquid or the occurrence of an energetic rupture. Because all the thermal protection systems meeting the § 179.18 performance standard that PHMSA studied performed equally well in the simulations, and because the simulations indicated the importance of a reclosing pressure relief valve, PHMSA is not requiring a particular system, but instead is requiring that a thermal protection system meet the performance standard of § 179.18 and include a reclosing PRD for new construction of the DOT–117 specification tank car. Finally, it was consistently noted that there are existing technologies available that can vastly improve the thermal survivability of the existing fleet. Thus, the thermal protection requirements for new construction of the DOT–117 specification tank car as proposed in the NPRM are adopted in this final rule.

Head and Shell Thickness

Shell and head punctures result in rapid and often complete loss of tank contents. Minimizing the number of cars punctured in a derailment is critical because ignited flammable liquids that result in a pool fire that can quickly affect the integrity of adjacent cars and their ability to contain their lading. In the August 1, 2014 NPRM, PHMSA and FRA proposed a range of head and shell thicknesses ranging from 7/16-inch to 9/16-inch. Many commenters opposed the thicker steel but were willing to

compromise by recommending an 8/16-inch shell thickness. More information regarding the relationship between puncture resistance and shell thickness is discussed in a subsequent section. Below are a few selected comments related to the topic.

The NTSB, in support of a thicker shell commented that:

> The minimum standards for new DOT–117 tank cars should include: full height ½-inch thick head shields; thermal protection; minimum 11-gauge jacket constructed from A1011 steel or equivalent and weather tight; reclosing and properly sized pressure relief valves; top fitting rollover protection equivalent to pressure tank car performance; 9/16-inch minimum shell thickness TC–128 Grade B normalized steel or steel with minimum equivalent performance standards; and enhanced bottom discontinuity protection for outlet valves and removal of bottom valve handles during transit. The top half of tank car heads are subject to damage and punctures during train derailments and half height head shields fail to provide the protection needed.

A concerned member of the public, Lynne Campbell, urged the Department to ''Select the most protective tank car standards, using the latest technology. Tank Car Option #1 would require 9/16-inch steel, electronically controlled pneumatic (ECP) brakes, and rollover protection.''

An environmental group, the Sierra Club, requested that ''at a minimum, DOT must implement the proposed Pipeline and Hazardous Materials Safety Administration (PHMSA) and Federal Rail Administration (FRA) design option [Option 1] for tank car safety improvements.'' Further, in its comments, the Brotherhood of Locomotive Engineers and Trainmen (BLET) fully support 9/16-inch thickness. In its comments, RLBA stated:

> RLBA believes that increasing the shell thickness from 7/16 to 9/16 is a reasonable compromise between safety and commercial viability of tank cars hauling High-Hazard Flammable materials. RLBA would not support a reduction of the proposed thickness from 9/16 to 8/16 inch but would support an increase from 9/16 to 5/8 or larger.

The Archer Daniels Midland Company in its opposition to Option 1 stated:

> The NPRM modeling used to estimate reduction in risk for increased tank thickness is substantially flawed, and is inconsistent with real-world assumptions on which PHMSA has previously relied and has actually endorsed on the record in this proceeding. This analysis by DOT plainly shows that shell thickness or the effect of a jacket will not result in an appreciable increase in puncture velocity. In this crucial part of the NPRM analysis, by ignoring on the record, and established DOT puncture velocity methods and studies, PHMSA has clearly failed to articulate a satisfactory explanation for its action including a rational connection between the facts found and the choice made.

Commenter Eighty-Eight Oil, LLC, used the AAR's Conditional Probability of Release Model (CPR) to support a claim that Option 2 and Option 1 (with a 9/16th inch shell thickness) are not economically justified.

Greenbrier fully supported Option 2, particularly, the 9/16 inch shell. They believe if this thickness is not adopted, PHMSA and FRA will be forced to revisit this problem in the future. Further, Greenbrier believes that when adopting a thickness PHMSA and FRA should accommodate for a margin of safety to avoid a scenario in which the topic is required to be modified in the future.

Exxon/Mobil supported Option 2, but with 8/16-inch shell. It suggested that unlike 9/16-inch, the 8/16-inch design has been fully engineered and can be implemented immediately. According to Exxon the weight increase by shell thickening is 2% from 7/16-inch to 8/16-inch and 4% from 7/16-inch to 9/16-inch so a lesser thickness would lessen wear on the rail track infrastructure and reduce weight penalty. It is their understanding that an 8/16-inch car reduces risk by 81% over legacy DOT–111 tank car.

API (and AAR) also supported a modified Option 2, with an 8/16-inch shell thickness. They state that the added weight of a 9/16-inch shell thickness would be offset safety-wise by the increased number of trains on tracks. Another commenter, NITL, also supports an 8/16-inch tank shell under Option 2.

AFPM, quoted a 2009 study conducted by Volpe that concluded, ''shell thickness had a relatively weak effect on preventing releases during derailments.'' In its comments AFPM ''supports the Option 3 specification for new and retrofitted rail tank cars shipping crude and ethanol in unit trains of 75 cars or more. The Option 3 specification tank car is an enhanced CPC–1232 tank car with a 7/16″ shell and other enhanced safety features. The Option 1 and 2 tank cars with a 9/16″ shell provide only negligible safety benefits at a substantial incremental cost.''

The Hess Corporation stated, ''[t]he AAR/API recommendation supported by Hess is based on the Option 3 tank car proposed by PHMSA, but increases the shell thickness of the jacketed tank car from a 7/16-inch shell to an 8/16-inch shell.'' In its comments, ''Phillips 66 supports the CPC–1232 at 8/16.''

PHMSA and FRA disagree with those who do not support a 9/16-inch thickness. Specifically, the final RIA for this rulemaking provides support for the effectiveness of the 9/16-inch thickness. In addition, PHMSA and FRA agree with commenters like Greenbrier and the concerned citizens who voiced a desire for the most effective thickness in preventing punctures. Options 1 and 2 require DOT Specification 117 tank car head and shells to be a minimum of 9/16-inch thick. This final rule also requires an 11-gauge steel jacket. The final RIA contains a detailed discussion of the improvement in the puncture force for Options 1 and 2 relative to the current specification requirements for a DOT Specification 111 tank car. The RIA also discusses the respective effectiveness rates of various tank specifications which lead to PHMSA and FRA's decision on a shell and head thickness of 9/16-inch.

The combination of the shell thickness and head shield of Options 1 and 2 provide a head puncture resistance velocity of 18.4 mph. Because the Option 3 tank car has a 7/16-inch shell, as opposed to the 9/16-inch shell in Options 1 and 2, it has a head puncture resistance velocity of 17.0 mph. It is for these reasons, PHMSA is adopting the 9/16-inch shell thickness as proposed in the August 1, 2014, NPRM for new construction of the DOT–117 specification tank car. See also the final RIA.

Top Fittings/Rollover Protection

The top fitting protection consists of a structure designed to prevent damage to the tank car service equipment under specified loading conditions. As adopted in this final rule, newly constructed tank cars will require top fittings consistent with the AAR's specification for Tank Cars, M–1002, appendix E, paragraph 10.2.1. In general, there was support for some top fittings protection, but not for the dynamic top fittings protections meeting a 9-mph performance standard required for tank cars required for the transportation of TIH materials.

Further, some commenters suggested continued development of top fittings protection. PHMSA is aware that the AAR Tank Car Committee has started a working group to investigate cost effective advancements in existing top fittings protections. PHMSA and FRA are supportive of these efforts as they would apply to both new and retrofitted tank cars. PHMSA and FRA may conduct further testing and develop future regulatory requirements if appropriate. We have summarized a few selected comments below to provide some idea of the overall comments.

RLBA recommended that the development of structures to contain and protect the over pressure device be continued including recessing the device in an inverted dome fastened to the shell.

Earthjustice, an environmental group, strongly urged ''PHMSA to require existing tank cars to have additional top-fittings protections (which the Canadian proposed rule would do).''

AAR's comments on top fittings protection were consistent with many other commenters. In particular the AAR noted the importance of top fittings protections yet stressed concern with overly burdensome top fittings standards. AAR stated it ''supports enhanced top-fittings protection, but not the 9 mph standard.''

Because there was little substantive opposition to the adoption of enhanced top fittings protection for new construction of the DOT–117 specification tank car, PHMSA and FRA are adopting such requirements consistent with the AAR's specification for Tank Cars, M–1002, appendix E, paragraph 10.2.1 as opposed to dynamic top fittings protections meeting a 9-mph performance standard.

Under proposed Option 1, the DOT Specification 117 tank car would be required to be equipped with a top fittings protection system and nozzle capable of sustaining, without failure, a rollover accident at a speed of 9 mph, in which the rolling protective housing strikes a stationary surface assumed to be flat, level, and rigid and the speed is determined as a linear velocity, measured at the geometric center of the loaded tank car as a transverse vector. Generally this (TIH top fittings protection) requirement was not supported by the regulated community but was supported by those endorsing the most robust tank car possible. Below are a few selected comments to provide some idea of the overall comments.

Dow stated with regard to the top fittings on Option 1 that, ''[o]ne rail tank car manufacturer indicated at least $8,000 additional cost for § 179.102–3 dynamic load roll-over protection . . . . The thicker 9/16-inch steel tank shell indicated in the NPRM may also require even larger nozzle reinforcement pads at additional cost.''

Another opposing commenter, Greenbrier, stated that it does not support TIH rollover protection, claiming it is an unproven technology. It does, however, support AAR specification M–1002, appendix E, Paragraph 10.2.1 Top Protection.

ADM asserted, ''PHMSA assumes without any supporting data that top fittings will decrease the damage to service equipment by 50 percent.''

PHMSA and FRA agree with commenters opposed to the TIH style rollover protection system proposed in Option 1 for new construction of the DOT–117 specification tank car. We disagree that it is ''unproven technology.'' Specifically, this is not a specific technology but rather a performance standard. Also, the standard exists and is used for tank car transporting PIH commodities. There are thousands of tank cars in operation that meet this standard. We do not believe this is a matter of technology but rather a matter of whether a practical design could be developed, one that will not introduce excessive stresses elsewhere in the tank in the event of a roll-over.

Therefore, while we disagree that it is ''unproven technology,'' we do not feel the effectiveness of the TIH rollover protection is justified when considering the cost of such a system and thus, we are not adopting such standards in this final rule.

Braking

For comprehensive analyses, conclusions, and regulatory codification on the braking proposal, see ''Advanced Brake Signal Propagation Systems.''

Supporting Analyses and Conclusions

The discussion below provides some of the supporting analysis that shaped PHMSA and FRA's decisions on the requirements for the new construction of the DOT–117 specification tank cars. For further detail and a more comprehensive discussion of our analysis, see the final RIA for this rulemaking. This section highlights particular areas that were the focus of numerous comments.

Puncture Resistance

Effective October 1, 2015, for new car construction, the adopted specification requirements are the same as proposed Option 2. See the ''Advanced Braking Signal Propagation Systems'' section for discussion on ECP braking. Industry is currently building DOT–111 tank cars constructed to the CPC–1232 standard. The primary difference between Option 2 and the jacketed DOT/CPC–1232 car is that the former has a 9/16 inch thick shell. Additional required thickness provides improved shell puncture resistance ranging from 7% to 40% depending on the initial speed and brake system employed as indicated in the following table:

TABLE 16—REDUCTION IN THE NUMBER OF PUNCTURES GIVEN TANK CAR DESIGN, INITIAL SPEED, AND BRAKE SYSTEM, WHEN COMPARED TO AN UNJACKETED DOT 111 TANK CAR WITH A TWO-WAY EOT DEVICE

	Two-way EOT device		ECP	
Tank car option	40 mph	50 mph	40 mph	50 mph
DOT 111 no jacket	0	0	2.3	1.4
7/16-inch w/jacket	5.0	6.5	6.8	7.2
8/16-inch w/jacket	5.6	7.3	7.3	8.0
9/16-inch w/jacket	6.2	8.1	7.8	8.7

Tank cars with a jacket are equipped with a one-half inch thick full height head shield. A two-way EOT device is applied to the end of the last car in a train to monitor functions such as brake line pressure and accidental separation of the train using a motion sensor. The two-way EOT device also is able to receive a signal from the lead locomotive of the train to initiate emergency braking from the rear of the train. ECP brakes are electronically controlled from the locomotive and can be used to initiate braking on all ECP-equipped cars in a train at substantially the same time. *See* ''Advanced Brake Signal Propagation Systems,'' below, for additional discussion.

Based on these effectiveness and the associated incremental cost, PHMSA and FRA have chosen the 9/16 thickness due to its increased puncture resistance. See the RIA for this final rule for further analysis.

Conditional Probability of Release

Many commenters who provided data and analysis in an effort to refute PHMSA and FRA modeling data did so with the use of the Conditional Probability of Release (CPR) modeling. In addition, some commenters challenged PHMSA and FRA modeling as a weakness in our analysis. In July 2014, FRA released a study conducted by Sharma and Associates entitled

''Objective Evaluation of Risk Reduction from Tank Car Design & Operations Improvements'' that describes a novel and objective methodology for quantifying and characterizing the reductions in risk (or reductions in puncture probabilities) that resulted from changes to tank car designs or the tank car operating environment. This approach can be used as an alternative to CPR when describing tank car performance. The report is placed in the docket for this proceeding at PHMSA–2012–0082–0209 which can be accessed online at *www.regulations.gov*. The following is an excerpt from the study relevant to this discussion:

> The methodology captures several parameters that are relevant to tank car derailment performance, including multiple derailment scenarios, derailment dynamics, impact load distributions, impactor sizes, operating conditions, tank car designs, etc., and combines them into a consistent probabilistic framework to estimate the relative merit of proposed mitigation strategies.
>
> The industry's approach (CPR) to addressing these questions has been to rely on past statistical data from accidents. RA–05–02, a report published by industry, and its more recent derivatives, have been used by the Association of American Railroads (AAR) and other industry partners as a means to address the above questions, in so far, as it relates to thickness changes. This approach has shortcomings, such as:
>
> • Limited applicability—cannot be applied to innovative designs or alternate operating conditions
>
> • Inconsistency—risk numbers seem to change with the version of the data/model being used
>
> • Based on a limited dataset, that may not have good representation from all potential hazards, particularly low probability-high consequence hazards, and car designs/features present only in limited quantities in the general population of tank cars.
>
> While the statistical data may be useful as a general gauge for safety, it does not make a valuable tool for future engineering decisions, or, for setting standards. Therefore, there is a distinct need to develop an objective, analytical approach to evaluate the overall safety performance and the relative risk reduction, resulting from changes to tank car design or railroad operating practices. The research effort described here addresses this need through a methodology that ties together the load environment under impact conditions with analytical/test based measures of tank car puncture resistance capacity, further adapted for expected operating conditions, to calculate resultant puncture probabilities and risk reduction in an objective manner. While not intended to predict the precise results of a given accident, this methodology provides a basis for comparing the relative benefits or risk reduction resulting from various mitigation strategies.

In addition, some commenters challenged PHMSA and FRA modeling as a weakness in our analysis. For example, Dr. Steven Kirkpatrick of Applied Research Associates, Inc., in his September 29, 2014, comments to the NPRM, entitled ''*Review of Analyses Supporting the Pipeline and Hazardous Materials Safety Administration HM–251 Notice of Proposed Rulemaking, Technical Report,''* challenged the methodology used in the July 2014 Sharma & Associates study. These comments were combined with the AAR and its TTCI comments under docket reference number PHMSA–2012–0082–3378 of this proceeding.

PHMSA and FRA stand behind the assumptions, conclusions, and methodology used in the Sharma Associates study on puncture resistance. In addition, based on the comments received this methodology was modified, where appropriate, to provide better results. Specific modifications are discussed below. For a more comprehensive discussion, see the RIA.

- The effect of derailment occurring at different locations throughout the train was included in the calculations.
- In the NPRM, 12 scenarios were used for each calculated most probable number of cars punctured. The scenarios have been expanded to 18, based on 3 track stiffness values, 3 friction coefficients, and 2 derailment initiating force values.
- Multiple analyses have been conducted in which the impactor distribution was varied towards either larger or smaller impactors.

In addition, the *Review of Analyses Supporting the Pipeline and Hazardous Materials Safety Administration HM–251 Notice of Proposed Rulemaking, Technical Report* offered some analysis PHMSA and FRA do not agree with. Below, PHMSA and FRA explain why they do not agree with some of the critiques put for the in that technical report. For a more comprehensive discussion see the RIA.

- PHMSA and FRA believe that the ''ground friction coefficient values'' used in the Sharma modeling analysis are methodical, reasonable, and adequate for the purposes of evaluating the relative performance of alternative tank car designs and determining the effectiveness rates of the proposed tank car design standards.
- PHMSA and FRA disagree with the Review of Analyses' critique of the Sharma modeling's ''assumed impactor distribution'' and reiterate that the Sharma modeling's assumptions are generally consistent with ''real life observations.'' In his critique, Dr. Kirkpatrick states that a larger impactor size should have been used for the analysis. However, in his report, ''Detailed Puncture Analyses Tank Cars: Analysis of Different Impactor Threats and Impact Conditions'', file name:TR_Detailed Puncture Analyses Tank Cars_20130321_final.pdf, page 2 (page 20 of PDF file) Dr. Kirkpatrick indicates smaller impactors sizes are appropriate.[48]

> ''A significant finding from the first phases of the study is that there are many potential impact threats with a relatively small characteristic size. When the combinations of complex impactor shapes and off-axis impactor orientations are considered, many objects will have the puncture potential of an impactor with a characteristic size equal to or smaller than the 6-inch impactor used in previous tank car tests.''

- PHMSA and FRA are confident that the findings for the number of tank cars derailed in derailment simulations are largely consistent with the ''spread seen in actual derailment data.''

The methodology used for calculating the effectiveness of the enhanced tank car design features, is covered in detail in the RIA. By combining well-established and new research with recent, directly applicable derailment data, this method appropriately considers the unique risks associated with the operation of HHFTs. The table below provides the calculated effectiveness rates of the proposed new car specification and retrofit specification relative to existing tank cars.

TABLE 17—EFFECTIVENESS OF NEWLY CONSTRUCTED AND RETROFITTED TANK CAR OPTIONS

Effectiveness rates of the PHMSA/FRA (NPRM Option 1) relative to the following	
DOT–111 non-jacketed	*0.504
CPC–1232 non-jacketed	0.368
DOT–111 jacketed	0.428
CPC–1232 jacketed	0.162
Effectiveness Rates of the Enhanced Jacketed CPC–1232 (NPRM Option 3) relative to the Following	
DOT–111 non-jacketed	0.459
CPC–1232 non-jacketed	0.31
DOT–111 jacketed	0.376
CPC–1232 jacketed	0.01

*These figures represent the percent effectiveness when comparing the DOT–117 and DOT–117R against the existing fleet in the first column. For example a DOT–117 is 50% more effective than a DOT–111 non-jacketed

[48] Detailed Puncture Analyses Tank Cars: Analysis of Different Impactor Threats and Impact Conditions'' can be found at: *http://www.fra.dot.gov/eLib/details/L04420.*

Weight Penalty

Some commenters raised concerns about potential loss of lading capacity due to the increased weight of the new tank cars. Concerns were raised about the loss of capacity of new or retrofitted tank cars because of the increased weight of the tank car resulting from the added safety features. The additional features that will affect the tare weight of the tank car include an 11-gauge jacket, thicker shell and full height, ½-inch thick head shield.

The majority of commenters in the rail and shipping industries cited the potential loss of lading capacity due to the increased weight of the new tank cars as a central concern related to the selection of a tank car specification. While most comments from the rail and shipping industries were concerned with potential loss of lading capacity, one commenter, Greenbrier, actually refuted the claims of weight issues made by a larger portion of the regulated community. It noted that there are those:

who suggest that a 9/16 inch shell thickness will significantly lower the volume capacity of the tank car. The legacy DOT–111 tank cars were limited to 263,000 pounds total weight on rail. Recently, the AAR and FRA increased that limit to 286,000 pounds, or a 23,000 pound increase. Greenbrier's legacy 263,000 pounds, 30,000 gallon, tank cars weigh 68,000 pounds (light weight) and have a load limit of 195,000 pounds. Greenbrier's proposed tank car of the future with a 9/16 inch shell weighs 90,500 pounds, has a volume capacity of 30,000 gallons and a load limit of 195,500 pounds. In other words, while the weight of the proposed car increases by 22,500 pounds, the volume capacity actually increases by 100 gallons and the weight capacity increases by 500 pounds.

PHMSA and FRA disagree with commenters' claims that the rule will necessarily reduce the load limit (*i.e.* the weight of the lading) of current and future crude and ethanol tank cars in the absence of this rule, and consequently disagrees with the claim that the increased tare weight will necessitate an increase in the number of carloads required to move a given amount of product. The maximum allowable GRL is 286,000 pounds. PHMSA and FRA believe that, for all but an inconsequentially small number of such tank car loads, the difference between the current weight of a loaded car using standard operating practices and 286,000 lbs. is more than the weight that will need to be added to comply with this rule. This is true for both the current crude and ethanol fleet and new tank cars (including jacketed and non-jacketed CPC–1232 cars) as they would have been placed into this service over the next 20 years in the absence of this rule. Therefore, the vast majority of tank cars will be able to comply with this rule without realizing any meaningful loss in capacity. Consequently we have not accounted for any capacity losses in our analysis. The issue of a weight and capacity limitations is addressed in-depth in the RIA.

Conclusion

Based on the previous discussion as well as the RIA, in this final rule, PHMSA and FRA are adopting Option 2 (see braking section of this rulemaking for discussion of braking systems to be included on tank cars) as the DOT Specification 117 tank car standard for new construction. The table below further summarizes details of the adopted enhanced tank car design standard (DOT specification 117) compared with the DOT 111A100W1 Specification currently authorized.

TABLE 18—SAFETY FEATURES OF DOT SPECIFICATION 117 TANK CAR

Tank car	Bottom outlet handle	GRL (lbs.)	Head shield type	Pressure relief valve	Shell thickness	Jacket	Tank material	Top fittings protection	Thermal protection system	Braking
Selected Option: DOT Specification 117 Tank Car.	Bottom outlet handle removed or designed to prevent unintended actuation during a train accident.	286K	Full-height, ½ inch thick head shield.	Reclosing pressure relief device.	9/16-inch Minimum.	Minimum 11-gauge jacket constructed from A1011 steel or equivalent. The jacket must be weather-tight.	TC–128 Grade B, normalized steel.	Must be equipped per AAR Specifications for Tank Cars, appendix E paragraph 10.2.1.	Thermal protection system in accordance with §179.18.	Dependent on service
DOT 111A100W1. Specification (Currently Authorized).	Bottom Outlets are Optional.	263K	Optional; Bare Tanks half height; Jacket Tanks full height.	Reclosing pressure relief valve.	7/16-inch Minimum.	Jackets are optional.	TC–128 Grade B, normalized steel*.	Not required, when equipped per AAR Specifications for Tank Cars, appendix E paragraph 10.2.1.	Optional	EOT device (See 49 CFR part 232)

*For the purposes of this figure, TC–128 Grade B normalized steel is used to provide a consistent comparison to the proposed options. Section 179.200–7 provides alternative materials, which are authorized for the DOT Specification 111.

2. Retrofit Standard

In the August 1, 2014 NPRM, we proposed to require that existing tank cars meet the same DOT Specification 117 standard as new tank cars, except for the requirement to include top fittings protection. In this final rule, we are adopting retrofit requirements for existing tank cars in accordance with Option 3 from the NPRM (excluding top fittings protection and steel grade). If existing cars do not meet the retrofit standard by the adopted implementation timeline, they will not be authorized for use in HHFT service. See the ''Advanced Brake Signal Propagation Systems'' section of this rulemaking for discussion of braking systems to be included on tank cars.

In Safety Recommendation R–12–5, the NTSB recommended that new and existing tank cars authorized for transportation of ethanol and crude oil in PG I and II be equipped with enhanced tank head and shell puncture resistance systems and top fittings protection. However, PHMSA chose not to include top fitting protections and changes in steel grade as part of any retrofit requirement, as the costliness of such retrofit is not supported with a corresponding appropriate safety

benefit.[49] We do apply the retrofit standard to tank cars carrying all flammable liquids in HHFTs, and not just ethanol and crude oil in PG I and II. Retrofitted legacy DOT–111 tank cars will be designated as ''DOT–117R.''

In consideration of adopting a retrofit standard, two aspects were considered thoroughly: (1) The technical specifications of the retrofit standard compared to the current fleet composition and (2) the corresponding retrofit schedule timeline. The timeline for retrofits will be discussed in greater detail in the upcoming section of this document entitled ''Implementation Timeline.'' In this section, we will focus on the technical specifications of the retrofit standard when compared with the current fleet composition.

PHMSA firmly believes that reliance on HHFTs to transport millions of gallons of flammable liquids is a risk that must be addressed. For the purposes of flammable liquids, under the proposals in the August 1, 2014 NPRM, the legacy DOT Specification 111 tank car would no longer be authorized for use in an HHFT after the dates specified in the proposed retrofit schedule. In recent derailments of HHFTs, the DOT Specification 111 and CPC–1232 tank car has been identified as providing insufficient puncture resistance, being vulnerable to fire and top-fittings damage, and they have bottom outlet valves that are can be inadvertently opened in accident scenarios. These risks have been demonstrated by recent accidents of HHFTs transporting flammable liquids.

In the August 1, 2014, NPRM, we proposed to limit continued use of the DOT Specification 111 tank car to non-HHFTs. In addition, we proposed to authorize the continued use of legacy DOT Specification 111 tank cars in combustible liquid service. The risks associated with flammable liquids, such as crude oil and ethanol, are greater than those of combustible liquids. The requirements proposed in the NPRM were not applicable to HHFTs of materials that are classed or reclassed as a combustible liquid. Existing HMR requirements for combustible liquids will not change as a result of this final rule. Thus, except for those tank cars intended for combustible liquid service, after the established implementation timeline, any tank car used in a HHFT must meet or exceed the DOT Specification 117, 117P, or the 117R standard. Those tank cars not retrofitted would be retired or repurposed. Further, if it can be demonstrated that an existing tank car can meet the new performance standards, it will be authorized for use in a HHFT as a DOT Specification117P.

General Retrofit Comments

We received a variety of comments representing differing viewpoints in response to the proposed tank car retrofit standard. Overall, 45 commenters supported the retrofit of existing fleets; 56 commenters opposed the retrofit of the existing fleets and 41 commenters asserted the retrofit standards as proposed in the NPRM did not go far enough. We have summarized a few selected comments below to provide some idea of the overall comments.

E.I. du Pont de Nemours and Company requests that PHMSA, ''authorize the continued use of existing DOT 111 tank cars for non-crude and non-ethanol Class 3 flammable service for the remainder of their useful life. Non-HHFT shipments of crude oil and ethanol also should be permitted in DOT 111 tank cars for the remainder of their useful life.''

Eighty-Eight Oil, LLC asserted its belief that ''the CPC–1232 jacketed fleet [should be permitted] to operate for its full useful life with a potential retrofit limited to an enhanced BOV handle and a larger pressure relief valve.''

PHMSA sought to limit the unnecessary retirement or repurposing of tank cars while implementing meaningful safety improvements on the existing fleet. This final rule requires the tank cars used in an HHFT to be retrofitted to specifications equivalent to Option 3 in the NPRM. This enables tank car owners to realize the full useful life of an asset. The final rule does not impact existing DOT–111 tank cars used in Class 3 flammable service that are not a part of an HHFT.

In support of retrofitting existing fleets, GBW noted that:

> GBW will be making substantial capital investments and will hire, train, and certify 400 new employees over the next year, creating jobs throughout the United States. Moreover, GBW is making its capital investments now to expand retrofit capacity and conducting hiring activity in advance of a final rule.

In its comments, Bridger noted their economic concerns over an overly burdensome retrofit standard, noting ''the economics of retrofitting the older and cheaper DOT–111 tank cars is considerably different from the economics of retrofitting the newer and costlier CPC–1232 tank cars.'' Bridger's main concern is that the price of tank cars has increased significantly, with a CPC–1232 costing 80% more (in 2014) than the DOT–111 (in 2008); and it noted this is very important because it is not equitable, as its competitors have less costs per tank car and undergo the same operations (using a retrofitted DOT–111).

The comments of Edward D. Biggs III question whether any other modifications (including jacketing) for DOT 111 tank cars built with normalized steel shells are necessary.

Cargill estimated that it would cost in excess of $45 million to retrofit its existing fleet of tank cars. Cargill expects that retrofitting costs will be $60,000 per tank car, more than twice the figure assumed by PHMSA.

In its comments, AFPM stated that it supports ''the Option 3 specification for new and retrofitted rail tank cars shipping crude and ethanol in unit trains of 75 cars or more. The Option 3 specification tank car is an enhanced CPC–1232 tank car with a 7/16'' shell and other enhanced safety features. The Option 1 and 2 tank cars with a 9/16'' shell provide only negligible safety benefits at a substantial incremental cost.''

The RSI–CTC supported retrofits in accordance with Option 3 for all PG I and PG II flammable liquid tank cars. But it supports only the addition of PRV and BOV protection at requalification for Class 3, PG III tank cars. RLBA echoes RSI–CTC with its recommendation that existing cars be retrofitted with the latest design of self-closing high capacity over pressure devices that meet the same standards as new car construction.

In addition to the previous general comments on the retrofitting of existing tank cars, the following notable issues were frequently cited when discussing the topic. In the following, we discuss comments on each issue, concerns raised and our response to the comments.

Shop Capacity

Numerous commenters asserted that shop capacity is insufficient to retrofit existing fleets in a timely and cost-effective manner or in accordance with the schedule proposed in the NPRM. Specifically, RSI–CTC noted that there are tiers of retrofitting that vary based on complexity. For example, retrofitting a legacy non-jacketed DOT–111 is a much more intensive process than retrofitting the most recent jacketed CPC–1232. RSI–CTC asked in their

[49] The cost to retrofitting a tank car with the proposed top fitting protection is estimated to be $24,500 per tank car, while the comparable effectiveness rates are low. However, the effectiveness rates were calculated assuming cars punctured would release all lading through the breach regardless of top fittings damage. With improved puncture resistance, lading loss through damaged top fittings will become a more significant point of release.

comments that PHMSA and FRA consider the complexity of these retrofits and the shop capacity to complete them in our analysis. We agree and have since revised our analysis accordingly. See RIA. Below are some additional comments that represent issues related to shop capacity.

In its comments, Eighty-Eight Oil, LLC stated, ''[a]ccording to the regulatory impact analysis in the NPRM (page 89), PHMSA suggests that 66,185 cars can be retrofitted over 3 years, or 22,061 cars per year. This estimate is considerably higher than the AllTranstek study estimate of 3,000 per year or RSI's estimate of 5,700 per year (after a one year ramp up period).'' [50] Eighty-Eight Oil, LLC continues, ''during this timeframe, thousands of new cars were manufactured to handle the growing business but there has not been a repair facility of any significant size put into service. The costs of retrofitting existing cars will cause many cars to be retired rather than retrofit thus adding to the shortage of cars in the network.''

Honeywell Performance Materials and Technologies stated that the ''backlog for present mechanical needs and requalification on all tank cars will be increased.'' In addition a report commissioned by RSI and authored by Brattle noted that shop capacity could be a considerable issue when determining a retrofit standard.[51] A similar report commissioned by API and authored by IFC international noted similar concerns.[52] API also expressed implementation concerns about shop capacity, the current backlog of car orders, and engineering capacity. Both these reports are discussed in the final RIA but it should be noted both these reports based their findings on the 5 year retrofit schedule which has since be revised.

In general, commenters expressed concern about the availability of materials, the availability of skilled labor, and facilities to conduct the needed procedures involved in a retrofit. PHMSA and FRA considered these and other concerns when determining a retrofit standard.

PHMSA and FRA understand the concerns with regard to shop capacities. Specifically, concerns about the time that will be required to acquire additional resources needed to build and ramp up facilitates to conduct retrofits, as well as the manufacturing and supply of the materials needed for the components of the tank cars (*i.e.,* steel plates and sheets, new valves, etc.). PHMSA and FRA also understand the limitations of the existing labor force. For example, a skilled labor force (welders, metal workers, machinists, etc.) must be hired and trained to perform the necessary retrofit work correctly and safely. We agree with many of the issues raised by commenters and have revised our analysis with regard to the retrofit standard.

Trucks

Many public commenters raised technical issues and potential implementation problems from an industry-wide retrofit for HHFTs. For example, the API public comment noted issues with the extra weight on stub sills and tank car structures, and issues with head shields and brake wheels/end platforms, and issues with truck replacement. Below is a list of comments that represent concerns over how the retrofit standard will affect the existing trucks of tank cars.

Amsted Rail believes PHMSA underestimated the cost of a new car and, in its comments, lists the prices for several components, suggesting $20,000 for complete car set of new trucks versus the $16,000 amount used by PHMSA.

It is RSI–CTC's understanding that modifications will add 13,000 pounds to cars; that trucks will require modification from 263,000 to 286,000; and that new wheel sets will cost $10,000 per car; and that new roller bearings, axles, and adaptor possibly will be added to the car. In its comments, Amsted Rail Company, Inc. also asserted that trucks will need replacement on 29,302 ethanol tank cars (pre 2011), 28,300 crude oil tank cars (pre CPC–1232), and 36,000 tank cars in ''other'' Class 3 flammable liquid service.

PHMSA and FRA believe that the majority of tank cars constructed in the last decade are equipped with trucks, save a particular sized bearing and bearing adaptor, that are rated for 286,000 pound gross rail load service. Further, the AAR's Engineering and Equipment Committee rules require replacement of trucks (bolster and side frames) and wheel sets when the gross rail load of a rail car is increased from 263,000 to 286,000 pounds. As a result, what would otherwise be a relatively small cost of approximately $2,000 to replace the bearing and adaptor, car owners are required to replace the trucks and wheel sets at the cost of $24,000/truck. The paucity of data distinguishing the cars that need a major versus minor retrofit leads PHMSA to conservatively assume all DOT legacy tank cars will require the replacement of the trucks and wheel sets.

Repurpose/Retirement

In the August 1, 2014 NPRM, we proposed, except for top fittings protection, to require existing tank cars that are used to transport flammable liquids as part of a HHFT to be retrofitted to meet the selected option. Those not retrofitted would be retired, repurposed, or operated under speed restrictions for up to five years, based on the packing group assignment of the lading being transported. The following commenters had varying opinions about this assumed strategy.

The RSI–CTC asserted that the minimum early retired tank cars rather than retrofit will be approximately 28% (25,600 tank cars). However, the AAR supports the repurposing of legacy tank cars to Canadian oil sands service. Eastman Chemical Company ''. . . also agrees with PHMSA's proposal to retain the exception that permits flammable liquids with a flash point at or above 38 °C (100 °F) to be reclassified as combustible liquids and allow existing DOT Specification 111 tank cars to continue to be authorized for these materials.''

The Massachusetts Water Resources Authority, ''supports the requirement of Packing Group III in the enhanced car standards as this provides consistency in providing packaging appropriate to handle all flammable liquids. These flammable liquids pose a safety and environmental risk regardless of the packing group.''

Bridger, does not agree with PHMSA's assumption that DOT–111 jacketed and CPC–1232 jacketed cars would be repurposed for use in Canadian oil sands service, as it requires heating coils and insulation in the tank car.

The Independent Petroleum Association of America (IPAA) stated in its comments, ''PHMSA's timeline for DOT–111 railcars is predicated on the assumption that DOT–111s now in use for PG I or PG II hazmat will be moved into PG III service. Even heavy Canadian crudes once mixed with diluents and shipped as ''dilbit'' or ''railbit'' are not expected to qualify as PG III materials, and therefore will not qualify as a home for the displaced DOT–111 railcars.''

DGAC asserted, ''[t]here is an assumption that all Legacy DOT 111 Jacketed and CPC–1232 Jacketed tank cars would be assigned to Canadian oil sands; however, under Transport Canada, these cars may also have to be retrofitted based on regulations.''

[50] It should be noted that this estimate was later revised to 6,400 units per year by RSI–CTC.

[51] See *http://www.regulations.gov/#!documentDetail;D=PHMSA-2012-0082-3415.*

[52] See *http://www.regulations.gov/#!documentDetail;D=PHMSA-2012-0082-3418.*

Growth Energy suggests the shift to Canadian oil sands service is greatly overestimated, and underestimates the costs of doing so (requires retrofit for heating coils), costs of moving cars, and the costs of moving leases. According to Exxon Mobil Corporation, ''[t]he DOT proposal to move DOT–111 tank cars to oil sands service is not feasible as the diluted bitumen to be shipped is PG I or II and carried predominantly in unit trains. There is limited projected growth in other, non-flammable products moved by rail.''

In their comments, Earthjustice, Forest Ethics, Sierra Club, NRDC, and Oil Change International asserted, ''the proposed rule would allow the DOT–111 and other unsafe tank cars to be shifted to tar sands service. The rule is thin on analysis to support this shift. However, on its face, it would be indefensible to allow unsafe tank cars to be used to ship tar sands bitumen diluted with chemicals that contain volatile components. Accidents involving diluted bitumen are notorious for being impossible to clean up.''

Based on these and other comments, PHMSA and FRA acknowledge that the assumption of no retirements and the level of repurposing needed to be revisited. In response to these comments, PHMSA and FRA have made adjustments to their analysis, and the final RIA to account for retirements as opposed to shifting of tank cars to tar sand service.

Many of the comments with regard to new construction also apply to the retrofit specifications. Below PHMSA and FRA discuss the various components of a retrofit tank car specification (see also new construction as many of those comments apply to both new and existing tank cars). The below discussion highlight those comments that were focused on the retrofit standard.

Shell Thickness

Many commenters posed a concern that a retrofit standard that called for an increased thickness would be technically infeasible and result in the scrapping of existing tank cars. For instance, in its comments, Cargill asserted that it is not feasible to retrofit an existing tank car built with a 7⁄16-inch steel shell to conform to a 9⁄16-inch shell requirement. RSI–CTC also stated that Option 1 is not feasible for retrofits. Further, GBW ''does not believe it is practical or economically feasible to bring existing tank cars fully up to the proposed standards for new tank cars particularly with respect to the 9⁄16 inch shell thickness proposed for the Option 1 and Option 2 tank car.''

PHMSA and FRA understand the concerns of the commenters and note the intent of the rule was not to require adding thickness to existing tank cars, but rather to improve the puncture resistance to the existing cars to be equivalent to a tank with a thicker shell. As it would not be technically feasible to add 1⁄8th of an inch of steel to a 7⁄16-inch shell and head when retrofitting a tank car, PHMSA will permit existing DOT–111 fleets to be retrofitted at currently authorized shell thicknesses (7⁄16-inch).

Top Fittings Protection

The NTSB believes that any retrofits should have top fittings protection, citing incidents in Cherry Valley, IL and Tiskilwa, IL due to where those tank cars breached. NSTB stated they will not consider Safety Recommendation R–12–5 as ''acceptable'' unless top fittings protection is included in the retrofitting requirements.

PHMSA is aware that the AAR Tank Car Committee has started a task force to evaluate potential advancements in existing top fittings protections. PHMSA and FRA urge industry to consider enhancements that will apply to both new and retrofitted tank cars. PHMSA and FRA are not requiring such protection in a tank car retrofit in this final rule. While we do believe this is an important safety feature, it is not cost justified.

Thermal Protection Systems/Pressure Relief Device

In its comments, the Dow stated, ''[it] does support thermal protection for crude oil and ethanol . . . Dow suggests that PHMSA consider non-CPC–1232 cars to be a higher retrofitting priority.'' Dow continues, ''[h]owever, addition of insulation and a jacket to existing DOT Specification 111 cars may introduce Plate clearance issues, so not all existing cars will be able to be retrofitted. Additionally, methods for attaching heavier jackets to prevent shifting during train handling will require engineering analysis; finite element analysis of the stub sill design may also be necessary to determine if existing designs are capable of handling the increased weight. Estimated cost for all the engineering and AAR approval application fees is $85,000 per certificate of construction, as per a major rail supplier.''

PHMSA and FRA do not agree. As stated above, in the Arcadia derailment, there were three high-energy thermal failures. In two of the three cases, the tank fractured into two pieces and those pieces were thrown from the derailment area. In the third case, the tank was nearly fractured around the entire circumference. In addition, NTSB restated the importance of thermal protection in their April 6, 2015 Recommendations. These recommendations, R–15–14 and 15, requested that PHMSA 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 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.

Jackets and thermal protection are critical in the survival of a tank car experiencing a thermal event. Thus, thermal protection is adopted as proposed. However, we do note that the new regulation provides flexibility for innovation to meet the performance standard.

Steel Retrofit

Much like the argument against requiring added thickness to retrofitted cars, many posed the relevant concern that a retrofit standard that called for a change in the type of steel used would be technically infeasible and result in the scrapping of existing tank cars. The RSI–CTC requests that non-normalized steel tank cars should be authorized for retrofit as there are 47,300 DOT–111 tank cars currently in service. Normalizing the steel after the tank car has been constructed is impractical. The requirements to this would create considerable cost which would not increase the ultimate strength of the steel.

Normalization does change the mechanical properties of the steel; specifically, a slight improvement in upper shelf toughness and a shift to a lower ductile-brittle transition temperature. PHMSA and FRA understand the concerns of the commenters and note the intent of the rule was not to require a change to the materials specification to existing tank cars, but rather to improve the puncture resistance to the existing cars to be equivalent to a tank constructed of the referenced steel. PHMSA and FRA believe that should a car owner decide to retrofit a tank car, the owner must consider the material properties of normalized steel on the design of the retrofit.

However, tank cars otherwise conforming to the HMR and manufactured of non-normalized steel may remain in service when retrofitted.

Conclusion

Except for top fittings protection and steel retrofit, retrofits will conform to Option 3, subject to brake requirements that depend on the tank car's service, and will be designated ''DOT Specification 117R.'' The retrofit requirements include the addition of an 11-gauge jacket, full height head shield, and a modified bottom outlet configuration.

TABLE 19—SAFETY FEATURES OF RETROFITTED DOT SPECIFICATION 117R TANK CAR

Tank car	Bottom outlet handle	GRL (lbs.)	Head shield type	Pressure relief valve	Shell thickness	Jacket	Tank material	Top fittings protection	Thermal protection system	Braking
Selected option: DOT Specification 117R retrofitted tank car.	Bottom outlet handle removed or designed to prevent unintended actuation during a train accident.	286K	Full-height, ½-inch thick head shield.	Reclosing pressure relief valve.	7/16-inch minimum.	Minimum 11-gauge jacket constructed from A1011 steel or equivalent. The jacket must be weathertight.	Authorized steel at the time of construction.	Not required, but when equipped per AAR Specifications for Tank Cars, appendix E paragraph 10.2.1.	Thermal protection system in accordance with § 179.18.	Dependent on service.
DOT 111 A100W1 Specification (currently authorized).	Bottom outlets are optional.	263K	Optional; bare tanks half height; jacket tanks full height.	Reclosing pressure relief valve.	7/16-inch-minimum.	Jackets are optional.	TC–128 Grade B, normalized steel*.	Not required, but when equipped per AAR Specifications for Tank Cars, appendix E paragraph 10.2.1.	Optional	EOT device (See 49 CFR part 232).

*For the purposes of this figure, TC–128 Grade B normalized steel is used to provide a consistent comparison to the proposed options. Section 179.200–7 provides alternative materials which are authorized for the DOT Specification 111.

3. Performance Standard

The prescribed performance standards adopted in this rule were developed to provide improved crashworthiness when compared to the legacy DOT–111 tank car and to foster innovation in the development of tank cars. In the NPRM, PHMSA and FRA proposed a performance standard in which the design, modeling and testing results would be approved by the Associate Administrator for Railroad Safety/Chief Safety Officer at FRA.

Accordingly, the final rule requires that the tank car design must be approved, and the tank car must be constructed to the conditions of an approval issued by the Associate Administrator for Railroad Safety/Chief Safety Officer, FRA. The performance of the tank car is subject to the following:

Puncture Resistance

The tank car must be able to withstand a minimum side impact speed of 12 mph when impacted at the longitudinal and vertical center of the shell by a rigid 12-inch by 12-inch indenter with a weight of 286,000 pounds. Further, the tank car must be able to withstand a minimum head impact speed of 18 mph when impacted at the center of the head by a rigid 12-inch by 12-inch indenter with a weight of 286,000 pounds.

Thermal Protection Systems/Pressure Relief Device

The tank car must be equipped with a thermal protection system. The thermal protection system must be designed in accordance with § 179.18 and include a reclosing PRD in accordance with § 173.31 of this subchapter.

Bottom Outlet

If the tank car is equipped with a bottom outlet, the handle must be removed prior to train movement or be designed with a protection safety system to prevent unintended actuation during train accident scenarios.

Top Fittings Protection

Tank cars tanks meeting the performance standard must be equipped per AAR Specifications Tank Cars, appendix E paragraph 10.2.1 (IBR, see § 171.7 of this subchapter). A tank car that meets the performance requirements will be assigned to ''DOT Specification 117P.'' Builders must be able to demonstrate compliance with the performance standards and receive FRA approval prior to building the cars.

4. Implementation Timeline

In the August 1, 2014 NPRM, we proposed a risk-based timeline for continued use of the DOT–111 tank car used in HHFTs in §§ 173.241, 173.242, and 173.243. This timeline was based on the packing group requirements in the HMR. The HMR require both the proper classification of hazardous materials and the selection and use of an authorized packaging. Packing groups assign a degree of danger posed within a particular hazard class. Packing Group I poses the highest danger (''great danger'') and Packing Group III the lowest (''minor danger''). In the NPRM, PHMSA proposed a timeline in accordance with the following table:

TABLE 20—TIMELINE FOR CONTINUED USE OF DOT SPECIFICATION 111 TANK CARS IN HHFT SERVICE

Packing group	DOT–111 not authorized after
I	October 1, 2017.
II	October 1, 2018.
III	October 1, 2020.

As discussed in the August 1, 2014 NPRM, PHMSA and FRA were confident the risk-based approach proposed provided sufficient time for car owners to update existing fleets while still prioritizing the highest danger material. Specifically, given the estimates of the current fleet size, composition, and production capacity of tank car manufacturers expressed by

comments submitted in response to the ANPRM, we were confident that a two year phase-in of packing group I flammable liquids would not result in a shortage of available tank cars intended for HHFTs. This strategy would have also provided additional time for tank cars to meet the DOT Specification 117 performance standard if offerors were to take steps to reduce the volatility of the material. Nevertheless, we did seek comment as to whether the proposed phase-out period provided sufficient time to increase production capacity and retrofit existing fleets.

As proposed in the August 1, 2014 NPRM, DOT Specification 111 tank cars may be retrofitted to DOT Specification 117 standards (as a DOT Specification 117R), retired, repurposed, or operated under speed restrictions. Further, we proposed limiting the future use of DOT Specification 111 tank cars only if these tank cars are used in a HHFT. Under the proposal, DOT Specification 111 tank cars would be able to continue to be used to transport other commodities, including flammable liquids, provided they are not in a HHFT. In addition, all retrofitted tank cars (including the DOT–111 tank cars meeting the CPC–1232 standards) are authorized for use for their full service life. This proposal provided tank car owners and rail carriers with the opportunity to make operational changes that focus on the greatest risks and minimize the associated cost impacts. In response to the proposed amendments regarding the retrofit timeline, we received a variety of comments representing differing viewpoints.

Harmonization

Commenters state that it is essential that the U.S. position on retrofit timelines is consistent with Canada's. PHMSA has been in close coordination with Transport Canada to ensure the seamless transition with regard to the retrofit of the existing North American DOT Specification 111 fleets. To that end, PHMSA recognizes the importance of harmonization and does not foresee any issues at this time with cross-border retrofit implementation timelines.

Retrofit Capacity

The capability of the industry to handle retrofit tasks and requirements within the proposed timeline was a topic of great interest among commenters. Many questioned PHMSA and FRA's assumptions regarding the retrofit capacity of the industry. The comments summarized and discussed below provide an indication as to the commenters' main concerns on this topic.

The Grain Processing Corporation requests that, ''when setting the timeline for compliance, please work closely with car builders to have an accurate understanding of when new cars can reasonably be made available to the market.'' This commenter further stated, ''current conditions indicate that it will take much more than three to five years to replace non-compliant cars in the market.''

The American Chemistry Council (ACC) stated that tank car shop capacity will not support PHMSA's regulatory timeline and some ACC members have reported waits of approximately two years from when a tank car is ordered until the time it was delivered. The ACC also relayed RSI information stating that the current order backlog is about 53,000 cars.''

The Dakota Gasification Company asserts that:

> PHMSA should consider how an influx of a very large number of DOT 111 cars for retrofit in a market already seeing backlogs for routine maintenance work will permit shippers to meet the proposed timelines in the rule. The rulemaking states there are 80,500 DOT 111 cars and 17,300 CPC 1232 cars in Flammable Service or a total of 97,800 cars potentially in need of some form of retrofit. A record number of tank cars have been produced the past few years. Retrofitting this number of cars while keeping up with yearly maintenance and standard repairs will be unattainable within the proposed timeframe given the current shop system.

In addition a report commissioned by RSI and authored by The Brattle Group noted that there could be considerable issues with a five year retrofit standard when considering production levels, fleet size and the predicted growth of both.[53] A similar report commissioned by API and authored by ICF International noted similar concerns.[54] API also expressed concerns about shop capacity, the current backlog of car orders, and engineering capacity. Both the RSI and the API reports are extensively discussed in the final RIA but it should be noted that both these reports based their findings on the NPRM's five-year retrofit schedule which has since been revised. Regardless, based on the comments received, PHMSA and FRA have modified our analysis and revised the final RIA to account for changes in retrofit capacity.

[53] See *http://www.regulations.gov/#!documentDetail;D=PHMSA-2012-0082-3415*

[54] See *http://www.regulations.gov/#!documentDetail;D=PHMSA-2012-0082-3418*

Retrofit Timeline (Length and Approach)

Overall, commenters agree that retrofits must occur, but the suggested timelines range from zero to ten years. In addition, RSI and API commissioned separate reports that evaluated the NPRM's proposed timeline and demonstrated the potential detrimental effects of an overly aggressive timeline. PHMSA has summarized and discussed the differing viewpoints on the retrofit schedule.

Generally, the comments of citizens, environmental groups, tribal communities and local government either supported the timeline as proposed in the NPRM or focused on an even more aggressive timeline than proposed. Some commenters even suggested the immediate ban of DOT 111 Specification tank cars. For example, two tribal communities, the Quinault Indian Nation and the Prairie Island Indian Community, represented the views of many citizens, environmental groups when they stressed the need for an immediate and ''total phase-out of the DOT 111.'' Amtrak encourages PHMSA to require the use of the selected option on as aggressive a schedule as manufacturing and retrofit capabilities permit.

As demonstrated in the final RIA, PHMSA and FRA do not believe a more aggressive timeline than what was proposed in the NPRM is achievable or prudent. In fact, an overly aggressive timeline could have a negative impact on safety or the environment. See the environmental assessment for this rulemaking.

The comments of the regulated industry regarding the implementation timeline varied, but a general consensus for a ten-year time frame emerged. The regulated community was generally consistent in noting that the timeline should account for both the tank car type and the packing group of the material.

In addition to comments on the timeline, PHMSA and FRA received many comments on our packing group based approach. Specifically, many in the regulated community noted that while the proposed method is risk based, it only accounts for the risk of the material itself and not the risks posed by the various types of tank cars used in HHFTs. The general consensus was that a retrofit timeline that accounted for the type of tank car would provide the greatest risk reduction in the shortest amount of time. Below are some relevant comments regarding the proposed timeline.

GBW suggested that, ''[w]hile the timeline [for retrofitting] is aggressive, the tank car repair industry, by expanded [sic] capacity at existing facilities and through new entrants into the industry, should be able to meet PHMSA's proposed timeline.''

Further, RSI–CTC stated that PHMSA and FRA should retrofit crude oil and ethanol tank cars first then other Class 3 tank cars. It noted that retrofit capacity is only 6,400 units per year whereas PHMSA assumes 22,061 units per year. RSI–CTC continues, ''there are 50K non-jacketed tank cars in service (23K crude and 27K ethanol/legacy and CPC 1232) that cannot be retrofitted by 10/01/2017—only 15K can be retrofitted by that time.''

Growth Energy requested a 3- to 10-year retrofit schedule. Arkema Inc., ''agrees with the RSI–CTC's December 5, 2013 recommendation to adopt, at a minimum, a 10-year program allowing compliance to be achieved in phases through modification, re-purposing or retirement of unmodified tank cars in Class 3, flammable liquid service.''

Quantum Energy, Inc. stated, if PHMSA elects not to adopt this exclusion for treated crude oil that they support ''at minimum establishing a phase-out date of October 1, 2022 for the use of DOT–111 tank cars in transporting stabilized crude oil.''

The Washington Utilities and Transportation Commission (WUTC) stated that tank cars that meet the AAR CPC–1232 standards and were built after October 1, 2011, should be allowed to continue in service for their economic life, except for the transportation of Packing Group I materials past October 1, 2016. Further, WUTU recommends that the proposed timeline for phasing out DOT Specification 111 tank cars should be expedited for Packing Group I and II materials by a year, and that all existing tank cars more than 10 years old have a thorough tank shell thickness inspection to ensure the tank is suitable for PG II and PG III, Class 3 flammable liquids. Any tank that shows significant signs of corrosion should be taken out of crude, ethanol, and any other Packing Group I or II service immediately.

Suggesting an alternate retrofit strategy, Eighty-Eight Oil, LLC stated, ''Eighty-Eight supports a 7 year retrofit schedule.'' According to Eighty Eight, the requirements for retrofitting cars will necessitate a longer time frame than proposed in the NPRM, given: the ''car cleaning'' process and preparation for ''hot work'' or retrofitting; training workers for tank car repair work; approval (via the AAR) of high-flow pressure relief valve technology; and the enabling of the production of full height head shields within repair shops.

In addition to these comments, RSI–CTC, API, Exxon, APFM and many others in the regulated industry provided specific alternative retrofit timelines which can be viewed in the docket for this rulemaking. PHMSA and FRA reviewed comments, alternative timelines, and data regarding the retrofit timeline and revised our implementation schedule accordingly. PHMSA is confident that retrofits can be accomplished in the revised timeline adopted in this final rule.

In developing the retrofit schedule, PHMSA and FRA examined the available shop capacity, the comments received, historical performance of the rail industry dealing with retrofit requirements, and the potential impacts associated with the retrofit schedule.

PHMSA has accepted feedback regarding its assumption of no retirements and the impracticality of transferring jacketed tank cars to tar sands service. This final rule and the RIA now consider the number of cars that could be retired early as a result of the rule and the associated costs of doing so. PHMSA believes that rail cars will be retired early when their owners have weighed the cost of meeting retrofit requirements against the marginal cost of acquiring a replacement rail car early.

Further, to aid in the analysis of an appropriate retrofit timeline, FRA developed a model to project the tank car retrofit capacity over time. The model is based on Wright's learning curve theory, which suggests that every time the total number of units that have been produced doubles, productivity will increase by a given percentage. This percentage is known as the learning rate.

The starting point of the analysis was to analyze the rail industry's forecast, as represented in the Brattle Group Report commissioned by RSI–CTC. Using the Brattle reports figure of 6,400 retrofits per year the FRA model was able to determine that the Brattle report would have to assume 40 facilities would be required to dedicate one crew to retrofits. After making this determination on the number of facilities, FRA sought to include other variables to model additional potential scenarios. The intent being to depict the extent to which the ''heavy retrofit'' [55] capacity will increase to a degree over time. The variables for the FRA model included the learning rate, number of crews, and number of facilities. In the model, the values for these variables are: a learning rate of .95 (which is relatively low for similar industries) [56], one crew (initially) per facility, and 40 facilities.[57] Using these values as the starting point, a parametric analysis was performed to show the values required to meet the industry forecasted production.

To determine the capacity of the industry, FRA used facility registration data to identify 60 current tank car facilities capable of performing heavy retrofits. Further, FRA identified 160 tank car facilities capable of performing light modifications, which include adding a valve and bottom outlet to the jacketed CPC–1232 cars. FRA also accounts for industry concerns regarding the readiness of current tank car facilities to perform retrofit services by maintaining the ramp-up period provided by commenters. In addition to the existing capacity, FRA's model assumes that capacity will increase to a degree over time.

FRA's model indicates the 6,400 retrofits per year would require 40 facilities to dedicate one crew to these retrofits. As a result, the remaining capacity (60 total facilities identified by FRA) would focus on the normal workload including requalifications, bad order repairs, and reassignments. As a result, FRA's model assumes:

- 40 facilities capable of heavy retrofits. FRA selected this number as a conservative estimate—in reality the number of facilities dedicated to heavy retrofits may be higher. It accounts for industry concerns regarding the readiness of current tank car facilities to perform retrofit services;
- A new crew (2 employees) will be added to each facility every 3 months, beginning in month 4;
- After 24 months, no additional resources are added; the only changes in capacity are based on the Wrights learning curve theory,[58]
- The learning rate is 0.95; and
- The learning rate is for the facility, not individuals. It is assumed the crew members all have the required skill set to perform the work.

In support of these assumptions, Figure 2 indicates the cumulative

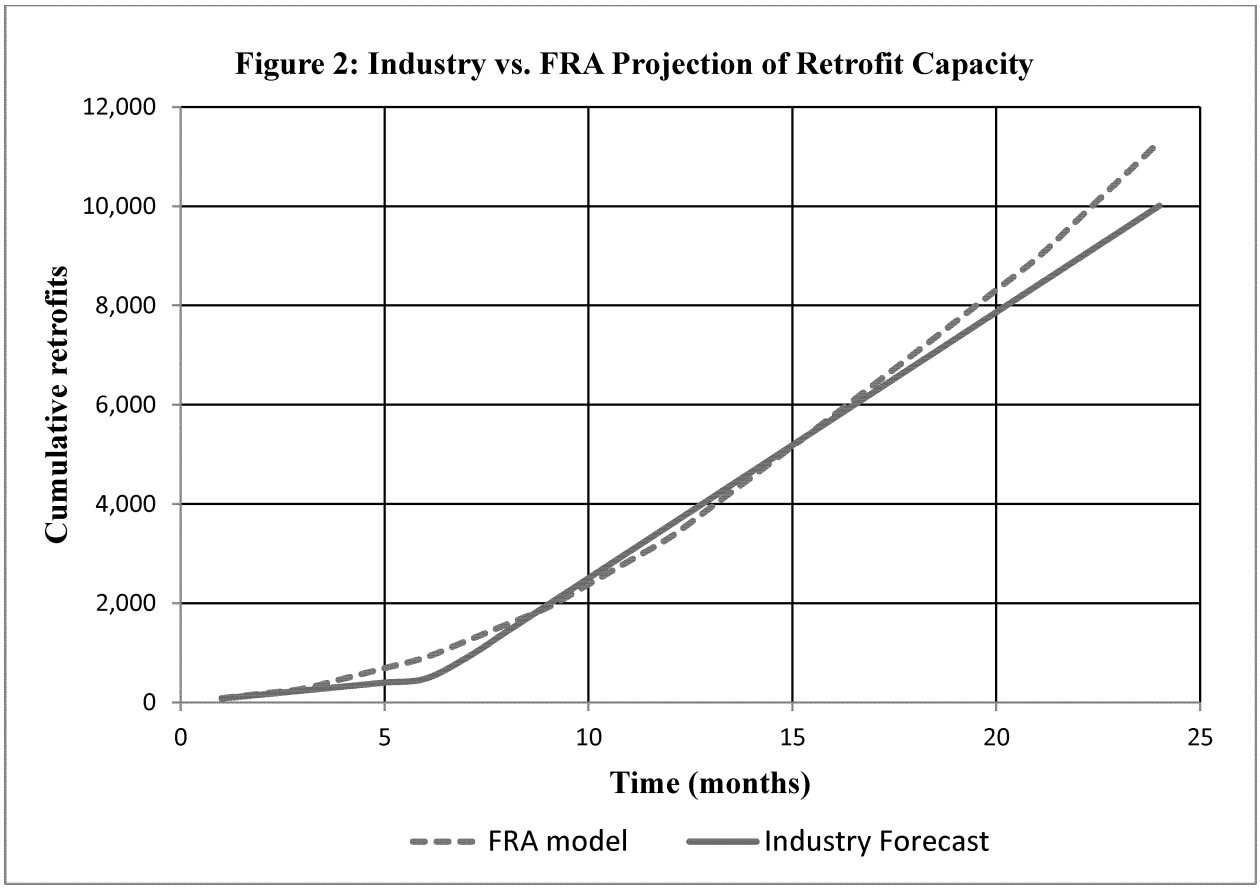
[55] Heavy retrofits include those that go beyond simply adding a valve and bottom outlet to the jacketed CPC–1232 cars.

[56] Represents a 5 percent rate of improvement. See *http://www.fas.org/news/reference/calc/learn.htm.*

[57] The variable of 40 facilities is a result of a parametric analysis. FRA also ran the model with 80, 60, and 40 facilities and 40 enabled us to recreate industry's production forecast.

[58] Every time production doubles the required resources and time, decrease by a given percentage, known as the learning rate. The learning rate for repetitive welding operations is 95 percent, meaning that when production doubles, the required resources and time are multiplied by 0.95.

production schedule for industry's model (based on The Brattle Group report), as well as FRA's model. Based on these assumptions, the FRA model indicates that a heavy retrofit capacity exceeding the industry's projection is achievable.



The most extensive retrofits (the ''heavy retrofits'') would need to take place in the initial phases of the implementation timeline, thus making these stages critical to the overall implementation timeline. Stakeholders generally agree that a 120-month timeline for light retrofits is acceptable.

Conclusion

In the NPRM the retrofit timeline was based on a single risk factor, the packing group. The packing group is a characteristic of the hazardous material. In the final rule the retrofit timeline was revised to focus on two risk factors, the packing group of the material and differing types of DOT–111 and CPC–1232 tank cars. By adding the additional risk factor, tank car type, we were able to not only account for the characteristics of the hazardous material but also those of the means of containment of that material. This revision as well as the outputs of FRA model discussed above provided an accelerated risk reduction that more appropriately addresses the overall risk. PHMSA and FRA also modified the overall length of the retrofit to account for issues raised by commenters. The rationale for the change in retrofit schedule is discussed in further detail in the RIA for this final rule.

Based on the commenters' input and additional analysis, in this final rule, PHMSA and FRA are adopting a packing group- and tank car-based implementation timeline for the retrofit of existing tank cars to the NPRM's Option 3 standard when used as part of HHFT. This risk-based retrofit schedule will be codified in authorized packaging section in part 173, subpart F of HMR and the prescriptive retrofit standard is detailed in *§ 179.202–13.* This timeline is based on public comment, the FRA modeling output and historical performance of the rail industry dealing with retrofit requirements. This timeline accounts for an initial ramp-up period as well as incremental improvements based on a learning curve throughout the implementation timeline. The implementation timeline adopted is outlined in the following table:

TABLE 21—TIMELINE FOR CONTINUED USE OF DOT SPECIFICATION 111 (DOT–111)

[Tanks for Use in HHFTs]

Tank car type/service	Retrofit deadline
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.

TABLE 21—TIMELINE FOR CONTINUED USE OF DOT SPECIFICATION 111 (DOT–111)—Continued

[Tanks for Use in HHFTs]

Tank car type/service	Retrofit deadline
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 date would trigger a retrofit reporting requirement, and tank car owners of affected cars would have to report to DOT the number of tank cars that they own that have been retrofitted, and the number that have not yet been retrofitted.

**We anticipate these will be spread out throughout the 120 months and the retrofits will take place during normal requalification and maintenance schedule, which will likely result in fleet being retrofit sooner.

Executive Orders 12866, 13563, and 13610 require agencies to provide a meaningful opportunity for public participation. Accordingly, PHMSA invited public comment twice (the September 6, 2013, ANPRM and August 1, 2014, NPRM) on retrofit timeline considerations, including any cost or benefit figures or other factors, alternative approaches, and relevant scientific, technical and economic data. Such comments aided PHMSA and FRA in the evaluation of the proposed requirements. PHMSA and FRA have since revised our proposed retrofit timelines to address the public comments received.

PHMSA and FRA have made regulatory decisions within this final rule based upon the best currently available data and information. PHMSA and FRA are confident that retrofits can be accomplished in the revised timeline adopted in this final rule. However, PHMSA and FRA will continue to gather and analyze additional data. Executive Order 13610 urges agencies to conduct retrospective analyses of existing rules to examine whether they remain justified and whether they should be modified or streamlined in light of changed circumstances, including the rise of new technologies. Consistent with its obligations under E.O. 13610, *Identifying and Reducing Regulatory Burdens,* PHMSA and FRA will retrospectively review all relevant provisions in this final rule, including industry progress toward meeting the established retrofit timeline.

To this end, the first phase of the timeline includes a January 1, 2017 deadline for retrofitting non-jacketed DOT–111 tank cars in PG I service. If the affected industry is unable to meet the January 1, 2017 retrofit deadline a mandatory reporting requirement would be triggered. This reporting requirement would require owners of non-jacketed DOT–111 tank cars in PG I service to report to Department of Transportation the following information regarding the retrofitting progress:

- The total number of tank cars retrofitted to meet the DOT–117R specification;
- The total number of tank cars built or retrofitted to meet the DOT–117P specification;
- The total number of DOT–111 tank cars (including those built to CPC–1232 industry standard) that have not been modified;
- The total number of tank cars built to meet the DOT–117 specification; and
- The total number of tank cars built or retrofitted to a DOT–117, 117R or 117P specification that are ECP brake ready or ECP brake equipped.

While this requirement applies to any owner of non-jacketed DOT–111 tank cars in PG I service, the Department of Transportation would accept a consolidated report from a group representing the affected industries. Furthermore, while not adhering to the January 1, 2017 retrofit deadline triggers an initial reporting requirement, it would also trigger a requirement which would allow the Secretary of Transportation to request additional reports of the above information with reasonable notice.

C. Speed Restrictions

Speed is a factor that contributes to derailments. Speed can influence the probability of an accident, as it may allow for a brake application to stop the train before a collision. Speed also increases the kinetic energy of a train resulting in a greater possibility of the tank cars being punctured in the event of a derailment. The kinetic energy of an object is the energy that it possesses due to its motion. It is defined as the work needed to accelerate or decelerate a body of a given mass.

$Kinetic\ Energy = \frac{1}{2}\ (Mass) \times (Velocity)^2$

Based on this calculation, given a fixed mass, if an accident occurred at 40 mph instead of 50 mph, we should expect a reduction of kinetic energy of 36 percent. After consultations with engineers and subject matter experts, we can assume that this would translate to the severity of an accident being reduced by 36%. A slower speed may also allow a locomotive engineer to identify a safety problem ahead and stop the train before an accident occurs, which could lead to accident prevention.

A purpose built model developed for FRA by Sharma and Associates, Inc. was used to simulate a number of derailment scenarios to evaluate the survivability of the tank cars proposed in the NPRM equipped with different brake systems and operating a range of speeds. The results of the simulations were the most probable number of tank cars derailed and punctured. The results were used to calculate the effectiveness of the tank car enhancements, speed reduction and brake systems individually in in combination with one or both of the other parameters. The model and simulation are discussed in detail in the March 2015 letter report prepared by Sharma and Associates, Inc. This letter report is available in the docket for this rulemaking.

As tank car enhancements, brake systems, and speed are interrelated aspects of this rulemaking and can have an effect on each other, various combinations of these variables were evaluated by FRA modeling. For example, by modifying the variables of speed (30 mph-50 mph), tank car enhancements (shell thickness, steel type, jacketing and head shielding), and braking (TWEOT, DP and ECP), FRA was able to create a matrix which could compare the effectiveness and benefits of numerous combinations of these variables. The table below describes the speeds that were evaluated with the various combinations of tank car enhancements and braking systems.

TABLE 22—SPEEDS EVALUATED IN THE FRA'S PURPOSE BUILT MODEL

Speeds evaluated	Description
50 mph	Proposed maximum speed.
40 mph	Proposed maximum speed in High-Threat Urban Areas.

TABLE 22—SPEEDS EVALUATED IN THE FRA'S PURPOSE BUILT MODEL—Continued

Speeds evaluated	Description
30 mph	Speed in the range at which most of derailments under consideration in this rulemaking occurred.

Given the data from FRA and Sharma & Associates, PHMSA anticipates the reductions in the speed of trains that employ less safe tank cars, such as the non-jacketed DOT–111 tank car, will prevent fatalities and injuries and limit the amount of damages to property and the environment in an accident. Simulation results indicate that limited safety benefits would be realized from a reduction in speed as the tank car fleet is enhanced as proposed in this NPRM. Please refer to the RIA for a detailed analysis of the impact of speed on the number of cars derailed and punctured when paired with a range of tank car enhancements and braking options.

In response to the Secretary Foxx's *Call to Action,* the rail and crude oil industries agreed to consider voluntary operational improvements, including speed restrictions in high consequence areas. As a result of those efforts, railroads began operating certain trains at 40 mph on July 1, 2014. This voluntary restriction applies to any ''Key Crude Oil Train'' with at least one non-CPC 1232 tank car or one non-DOT specification tank car while that train travels within the limits of any high-threat urban area (HTUA) as defined by 49 CFR 1580.3.

In the August 1, 2014, NPRM, PHMSA and FRA proposed to add a new § 174.310 to include certain operational requirements for a HHFT. Among those operational requirements was a proposal to limit the speed of an HHFT. Specifically, the NPRM proposed to add a new § 174.310 to Part 174—Carriage by Rail that would establish a 50-mph maximum speed restriction for HHFTs. This 50-mph maximum speed restriction for HHFTs was generally consistent with the speed restrictions that the AAR issued in Circular No. OT–55–N on August 5, 2013.

In § 174.310(a)(3), PHMSA also proposed three options for a 40-mph speed restriction for any HHFT unless all tank cars containing Class 3 flammable liquids meet or exceed the proposed standards for the DOT Specification 117 tank car. The three 40-mph speed limit options are as follows:

Option 1: 40-mph Speed Limit in All Areas

All HHFTs are limited to a maximum speed of 40 mph, unless all tank cars containing flammable liquids meet or exceed the proposed performance standards for the DOT Specification 117 tank car.

Option 2: 40-mph Speed Limit in Areas With More Than 100,000 People

All HHFTs—unless all tank cars containing flammable liquids meet or exceed the proposed standards for the DOT Specification 117 tank car—are limited to a maximum speed of 40 mph while operating in an area that has a population of more than 100,000 people.

Option 3: 40-mph Speed Limit in High-Threat Urban Areas (HTUAs)

All HHFTs—unless all tank cars containing flammable liquids meet or exceed the proposed standards for the DOT Specification 117 tank car—are limited to a maximum speed of 40 mph while the train travels within the geographical limits of HTUAs.

In addition, PHMSA proposed to add a new § 174.310(a)(3)(iv) to Part 174—Carriage by Rail that would prohibit a rail carrier from operating HHFTs at speeds exceeding 30 mph if the rail carrier does not comply with the proposed braking requirements set forth in the Advanced Brake Signal Propagation Systems section of the NPRM. The intention of this requirement was to further reduce risks through speed restrictions and encourage adoption of newer braking technology while simultaneously reducing the burden on small rail carriers that may not have the capital available to install new braking systems.

On the issue of speed restrictions, PHMSA received public comments representing approximately 90,821 signatories. Comments in response to the NPRM's speed restrictions were wide ranging, with comments both supporting and opposing speed restrictions. Some commenters supported the speed restrictions explicitly as they were proposed in the NPRM. Other commenters opposed the NPRM's speed restrictions and proposed alternatives, such as different speed limits or different geographical standards for use in determining where a speed limit is applicable. Further, many commenters did not directly support or oppose any of the proposed speed restrictions, but rather chose to comment generally. Below is a table detailing the types and amounts of commenters on the speed proposals.

TABLE 23—COMMENTER COMPOSITION: SPEED COMMENTS

Commenter type	Signatories
Non-Government Organization	85,023
Individuals	5,475
Industry stakeholders	265
Government organizations or representatives	58
Totals	90,821

Overall, the comments of citizens, environmental groups, tribal communities and local government representatives supported more restrictive speed limits. These comments were essentially focused on how speed restrictions would provide safety benefits to local communities or the environment. Referencing data from the NPRM, these groups expressed concerns that derailments and releases of crude oil and ethanol present public safety risks and have occurred at lower speeds than the speed limits proposed in NPRM. Environmental groups and affiliated signatories, in particular, voiced concerns that releases of hazardous materials in derailments could have far-reaching adverse impacts on environmental quality, including water quality and biological diversity. Some commenters asked PHMSA to consider making the proposed speed restrictions applicable to specific environmental areas, such as in the vicinity of water resources or national parks. In illustration of these viewpoints, Clean Water Action has stated:

> The agencies' promotion of a 40 miles per hour speed, when in fact nine of the major 13 train accidents (Table 3 of the NPRM) occurred with speeds under 40 miles per hour does not seem justified nor is it in the public interest. Fire resulted in 10 of the 13 accidents, three of which were involved in speeds over 40 miles per hour and five of which were between 30 miles per hour and 40 miles per hour. The 6 accidents involving crude oil resulted in over 1.2 million gallons of oil being spilled [. . .] Clean Water Action encourages the agency to analyze reducing travel speeds to 30 mph and lower. [. . .] Clean Water Action respectfully encourages the agency to examine additional speed restrictions in areas near public drinking water supplies and sensitive environments.

Three entities representing tribal communities, the Tulalip Tribes, the Prairie Island Indian Community and the Quinault Indian Nation, expressed specific concerns with regard to the speed restrictions proposed in the August 1, 2014, NPRM. The Tulalip Tribes noted that ''[t]he maximum speed limit for the trains should not be higher than the maximum speed the rail cars

can survive in the case of an accident. Only lowering the speeds to 40 miles per hour is inadequate to protect life and property.'' The Prairie Island Indian Community supported this viewpoint and expressed concern noting the proximity of a crude oil route to their primary residential area and gaming enterprise. They continued that they ''would like to see the non-enhanced HHFT trains slowed down even further, to 30 miles per hour through residential areas or through areas with critical or sensitive infrastructure (like nuclear power plants).'' Finally, the Quinault Indian Nation conveyed their support of a 40-mph restriction in all areas with further research being completed on the benefits of a 30-mph restriction in all areas.

In addition, some individual citizens, environmental groups, and local communities expressed concern that speed restrictions might protect some cities and towns while potentially leaving others exposed to safety risks. Consequently, many individual citizens, environmental groups, and local government representatives supported Option 1, the 40-mph speed limit for HHFTs in all areas, or proposed an alternative lower speed limit to be applied as a nation-wide speed limit. These commenters did not address for the costs of implementing Option 1; rather, they emphasized that Option 1's geographical standard (''all areas'') is the most protective, and most beneficial, of the three speed options proposed and would benefit all communities, large and small. As Earthjustice, Forest Ethics, Sierra Club, et al. have expressed:

> Imposing a 40 m.p.h. speed limit only in the largest cities or 'high-threat urban areas' would be far less protective of the public than requiring safer speed limits in all populated and sensitive areas. First, the option that would focus speed restrictions on areas with more than 100,000 people excludes far too many populated areas that [are] in harm's way. For example, many U.S. cities that have experienced dangerous and potentially deadly HHFT derailments would not be covered by safer speed limits using this threshold, including Lynchburg, Virginia (78,000 people); Painesville, Ohio (20,000 people); and Vandergrift, PA (5,000 people).

Comments from rail network users and operators generally supported less restrictive speed limits. They were essentially concerned with the cost impacts of the proposed speed restrictions. In illustration of these potential cost impacts, the rail network users and operators provided some industry-specific data and analysis on the detrimental effects to network fluidity and the additional costs that would result from the proposed speed restrictions. Overall, these commenters and other stakeholders stated that speed restrictions would lead to: (1) Increased congestion; (2) slower or less predictable delivery times for various products, including crude oil, ethanol, and agricultural commodities; (3) increases in the number of tank cars required to ensure consistent timely delivery service due to increases in transit times; (4) increased costs to shippers and carriers; (5) constrained investments in the rail network's infrastructure and capacity due to reduced rail carrier revenues; (6) diversions of crude oil and ethanol transport to other modes of transport; and (7) slower passenger or commuter rail service.

Several commenters stated that the proposed speed restrictions would result in additional congestion. These commenters emphasized that the rail network is already congested and has ''fluidity'' issues. Dow and the DGAC suggested that the proposed speed restrictions could inadvertently increase the risk of incidents due to congestion. According to multiple commenters, increased congestion and subsequent reductions in network fluidity could ''ripple'' across the rail network and would affect various commodities that are transported by rail, not just crude oil and ethanol.

PHMSA received comments from a coalition of agri-business organizations that have been affected by ''service disruptions'' and ''severe backlogs,'' including the Agricultural Retailers Association, National Corn Growers Association, U.S. Dry Bean Council, and various state associations. According to these commenters, the agricultural sector has succeeded at producing agricultural commodities, such as grain and oilseed, at ''record or near-record'' levels, but faces difficulty in making timely deliveries due to increased demand for freight rail service. This increased demand is due in part to ''non-agricultural segments of the U.S. economy,'' such as crude oil production, and has caused a relative scarcity of rail service supply and competition among shippers seeking to use rail transport. These commenters have stated that the NPRM's proposed speed restrictions would further strain the transport of commodities.

Affirming these commenters' concerns, the Energy Information Administration (EIA) has stated that rail traffic has increased by 4.5 percent from January through October 2014 compared to the same period in 2013. Over the same period, carloads of crude oil and petroleum products have increased 13 percent, and these shipments of crude oil and petroleum are occurring in the parts of the U.S. where there is also strong demand to move coal and grain by rail.[59] Along with crude oil shippers, shippers of coal, grain, ethanol, and propane have expressed concerns that rail service has been slow.

In response to these congestion issues, the Surface Transportation Board (STB) called hearings in April and September 2014 to address rail ''service problems,'' and in October, STB required ''weekly data reports'' from all Class I railroads.[60] [61] The EIA information and the STB's actions appear to reflect the commenters' concerns regarding the current rail transportation environment, characterized by increased demand, rail service issues, and competition among shippers of different commodities for the available rail service supply.

Among the proposed speed restrictions, many rail users and operators and other stakeholders have expressed that Option 1—a 40-mph speed limit for HHFTs in all areas—would have the greatest negative impact on network fluidity. The Independent Petroleum Association of America (IPAA) and the North Dakota Petroleum Council (NDPC) delineated how Option 1, in particular, would create a chain of effects in the rail network and increase costs to shippers or carriers:

> The consequences of the proposed 40-mph speed restriction in all areas would be significantly longer turnaround times for unit trains, thus necessitating the need to have more railcars in the shipping fleet. Longer turnaround times alone will make railcars in short supply on the first day the new rule takes effect. A 10-mph reduction in speed equates to a twenty percent increase in turnaround time (assuming 50 mph average train speed), requiring a twenty percent increase in fleet size.

Other commenters have described how transit times and costs to shippers and carriers would increase. The Alaska Railroad Corporation stated that a common route from Anchorage to Fairbanks, Alaska, would ''take an extra 69 minutes'' with a maximum speed of 40 mph. Bridger has stated that ''an increase in round-trip transit time for Bridger's unit trains from North Dakota to the East Coast from 15 days to 20

[59] *https://www.aar.org/newsandevents/Freight-Rail-Traffic/Documents/2014-11-06-railtraffic.pdf*

[60] STB News Releases. Available online at: *http://www.stb.dot.gov/newsrels.nsf/13c1d2f25165911f8525687a00678fa7/b9b95d1200b9d81985257cad006a133a?OpenDocument* and *http://www.stb.dot.gov/newsrels.nsf/13c1d2f25165911f8525687a00678fa7/037f6ab62281bba985257d380068208a?OpenDocument*

[61] STB Decision Document. Available online at: *http://www.stb.dot.gov/decisions/readingroom.nsf/WebDecisionID/43850?OpenDocument*

days will increase the cost per barrel [. . .] by 33%.'' In addition to impacting rail carriers and oil and gas producers, the proposed speed restrictions could impact a wide variety of shippers. The Council on Safe Transportation of Hazardous Articles (COSTHA) relayed that one of its members, a large manufacturer and distributor of consumer products, estimated increased costs of $80 million annually to its operations alone due to the proposed speed restrictions.

Rail users and operators predicted that the proposed speed restrictions would constrain their ability to invest in the rail network's infrastructure (*i.e.* add capacity) at a time when capacity is already stressed. Adding capacity would be one way in which the railroads might seek to counteract the potential network fluidity impacts resulting from the proposed speed restrictions. Union Pacific Railroad Company has stated that investments to expand capacity are risky, expansions require 2–3 years or more to complete, and the decision to invest depends significantly on the ''ability to generate returns at reinvestible levels.'' Thus, if the proposed speed restrictions have a significant impact on revenues or returns, railroads have implied that they might not be capable of investing in the rail network's infrastructure at a rate that sufficiently addresses recently increased demand for rail transport. Railroads have also stated that they have been investing greatly in the rail network's infrastructure, but the costs of adding capacity have increased in recent years. Thus, according to the railroads, the proposed speed limits would increase costs in a business environment that is already characterized by increasing costs, which stresses the railroad's ability to make new capital investments and add capacity.

Rail users and operators and other stakeholders have projected that reduced network fluidity due to speed restrictions could result in rail-to-highway diversions or other modal shifts. As the American Association of Private Rail Car Owners (AAPRCO) commented, ''Since the railroad network is already near or over capacity in many places, and consists overwhelmingly of single and double-track lines, widespread, new speed restrictions would have a major impact [...]. The impact in some cases could be diversion of freight to less-safe highways.'' Commenters have stated, if the proposed speed restrictions were to negatively influence rail network fluidity, some crude oil and ethanol transport by rail would be diverted to highway transport, and this would expose users of the nation's highways to increased flammable cargos transported by trucks.

Rail users and operators have stated that the proposed speed restrictions and subsequent reductions in network fluidity would have adverse effects on passenger or commuter rail, and they state that network fluidity is already stressed for these types of rail. The National Railroad Passenger Corporation (Amtrak) has commented:

> Amtrak believes that any significant slowing of the general railroad system could have an adverse effect on the performance of intercity passenger rail service, which has already been slowed by the recent increase of freight traffic, including the increase in the number of Key Crude Oil Trains.

Similarly, the Sao Joaquin Partnership has contextualized this effect for commuters, stating:

> Overly restrictive speeds will reduce the fluidity of the rail network and may reduce rail capacity for both people and freight. Passenger rail service via ACE Train carries over 1 million riders from Stockton to San Jose each year servicing major technology employers in Silicon Valley providing high wage opportunities for San Joaquin residents. Slowing freight will delay transit along this important trade rail corridor.

Thus, if the proposed speed restrictions affect the performance of commuter trains, adverse impacts on labor output might also occur.

Regarding industry data or projections, PHMSA often times could not corroborate the data provided by industry stakeholders. Some commenters did not supply data, while others supplied only limited data. PHMSA made efforts to acquire and analyze different data that was required for the RIA and the rulemaking's decision-making process.

Despite having voiced some cautions about speed restrictions, some rail network users and operators expressed their support for the voluntary speed restrictions that were agreed upon by industry members as a result of Secretary Foxx's *Call to Action* and subsequent *Letter to the Association of American Railroads* published on February 21, 2014.[62] These voluntary speed restrictions are generally consistent with the proposed 50-mph maximum speed limit and Option 3, the 40-mph speed limit in HTUAs. Notably, Option 3 had substantial support among the rail network users and operators and related trade associations. Some commenters concluded that all proposed speed restrictions would have negative impacts on industry, but, if a speed restriction were to be implemented, Option 3 should be implemented as it would minimize these negative impacts.

Regarding Option 2, the 40-mph speed limit in areas with a population of 100,000 or more, commenters raised additional concerns. One commenter stated that the risk to a population from a train accident depends less on the size of the population in a given area than on the proximity of that population to the railway. Thus, Option 2 might not accurately address the true number of people threatened by railway accidents. The Kansas City Southern Railway Company stated that the term ''area'' is ''unacceptably vague,'' and Option 2 is therefore ''unworkable.'' This concern was echoed by other commenters.

Some commenters expressed that Option 2 would also adversely impact network fluidity. While significantly less restrictive in a geographical sense than Option 1, some commenters, such as Amsted Rail and the National Shippers Strategic Transportation Council, still considered Option 2 to be overly restrictive or costly.

Some commenters considered Option 2 to be an acceptable ''compromise'' between competing concerns for the efficiency of the rail transportation system and enhanced safety. According to the State of Minnesota:

> Option 1, a 40 MPH speed limit in all areas, would have extensive negative effects on the shipment capacity, reliability, cost, and overall system velocity for Minnesota and its market connections. Option 2, a 40 MPH limit in areas with more than 100,000 people, would be an acceptable limit for trains using tank cars not conforming with the improved performance specifications, and would put relatively limited strain on system velocity and capacity compared to Option 1. The cost benefit analysis supports this compromise order.

Nevertheless, relatively few commenters expressed support for Option 2 as proposed in the NPRM. Comparatively, there was much wider support for Option 1 and Option 3 as proposed in the NPRM, with different groups of commenters expressing their respective support for each.

Regarding the NPRM's 30-mph speed limit, some commenters were in support, echoing the rationale that reduced speeds enhance the safety profile of conventional braking systems. Other commenters thought that the 30-mph speed limit should be adopted, but asserted that it would be more appropriate to make it a requirement for all tank cars that did not meet or exceed the standards of Specification DOT–117. Different commenters asked that the

[62] Available online at: *http://www.dot.gov/briefing-room/letter-association-american-railroads*

tank cars without enhanced braking systems be required to travel at speeds under 30 mph, such as 20 mph or 18 mph. Multiple concerned citizens asked that a 30-mph speed limit be required for all HHFTs, irrespective of their braking systems.

Some commenters were opposed to the 30-mph speed limit. These commenters either opposed speed restrictions in general or they supported higher or less restrictive speed limits. For many rail users and operators and other stakeholders, the 30-mph speed limit appeared to be unnecessary in light of the 50-mph maximum speed limit and the 40-mph speed limit in HTUAs, which have already gained support as voluntary speed restrictions for certain tank cars transporting crude oil. Further, multiple commenters pointed out that some of the enhanced braking systems proposed in the NPRM—namely, two-way EOT devices and DP braking systems—are already widely adopted by industry. If two-way EOT devices and DP braking systems are already widely adopted, the 30-mph speed limit would not be generally applicable to HHFTs, unless the 30-mph speed limit also required HHFTs to equip and/or operate ECP braking systems. For more information regarding ECP braking systems, please see the Braking Section of the final rule.

In addition to the aforementioned comments, PHMSA received other comments in relation to speed restrictions. These comments have been grouped together where appropriate and paraphrased.

Response to Comments Related to Speed Restrictions

As a safety organization, PHMSA works to reduce the safety risks inherent in the transportation of hazardous materials in commerce by all modes of transportation, and in this rulemaking, has focused its efforts on the safety of the transportation of large quantities of Class 3 flammable liquids by rail. To demonstrate that speed restrictions relate directly to safety risks, PHMSA has provided data to demonstrate the relationship between speeds, kinetic energy, tank car punctures in a derailment, and subsequent releases of hazardous material into the environment (See RIA). As a result of the Sharma modeling, PHMSA agrees with the commenters' concerns that derailments and releases of hazardous material could have adverse impacts on public safety and the environment and has proposed to reduce safety risks through the implementation of speed restrictions.

In addition to demonstrating that its proposed speed restrictions will benefit public safety, PHMSA must evaluate the impact of its regulations on diverse stakeholders. In some cases, PHMSA is required by law to conduct and publish a cost/benefit analysis, among other legal requirements. Therefore, while some of the proposed speed restrictions are more restrictive and may lead to greater safety benefits than others, PHMSA must consider concurrently the cost of implementing each proposed speed restriction and evaluate the net effect on a diverse set of stakeholders. PHMSA must also consider the costs and benefits to the various stakeholders of alternatives. As such, the costs imposed on industry and society at large by the proposed speed restrictions are an important factor in our regulatory analysis and decision-making.

PHMSA believes that an overly restrictive speed limit would present costs that outweigh benefits, and this was echoed by many commenters. These commenters expressed the outlook that the proposed speed restrictions would present significant new costs, caused primarily by substantial negative effects on rail network fluidity. As a result of its understanding of commodity flows and rail network fluidity, PHMSA agrees that speed restrictions could result in: An increase in the number of tank cars needed to ensure consistent delivery service due to increases in transit or ''turn'' times; increased congestion; slower or less predictable delivery times for some products transported by rail, including crude oil, ethanol, and agricultural commodities; slower passenger or commuter rail service; and increased costs to shippers and carriers. Moreover, if an overly restrictive speed limit were codified in the final rule, the negative effect on network fluidity could become an indefinite burden on carriers, shippers, rail passengers, and other stakeholders, since adding capacity to the rail network would likely be costly, time-intensive, and in some cases not feasible.

Therefore, if the proposed speed restrictions were to significantly hinder rail network fluidity, PHMSA believes that some diversion of crude oil and ethanol transport to highways could occur. Given substantial rail-to-truck diversions, the proposed speed restrictions might also lead to increased safety risks in the wider transportation system, especially the highway transportation system, which could in turn result in increased highway accidents involving Class 3 flammable liquids and increased costs related to responding to or mitigating highway accidents. In other words, the proposed speed restrictions could shift safety risks from rail transportation to highway transportation. PHMSA has taken this into consideration and generally agrees with this line of reasoning as presented by commenters.

Many concerned citizens and local communities stated that rural areas or small towns should have the same speed restrictions and safety protections as highly populated areas. This is a valid statement, which PHMSA considered. However, in terms of potential injuries and fatalities, PHMSA believes that the damages from a derailment in a densely populated area are more likely to be catastrophic, than damages from a derailment in a less densely populated area. Further, the application of speed restrictions to densely populated areas is less costly because only a small portion of the rail network is located within the limits of these areas and railroad operating practices already account for other kinds of restrictions, *e.g.,* railway crossings and signals, in urban areas.

PHMSA determined that there is a trade-off between the safety benefits of the proposed speed restrictions and the costs incurred by rail network operators and users, including offerors, tank car manufacturers, tank car-related businesses, rail carriers, rail passengers, and consumers of products transported by rail. PHMSA found that the proposed speed restriction that offers the greatest safety benefits is also the most costly; conversely, the least costly speed restriction offers the least safety benefits.

To further refine this analysis, PHMSA has focused its attention on identifying the proposed speed restriction that confers the greatest amount of benefit per dollar of cost. PHMSA has determined that Option 3 confers the greatest amount of benefits per dollar of costs, which lends support for the implementation of a 40-mph speed limit in HTUAs. See the Final RIA for detailed cost and benefit figures.

Accordingly, PHMSA has decided not to apply the 40-mph speed limit to all areas (Option 1) because this would be overly restrictive and highly costly to a variety of stakeholders, and it confers the least benefits per dollar of costs. PHMSA has also taken into consideration the fact that Option 2 has a lower benefit-cost ratio than Option 3, which lends further support for Option 3 and raises concerns about Option 2.

Regarding Option 2, PHMSA agrees with some of the commenters' concerns and acknowledges some of the potential problems presented by Option 2's geographical standard, ''an area [. . .]

that has a population of more than 100,000 people.'' Specifically, PHMSA recognizes that the size of a population does not always relate to the proximity of a population to a potential railway accident. Proximity may be a better indicator of potential damages or harm in the event of a derailment. PHMSA also recognizes that the threshold of 100,000 people may present difficulties for purposes of compliance and enforcement. Further, PHMSA reiterates that the implementation of Option 2 would be more costly and confers fewer benefits per unit of costs than Option 3. This cost/benefit analysis, the problems presented regarding the geographical standard of Option 2, and the general lack of commenter support for Option 2 as proposed, have led PHMSA to not elect to codify Option 2 in the Final Rule.

Regarding Option 3, PHMSA believes that the implementation of Option 3 would yield significant safety benefits, especially in the nation's most populated areas where derailments are more likely to be catastrophic. PHMSA also believes that the costs of implementing Option 3 are justified. PHMSA is confident that the geographical standard, HTUAs, is practical and well-defined and thus, would be understood for compliance and enforcement purposes. Namely, the HTUA designation has been codified since 2008 in 49 CFR Section 1580.3. In addition, PHMSA recognizes the importance of industry cooperation to date on the issue of a 40-mph speed limit in HTUAs. For these reasons, PHMSA is electing to adopt Option 3, a 40-mph speed limit for HHFTs in HTUAs.

PHMSA must also conduct its final rulemaking with due consideration to the scope of its proposed rulemaking. Some of the commenters suggested alternative, more restrictive speed limits that were significantly lower than the speed limits proposed in the NPRM. These speed limits cannot be adopted because PHMSA must codify regulations in its Final Rule that are reasonably aligned with what PHMSA has proposed in previous stages of the rulemaking in order to afford the public and interested parties an opportunity to comment on the agency's proposed actions.

Other commenters suggested alternative lower speed limits that are approximate or comparable to the proposed speed restrictions. For example, the City of Chicago suggested a 35-mph speed limit in HTUAs. These alternative lower speed limits that were approximate or comparable to the speed restrictions proposed in the NPRM were duly considered, but PHMSA is not electing to adopt them. PHMSA was not provided with sufficient data to demonstrate concretely that any one alternative lower speed limit would be superior to the speed restrictions proposed in the NPRM. These commenters either did not disclose how a given damage reduction estimate was formulated, or their suggestion for an alternative speed limit lacked an empirical basis.

The BLET and other commenters have stated that additional accident modeling could be conducted at different speeds, such as 30 mph. PHMSA believes additional accident modeling could help determine if alternative lower speed limits would reduce the severity of an accident more effectively than the proposed speed restrictions. In response to this and other comments about the costs and benefit calculations related to speed, further modeling was conducted from speeds of 30 mph through 50 mph (See table 22).

In contrast to alternative lower or more restrictive speed limits, some commenters suggested a different, less restrictive alternative: PHMSA should not impose new speed restrictions at all. For example, Biggs Appraisal Service has stated, ''The railroads have speed limits on every section of track that they operate. [. . .] Why put additional restrictions on the railroads when they already have systems in place that work?'' Regarding this point, PHMSA recognizes that there are FRA regulations in place pertaining to speed restrictions and track classes, and some railroads have voluntarily chosen to implement speed restrictions. However, the FRA regulations relate to track classes and do not address the specific risks of HHFTs, and the voluntary speed restrictions in place do not carry the weight of law. PHMSA believes that the increased number of derailments and accidents in recent years has demonstrated that the speed limit systems in place require enhancements, such as the proposed speed restrictions. Accident modeling data has shown that reducing speeds from 50 mph to 40 mph is an effective way to reduce safety risks, namely the number of punctures that occur in a derailment. To implement no speed restriction at all would require a deliberate decision to forego certain safety benefits.

In the NPRM, PHMSA proposed an additional speed restriction of 30 mph for tank cars that are not equipped and operated with either a two-way EOT device or a DP system. Furthermore, the NPRM proposed requirements for certain tank cars to be equipped with ECP braking systems. These proposals and related comments are discussed in the ''Advanced Brake Signal Propagation'' section below.

Various commenters expressed concerns for the environment and thought speed restrictions should be applicable in environmentally sensitive areas, such as in the vicinity of water resources or navigable waterways. In response, PHMSA affirms that our organizational mission includes protecting the environment from the risks of transporting hazardous materials in commerce. PHMSA acknowledges the importance of environmental concerns and that speed restrictions may be an effective way to protect the environment from releases of hazardous material. Releases of hazardous materials in a derailment could have significant adverse impacts in these areas. Further, these areas might not be highly populated or part of a designated HTUA and consequently, might not be protected by the proposed speed restrictions.

Citizens Acting for Rail Safety (CARS) suggested using the Environmental Protection Agency (EPA)'s definition of ''environmentally sensitive areas'' or using a pipeline safety definition, which pertains to ''areas that are unusually sensitive to environmental damage.'' PHMSA believes these sources might provide a sound basis for defining an environmentally sensitive area, or similar areas, in order to extend the use of speed restrictions and offer specific protections to the environment. However, under 49 CFR 172.820, routing analyses are required of railroads carrying certain hazardous materials. The final rule will codify these same routing requirements for railroads transporting Class 3 flammable liquids in a HHFT. By performing a routing analysis, railroads transporting flammable liquids in a HHFT will be required by the HMR to consider, among other things, ''environmentally sensitive or significant areas,'' and they must base their routing selection on the analysis. PHMSA believes this is ultimately a more effective approach to reducing risks to environmentally sensitive areas than the promulgation of speed restrictions that are specific to those areas. Further, in the NPRM, PHMSA did not propose a definition for the designation of environmentally sensitive areas nor did it propose to base speed restrictions on environmental criteria. PHMSA believes it would be outside the scope of this rulemaking to require lower speeds in these areas.

PHMSA would like to respond to other comments related to speed restrictions enumerated below.

1. Speed Restrictions Should Be Harmonized

PHMSA has cooperated and will continue to cooperate with Transport Canada and other appropriate international bodies. PHMSA seeks to harmonize the proposed operational controls whenever it is feasible and justified. As of April 23, 2014, Canada issued an Emergency Directive that established a 50-mph maximum speed limit for certain trains carrying ''Dangerous Goods,'' which is comparable to the 50-mph maximum speed limit established through the cooperation of the Department and AAR. These actions demonstrate that PHMSA and Transport Canada have already achieved harmonization in some respects.

Nevertheless, speed restrictions do not necessarily need to be harmonized between Canada and the U.S. In the final rule, PHMSA is implementing a geographical standard for speed restrictions that is specific to U.S. geography. Also, train speeds can be adjusted fairly easily, and differences in speed limits between localities in the U.S. and Canada would not present an undue burden on locomotive operators. Harmonization of speed restrictions is not essential.

2. Speed Restrictions Should Only Apply to Tank Cars Carrying Certain Hazardous Material(s); or Alternatively, to the Rail Transport of All Hazardous Materials

PHMSA typically uses the hazardous materials classes (Hazard Classes 1 through 9) to distinguish the risks of different hazardous materials. In recent years, increased crude oil and ethanol production have presented increased risks to the rail transportation system, but other types of flammable liquids could present similar risks. By defining a HHFT as a train with a continuous block of 20 or more tank cars or a total of 35 or more tank cars containing a Class 3 flammable liquid, we address the specific risks of increasing crude oil and ethanol production while also anticipating the potential for future risks presented by the increased production or transport of other Class 3 flammable liquids.

PHMSA disagrees with commenters who suggested that the proposed speed restrictions only apply to crude oil, or alternatively, only to crude oil and ethanol. PHMSA believes that Class 3 flammable liquids present similar risks and as such, basing the proposed speed restrictions on a given hazardous material's classification as Class 3 would be a comprehensive and responsive approach to mitigate these risks.

Comments suggesting that proposed speed restrictions should apply to the transport of all hazardous materials by rail were considered. However, PHMSA did not propose this in the NPRM, and this suggestion cannot be adopted in the Final Rule due to concerns that it is not reasonably aligned with what has been proposed. Moreover, the operational controls addressed in this rule, including speed restrictions, are aimed at reducing the risk and consequences of incidents involving rail shipments of Class 3 flammable liquids. The analyses, data, and relevant factors considered in developing this rule are specific to these materials. Information has not been provided to support expanding these restrictions to all hazardous materials or to justify the associated negative impacts on rail fluidity and costs.

3. PHMSA Lacked Important Data That Could Be Used To Estimate Costs or Benefits Pertinent to Speed Restrictions and/or More Cost/Benefit Analysis Should Be Conducted

Various commenters have identified factors that contribute to costs or benefits that PHMSA has not included in its cost/benefit analysis. PHMSA published a Draft RIA alongside the proposed rule to address the requirements of Executive Order 12866, to explain the basis of its cost/benefit analysis, and also to encourage stakeholder discussion of cost/benefit analyses pertinent to this rulemaking. Since the NPRM, PHMSA has improved upon its cost/benefit analyses and has published a final regulatory impact analysis in conjunction with the final rule based on comments received and data provided.

4. Speed Limits Should Apply to Trains Consisting of ''Enhanced'' Tank Cars, as Well as to Trains With One or More Tank Cars That Are Not ''Enhanced''

An ''enhanced'' tank car is one that meets or exceeds the retrofit standards or the standards set forth by Specification DOT–117. Specification DOT–117 tank cars and retrofitted tank cars have advanced technology and present less safety risks to the rail transportation system, the public, and the environment than ''legacy'' Specification DOT 111 tank cars. In addition, PHMSA believes that there should be incentives for tank car owners and lessors to retrofit or upgrade their fleet of tank cars. By retrofitting or upgrading their tank cars, a carrier can transport their tank cars at speeds above the proposed speed restrictions, and this could advantageously shorten transit times for offerors and carriers with retrofitted tank cars.

5. Speed Restrictions Could Be Lessened Over Time If Technology Improves

Technological improvements are oftentimes the ''triggering'' or ''initiating'' event for a new rulemaking or some other regulatory action. PHMSA agrees that there is a possibility that speed restrictions could be reduced or eliminated amid significant technological improvements in the rail transportation industry.

6. Speed Limits Should Apply Only to Specific Configurations and/or a Specific Number of Tank Cars, Such as a Continuous Block of 20 or More Tank Cars

PHMSA agrees with this point of view. Based on commenter feedback, we have revised the NPRM's proposed HHFT definition to comprise trains with a continuous block of 20 or more tank cars or trains with a total of 35 or more tank cars carrying Class 3 flammable liquids. In doing so, PHMSA seeks to address higher risk unit train configurations. In other words, PHMSA seeks to regulate trains that transport a substantial number of Class 3 flammable liquid-carrying tank cars while avoiding unwarranted regulation of trains that transport smaller quantities of flammable liquids in a ''manifest'' train. For additional information regarding the scope of the Final Rule, please refer to the section describing the definition of an HHFT.

7. Speed Limits Should Be Based on Track Conditions, Classes, or Quality/Integrity.

While track conditions and quality are an important part of rail safety, PHMSA believes that creating a system of speed restrictions based on these track factors is not warranted at this time. PHMSA did not propose in the NPRM to base speed limits on these factors. The commenters did not provide sufficient data to show how and to what degree new speed restrictions would relate to track conditions or quality. The commenters did not propose any specific system for the implementation of speed restrictions based on track conditions or quality.

Further, FRA regulations codified in 49 CFR part 213—Track Safety Standards already enforce a system of speed limits based on track classes. One commenter stated that the aforementioned FRA regulations render the NPRM's speed restrictions ''redundant.'' On this point, PHMSA disagrees because the proposed speed restrictions are specific to the risks of

Class 3 flammable liquids and the type, number, and configuration of tank cars in a train. The proposed speed restrictions offer additional safety benefits.

Also, the Final Rule extends the routing requirements of § 172.820 to the transport of Class 3 flammable liquids by rail in HHFTs. Under these routing requirements, railroads transporting HHFTs will be required to consider ''track type, class, and maintenance schedule'' and ''track grade and curvature,'' among other factors, in their choice of routes. Railroads moving HHFTs must base their routing decision on this analysis, effectively taking into consideration the potential problems presented by track conditions, classes, or quality.

One commenter stated that a 30-mph speed limit should be in place for the segments of track that are in use for passenger service. Trains in freight rail service and passenger rail service share significant portions of the nation's rail infrastructure, so implementing this suggestion would be overly restrictive.

8. The Proposed Speed Limits Are Based on Inadequate Geographical Standards

PHMSA considered different geographical standards in its development of the proposed speed restrictions, and commenters offered various alternative geographical standards, including references to Bureau of the Census criteria or data for urban areas. However, the commenters did not submit an accompanying cost/benefit analysis of the alternative geographical standards, and these alternatives in many cases were not adequately elaborated so that PHMSA could analyze whether or not they would be superior to the proposed speed restrictions.

The NTSB proposed the ''potential impact radius'' (PIR) model as an alternative geographical standard. NTSB likened PIR to an approach used by PHMSA's gas pipeline regulations. PIR might be an effective geographical standard for pipeline safety, but it is not clear if this standard would also be suitable for rail transportation safety. Rail transport involves a wider variety of commodities and amounts transported, which presents a wider variety of risks that are mode-specific. On this basis, PHMSA does not believe that PIR would be better than the geographical standards proposed in the NPRM. Furthermore, PHMSA believes that the HTUA designation is in fact responsive to the need for greater protections in the areas that present the greatest risks or ''potential impact.''

One commenter stated that the HTUA designation is ''irrelevant'' in the context of reducing rail safety risks, as it was designed for the identification of terrorist targets. PHMSA disagrees. The HTUA designation is also applicable to the reduction of rail safety risks because it encompasses many areas that, if they were involved in a derailment, could result in widespread damages. The likelihood that a derailment would result in catastrophic damages is greater in HTUAs than most other areas. A different commenter criticized Option 3 and the HTUA designation because it was seen as overly restrictive and includes ''dozens of areas.'' PHMSA disagrees on the basis that only approximately 7% of the rail network is located within the limits of HTUAs.

Regarding alternative geographical standards, PHMSA affirms that there are costs involved in creating new regulatory standards, potential issues with implementation and clarity, and benefits involved in consistencies between federal regulations. In this respect, the HTUA designation would be easier, more effective, and clearer to implement in accordance with a 40-mph speed limit because it has been codified since 2008 in Title 49, CFR. Accordingly, rail network users and operators already have a compliance history with this regulation. Conversely, rail network operators are not familiar with PIR and other alternative geographical criteria, and there would be a particular cost attached to introducing novel geographical criteria.

9. Slow Rail Operations Have Already Affected U.S. Ethanol Production by Limiting the Amount of Ethanol That Can Be Transported by Rail, and the Proposed Speed Restrictions Will Negatively Impact Ethanol Transport

According to the Michigan Agri-Business Association, the Michigan Farm Bureau, and businesses in the ethanol industry, slow rail service has already impacted the ability of ethanol producers to effectively ship and deliver ethanol to consumers. To that effect, Homeland Energy Solutions has stated that the presently slow rail service has been difficult to overcome and additional speed restrictions applicable to ethanol transport will further hinder the industry, potentially causing some producers to shut down.

In response, PHMSA asserts there are many factors that might be slowing existing rail operations. Reduced speed is only one factor that might result in slow rail service. For example, the contributing factors of poor rail service might include the rapid increase in the production and transport of crude oil and subsequent displacement of other commodities in the rail system. In such a case, poor service could not necessarily be attributed to PHMSA's proposed speed restrictions. Nevertheless, PHMSA is also concerned with the impact of the proposed speed restrictions on rail network fluidity, and seeks to limit their potential negative effects.

The AAR proposed and implemented voluntary speed restrictions to mitigate the risks of crude oil transport. Thus far, these voluntary speed restrictions have not been applicable to ethanol transport by rail. When considering additional speed restrictions, PHMSA looks at cost/benefit analysis from a holistic perspective and does not give any one industry or stakeholder a preference in its analysis. PHMSA seeks to extend the safety benefits of the proposed speed restrictions to the transport of all Class 3 flammable liquids, including ethanol, as well as limit the negative effect of these speed restrictions on overall rail network fluidity and the costs borne by all industry participants, including ethanol producers.

PHMSA acknowledges that, after the final rule takes effect, the adopted speed restrictions will have a direct impact on ethanol producers and carriers. There will be an increase in burden or costs to shippers and carriers of ethanol if, prior to the rulemaking, they had moved ethanol above 50 mph. Union Pacific has stated, ''Freight trains often operate at speeds between 50 mph and 70 mph.'' Thus, freight trains could have moved ethanol above 50 mph prior to the rulemaking.

Nevertheless, commenters did not adequately relate to what degree the 50-mph maximum speed limit would decrease the actual operating speeds of HHFTs carrying ethanol. Overall, fewer commenters expressed concerns about the 50-mph speed limit than about the three 40-mph speed limits. In addition, industry cooperation with the Department has already established 50 mph as a maximum speed limit for certain trains. In Canada, Transport Canada issued an Emergency Directive in April 2014 requiring all companies to not operate a ''Key Train'' at speeds that exceed 50 mph. For these reasons, it is PHMSA's understanding that the 50-mph maximum speed limit is a common industry practice and implementing this speed limit would not drastically change the maximum speeds at which most trains carrying hazardous materials, including ethanol, operate.

In addition to the 50-mph maximum speed limit, ethanol shippers and carriers are directly affected by the 40-mph speed limit in HTUAs as a result

of the final rule. As with the 50-mph maximum speed limit, however, it is not clear to what extent HHFTs carrying ethanol would be affected. BNSF has indicated that rail speeds through population centers of 100,000 or more, which would also include all HTUAs, are already ''at or below 40 mph.'' This suggests the costs impacts of the 40-mph speed limit in HTUAs would be minimal.

For other carriers or entities within the ethanol industry, Option 3 might introduce new costs to them, but PHMSA believes the costs are justified by additional safety benefits. Since Option 3 refers to a 40-mph speed limit in HTUAs, only a small portion of the rail network—around 7% of the nation's track—will be affected by this new speed restriction. On balance, Option 3 is the least costly of the three speed options proposed and concentrates its protections in the areas where a derailment is most likely to be catastrophic and safety benefits are greatest. The ability to limit the cost impacts of the proposed speed restrictions on industry, including ethanol shippers, carriers, and others, has lent support to PHMSA's decision to implement Option 3. PHMSA believes the new costs to ethanol industry participants are limited and justifiable.

PHMSA does not intend to unjustifiably introduce costs into the operations of stakeholders, especially those who qualify as small businesses or small entities. For this reason, and in compliance with the Regulatory Flexibility Act (RFA) (5 U.S.C. 601–612), PHMSA must conduct a regulatory flexibility analysis addressing the rulemaking's economic impact given that the rulemaking is likely to ''have a significant economic impact on a substantial number of small entities.'' The rulemaking's RFA demonstrates that the impact to small entities as a result of this rulemaking will be limited and should not cause any small entities to cease operations. Please refer to the RFA section for additional explanation of the final rule's impact on small entities.

10. Voluntary Speed Restrictions Are Sufficient and Should Not Be Codified; or Voluntary Speed Restrictions Are Insufficient and Should Be Codified

PHMSA believes the speed restrictions should be codified. Recommended practices, such as voluntary speed restrictions, do not carry the weight of law. Recommended practices do not provide legal recourse in the event a railroad moves an HHFT at speeds exceeding voluntary speed restrictions thus increasing the likelihood of catastrophic damage in a train accident. Further, without the codification of these requirements, the speed restrictions could be lifted altogether in a premature manner, increasing safety risks. Codifying the speed restrictions will ensure that the safety benefits of speed restrictions are realized indefinitely and cannot be prematurely lifted without the appropriate procedural requirements. Further, this codification allows PHMSA and FRA to ensure compliance by exercising oversight and taking appropriate enforcement actions.

11. Speed Restrictions Could Have Unintended Consequences, Such as Increased Delays to Vehicles Stopped at Railroad Crossings or Carriers Choosing Not To Configure a 20th Tank Car in Order To Avoid Speed Restrictions

Regarding increased delays to vehicles stopped at railroad crossings, commenters did not provide specific data regarding the time or cost burden of this kind of delay. PHMSA recognizes this could be a consequence of the proposed speed restrictions, but is unable at this time to quantify the time burden or cost of increased vehicle delays at railroad crossings. PHMSA expects the cost of these delays would not be substantial.

Regarding train configurations and the proposed speed restrictions, PHMSA seeks to limit the implementation of speed restrictions to train consists with a substantial number of tank cars carrying Class 3 flammable liquids. In practical terms, PHMSA seeks to limit the effect of the proposed speed restrictions so that ''manifest'' trains would not be regulated to the same degree as a unit train of Class 3 flammable liquid.

PHMSA has revised its definition of an HHFT in response to commenter feedback on typical train configurations involving Class 3 flammable liquids, including crude oil and ethanol. The revised definition would allow rail carriers to configure up to 34 tank cars carrying flammable liquids so long as there are not 20 or more tank cars in a continuous block. A train that distributes hazmat-carrying tank cars (*i.e.,* configures them to limit the size of continuous blocks) in a consist would most likely pose a lower risk than a train with continuous blocks of cars containing hazmat. Moreover, the threshold of 35 or more total tank cars prevents a rail carrier from being able to transport an essentially unrestrained quantity of Class 3 flammable liquid tank cars by continually and purposefully avoiding the configuration of a 20th tank car in a continuous block. As such, the revised HHFT definition will limit the impact of the proposed speed restrictions on ''manifest'' trains.

12. Speed Restrictions Will Influence Externalities, Such as Noise Disturbances

PHMSA agrees that the proposed speed restrictions might result in externalities, such as reduced noise disturbances. PHMSA has taken into consideration the most significant externalities that would result from this rulemaking. PHMSA's review of the comments, analysis of costs and benefits, and coordination between regulatory, economic, and technical subject matter experts has facilitated a critical evaluation of the NPRM's proposed speed restrictions.

The following table summarizes the NPRM's proposed speed restrictions and presents some of PHMSA's analysis as to whether or not a given speed restriction would be an effective regulation.

TABLE 24—ANALYSIS OF SPEED RESTRICTIONS

The NPRM's proposed speed restrictions	Analysis
Option 1: 40-mph speed limit in all areas.	Option 1 was the most restrictive of the three 40-mph speed limits proposed. Option 1 was the most costly and confers the least benefits per dollar of costs. Also, the costs presented by Option 1 significantly outweighed the benefits of Option 1 in PHMSA's cost/benefit analysis, even when using the highest value in the benefit range to evaluate Option 1's net effect. Further, PHMSA believes the effect of Option 1 on rail network fluidity could be substantial.
Option 2: 40-mph speed limit in areas with more than 100,000 people.	Commenters stated that Option 2's geographical standard is inadequate and unworkable. There was relatively little explicit support for Option 2 among commenters. Option 2 confers significantly less benefits per unit of costs than Option 3.

TABLE 24—ANALYSIS OF SPEED RESTRICTIONS—Continued

The NPRM's proposed speed restrictions	Analysis
Option 3: 40-mph speed limit in High-Threat Urban Areas (HTUAs).	Option 3 would yield significant safety benefits, particularly in the nation's densely populated areas, which present an increased likelihood of the occurrence of a catastrophic event. Likewise, Option 3 confers the most safety benefits per unit of costs. In addition, the geographical designation of High-Threat Urban Area (HTUA) is workable, defined, and codified in Part 1580 in Title 49 CFR.
50-mph maximum speed limit for HHFTs.	The 50-mph maximum speed limit for HHFTs does not introduce new costs to stakeholders that offer or ship crude oil. A 50-mph speed limit for HHFTs is in line with widely adopted practices due to trade association and industry cooperation with regulatory bodies. It is also considerably harmonized with Transport Canada's April 2014 Emergency Directive.
30-mph speed limit for HHFTs without enhanced braking systems.	The 30-mph speed limit for HHFTs without a two-way EOT device or DP braking systems would not be generally applicable, provided that HHFTs are in compliance with the requirements for the use of these enhanced braking systems in the Final Rule. Speed limits pertinent to the use of ECP braking systems are discussed in the Braking Section of the Final Rule.

Conclusion

In the final rule, PHMSA and FRA are adopting requirements for speed restrictions for HHFTs. Specifically, this rulemaking adds a new § 174.310 to Part 174—Carriage by Rail. Section 174.310(a)(2) establishes a 50-mph maximum speed restriction for HHFTs. In addition, § 174.310(a)(2) establishes a 40-mph speed limit for HHFTs within the limits of high-threat urban areas (HTUAs) as defined in 49 CFR 1580.3, unless all tank cars containing a Class 3 flammable liquid meet or exceed the retrofit standards, the performance standard, or the standards for the DOT Specification 117 tank car provided in Part 179, Subpart D of the Hazardous Materials Regulations (HMR). The 40-mph speed limit for HHFTs within the limits of HTUAs is in line with Option 3 proposed in the NPRM.

In addition as discussed previously on April 17, 2015 FRA issued Emergency Order 30 to require that certain trains transporting large amounts of Class 3 flammable liquid through certain highly-populated areas adhere to a maximum authorized operating speed limit.[63] Under Emergency Order 30, an HHFT with at least one DOT–111 tank car (including those built in accordance with CPC–1232 loaded with a Class 3 flammable liquid) must not exceed 40 mph in HTUAs as defined in 49 CFR 1580.3. As this final rulemaking does not become effective for 60 days from publication FRA believes the restrictions in Emergency Order 30 will address an emergency situation while avoiding other safety impacts and harm to interstate commerce and the flow of necessary goods to the citizens of the United States. FRA and DOT will continue to evaluate whether additional action with regard to train speeds is appropriate.

D. Advanced Brake Signal Propagation Systems

Since the passage of the First Safety Appliance Act of March 2, 1893, freight train operations in the U.S. have traditionally relied on air brakes to slow and stop a train.[64] This conventional air brake system has proven to be reliable, but it has drawbacks. When a train is long and heavy, as is typically the case in the context of an HHFT, a conventional air brake system can easily take over one-half mile to bring a train to a stop, even with the emergency brakes applied. Moreover, the length of a train will significantly affect the time it takes for the conventional air brakes to apply to the entire consist. It can take a number of seconds for the air brake system to function as air is removed from the system to engage the brakes, beginning with the cars nearest to the locomotive and working towards the rear of the train. For example, in a 100-car train it could take up to 16 seconds as the brakes fully apply sequentially from front-to-back. This lag in air brake application time from the front to the back of the train also can result in significant in-train buff and draft forces. These in-train forces can lead to wheel damage (*e.g.* slid flat spots) and can negatively impact rail integrity as these flat spots create a vertical impact force (''pounding'') on the rails. These are major contributing factors to derailments. In-train forces resulting from the application of conventional air brakes also can directly contribute to derailments, particularly in emergency situations, as freight cars can be forcefully bunched together when the train is brought to a stop quickly. These forces may also be amplified by the longitudinal slosh effect of a liquid lading, such as crude oil or ethanol. Such factors have led PHMSA and FRA to consider advanced brake signal propagation systems as a way to improve safety in the transportation of Class 3 flammable liquids by rail, particularly with respect to longer trains transporting 70 or more tank cars loaded with Class 3 flammable liquids. These more advanced systems have the capability to stop trains more quickly and reduce the number of braking induced derailments.

Types of Brake Signal Propagation Systems Considered in the NPRM

Brake signal propagation systems are interconnected arrangements of braking components that operate together to slow or stop a train. Compared to conventional air brakes, these systems can reduce the number of cars impacted (*e.g.,* derailed or punctured), can dissipate the kinetic energy associated with train accidents, and in some instances can prevent an accident from occurring through accident avoidance. In the NPRM, PHMSA and FRA considered three advanced brake signal propagation systems that would contribute to the safe transportation of Class 3 flammable liquids when transported in bulk by rail: Two-way end-of-train (EOT) devices, distributed power (DP) systems, and electronically controlled pneumatic (ECP) braking systems.

Two-way EOT devices include two pieces of equipment linked by radio that initiate an emergency brake application

[63] See *http://www.phmsa.dot.gov/pv_obj_cache/pv_obj_id_2DA43BA3704E57F1958957625273D89A29FF0B00/filename/EO_30_FINAL.pdf.*

[64] The conventional air brake system was invented by George Westinghouse in approximately 1869. It relies on air pressure to apply and release the air brakes on each car in a train's consist. There is an air brake line that connects each car to an air source provided by the locomotive. When the air brakes are in the release position, the locomotive is providing air pressure to prevent the air brakes from applying. When air pressure is reduced in the system during a service application, the air brakes will apply. (Note: There are also handbrakes on each car and each locomotive and an independent brake on each locomotive. Handbrakes are not activated by a train's air brakes system. Independent brakes may be applied and released separately from the train's air brake system.)

command from the front unit located in the controlling (''lead'') locomotive, which then activates the emergency air valve at the rear of the train within one second. The rear unit of the device sends an acknowledgment message to the front unit immediately upon receipt of an emergency brake application command. A two-way EOT device is slightly more effective than conventional air brakes because the rear cars receive the emergency brake command more quickly in an engineer induced emergency brake application.

DP systems use multiple locomotives positioned at strategic locations within the train consist (often at the rear of the train) to provide additional power and train control in certain operations. For instance, a DP system may be used to provide power while climbing a steep incline and to control the movement of the train as it crests the incline and begins its downward descent. The DP system works through the control of the rearward locomotives by command signals originating at the lead locomotive and transmitted to the remote (rearward) locomotives. DP systems are a mature technology and are in widespread use on Class I railroads, particularly those operating west of the Mississippi River. While distributed power technically is not a braking system, the additional power source in or at the rear of the train consist can provide enhanced braking for a train.

ECP brake systems simultaneously send an electronic braking command to all equipped cars in the train, reducing the time before a car's pneumatic brakes are engaged compared to conventional air brakes. They can be installed as an overlay to a conventional air brake system or replace it altogether; however, FRA regulations do require that ECP brake systems be interoperable pursuant to the AAR S–4200 standard, which allows for interchange among the Class I railroads. 49 CFR 232.603. The modeling performed for the NPRM by Sharma & Associates suggested that ECP brakes could reduce the severity of an accident when emergency braking is applied by 36 percent (meaning that 36 percent fewer cars would be expected to puncture in the event of a derailment of a 100 car train) compared to conventional air brakes.[65] Additional modeling (discussed in detail below) conducted after the NPRM, supports the finding that ECP brakes reduce the probability of punctures in the event of a derailment, although the updated modeling determined that ECP brakes provide an approximate safety benefit of 26–30 percent in terms of reduced probability of tank car punctures. PHMSA and FRA conducted additional analysis of the results provided in the updated analysis and determined that ECP brakes were almost 20 percent more effective than a two-way EOT device or DP unit when weighted based on the quantity of product spilled in a derailment.

The simultaneous application of ECP brakes on all cars in a train also significantly improves train handling by substantially reducing stopping distances as well as buff and draft forces within the train, which under certain conditions can result in a derailment. Because ECP brakes do not rely on changes in air pressure passing from car to car, there are no delays related to the depletion and recharging of a train's air brake system. These factors provide railroads with the ability to decrease congestion or to increase volume by running longer trains closer together.[66] Further, under current FRA regulations, trains relying on ECP brakes are allowed to run for longer distances between brake inspections (up to 3,500 miles), which decreases the time equipment spends out of service. *See* ''ECP Efficiencies'' discussion in the RIA. FRA's existing regulations also permit significant flexibility related to the handling of cars with inoperative brakes due to the fact that ECP braking systems allow train crews to electronically monitor the effectiveness of the brakes on each individual car in a train and provide real-time information on the performance of the entire braking system of the train.[67] ECP braking system technology also reduces the wear and tear on brake system components and can reduce fuel consumption. The combination of all these factors allows for more efficient operations, which results in ECP-equipped trains having higher utilization rates. These efficiencies are addressed in detail in the RIA, which is included in the docket.

Because U.S. railroads have traditionally relied on conventional air brakes, existing tank cars and locomotives (to a lesser extent) have not been built with ECP brake technology installed. All cars in a train, as well as locomotives, must be equipped with wiring to allow the brake system to be relayed through the entire train before the train can operate in ECP brake mode.[68] As a result, an ECP brake system is not efficient in a situation where a substantial number of cars are not equipped to handle ECP brakes. This aligns with the experiences learned from the operation of ECP-equipped trains by BNSF Railway (BNSF) and Norfolk Southern Railway (NS), which indicate that ECP braking technology can be implemented most effectively on unit trains that tend to be kept in dedicated service (*i.e.* primarily used in unit trains that are essentially transporting a single commodity, such as crude oil). Applying ECP brake systems in this manner has been demonstrated to be successful both domestically and internationally as discussed in further detail below.

Public Comments to the Brake System Proposal in the NPRM

Given the increased risks associated with an accident involving HHFTs, we specifically requested comments in the September 6, 2013, ANPRM on the use of advanced brake signal propagation systems to reduce the number of cars and energy associated with derailments. Based on comments to the ANPRM and the FRA simulation data described above, in the August 1, 2014, NPRM we proposed to require that each HHFT be equipped with an enhanced brake signal propagation system (*i.e.,* equipped with more than just conventional air brakes) along with an implementation schedule that would minimize the impacts on rail carriers. Specifically, subject to one exception, we proposed to require the following:

- HHFTs are to be equipped with a two-way EOT device as defined in 49 CFR 232.5 or a DP system as defined in 49 CFR 229.5, by October 1, 2015.
- After October 1, 2015, a tank car manufactured in accordance with proposed § 179.202 or § 179.202–11 for use in a HHFT must be equipped with ECP brakes.
- After October 1, 2015, HHFTs comprised entirely of tank cars manufactured in accordance with proposed § 179.202 and § 179.202–11 (for Tank Car Option 1, the PHMSA and FRA Designed Car, only), except for required buffer cars, must be operated in ECP brake mode as defined by 49 CFR 232.5.

[65] The estimates for ECP braking systems in the NPRM have been revised based on updated modeling from Sharma & Associates. *See* ''Letter Report: Objective Evaluation of Risk Reduction from Tank Car Design & Operations Improvement—Extended Study,'' Sharma & Associates, March 2015. The final rule relies on the updated modeling.

[66] PHMSA and FRA recognize that the outer length of trains will ultimately governed by structural factors, such as the length sidings.

[67] A train equipped with ECP brakes may depart its initial terminal with 95 percent operative brakes, whereas a train equipped with conventional air brakes must have 100 percent operative brakes at departure.

[68] This wiring could be used to by-pass a car or locomotive if it were not equipped with ECP brakes. However, the train must have a minimum of 95 percent effective brakes. See 49 CFR 232.609.

To reduce the burden on small carriers that may not have the capital available to install new braking systems, we proposed an exception. If a rail carrier does not comply with the proposed braking requirements above, we proposed that the carrier may continue to operate HHFTs at speeds not to exceed 30 mph. Additionally, we sought specific comment on the capacity of tank car and locomotive manufacturing and retrofit facilities to install advanced brake signal propagation systems, estimated costs of ECP braking systems, alternative simulations or modeling data to validate the results of the FRA commissioned analysis, and the interaction of safety and environmental benefits when coupled with speed restrictions or enhanced tank car standards. The table below details the types and amounts of commenters on the braking proposals.

TABLE 25—COMMENTER COMPOSITION: BRAKING COMMENTS

Commenter type	Signatories
Non-Government Organization	100,738
Individuals	8,622
Industry stakeholders	217
Government organizations or representatives	19
Totals	109,596

Most of the commenters support the proposed requirements for enhanced braking systems beyond conventional air brakes on HHFTs. Of those commenters who identified the braking issue in their response, approximately 98 percent of signatories specifically supported mandating ECP brakes for HHFTs. Whereas, two percent of signatories opposed specifically mandating ECP brakes for HHFTs in favor of two-way EOT devices, DP systems, any enhanced braking, or no enhanced braking.

Environmental groups, concerned public, other governmental organizations, Indian tribes, local governments, towns and cities, NGOs and trade associations were among the main groups supporting the mandating of ECP brakes for HHFTs. It should be noted that while 98 percent of signatories supported ECP brakes, these commenters largely did not provide additional data supporting the proposal in the NPRM. Some concerned public commenters supported expanding the braking proposal to require that all tank cars transporting hazardous materials be equipped with ECP brakes. In an online write-in campaign, over 3,000 public commenters state: ''[t]hree levels of brakes for tank car standards are offered but ALL tank cars carrying hazardous materials should be equipped with the highest level of brakes and brake signaling systems.''

Other concerned public, Congressional, Indian tribes and environmental group commenters expressed support for ECP brakes as proposed in the NPRM. Most stated generally that they were in favor of the most stringent and advanced brakes available for HHFTs. The Regional Tribal Operations Committee commented that the final rule must ''require state-of-the art braking systems for crude-by-rail trains to protect the public in the face of what the [NTSB] has called 'unacceptable public risks.'' Cost was not generally discussed by those commenters who supported ECP brakes, and cost did not appear to be a deciding factor in selection of a braking option for the commenters who supported use of ECP braking systems. Specifically, these commenters desired the tank car braking enhancements that would result in the greatest improvements in safety for those in proximity to the rail network as well as for environmentally sensitive areas along such routes.

Commenters such as environmental groups and state agencies supported ECP braking based on the modeling data provided by PHMSA and FRA. The Center for Biological Diversity, in its comment with almost 23,000 signatories, stated:

> Given that the ECP system would only reduce the potential for tank car punctures by 36%, it is unconscionable to allow the option of a potentially cheaper distributed power system, which would only reduce accident severity by 18%. . . . Given the imminent hazard that HHFTs pose to human health and the environment, the most effective brake system that has been shown to be readily available for these trains must be employed, and PHMSA must not offer a choice that would drastically increase the severity of accidents.

Clean Water Action supports ECP brakes in their comment stating ''[t]o slow HHFTs[,] all rail cars should be equipped with the [ECP] brake system whose effectiveness has been shown to be 36%.'' It also comments that, ''[e]ven though industry believes the ECP adds significant time and cost investment and the benefits will not be realized for months or years in the future, the technology seems to offer significant benefits such as real time monitoring, reduced wear and tear on the brake system, and fuel savings.'' Clean Water Action further noted that, ''[i]t would have been encouraging for the industry to embrace a proven technology rather than to suggest ECP offers marginal benefits,'' particularly when the increased effectiveness of DP systems is only 18 percent. The California Public Utilities Commission and California Governor's Office of Emergency Services in their joint comment also noted that the 2006 study, ''ECP Brake System for Freight Service: Final Report,'' [69] identifies a number of benefits related to the implementation of ECP braking including: reduced stopping distances up to 70 percent, reduction in undesired emergency brake applications, improved train handling, and reduced fuel consumption.

Additionally, some commenters noted that EOT devices or DP systems are already the base standard for industry and expressed concerns that codifying the requirement to equip one of those two systems would not increase safety in any significant manner. The BLET stated in its comment that, ''. . . the EOT requirement already exists in 49 CFR 232.407.'' As a result, it contended that the proposed EOT device ''requirement was picked simply to have no economic impact on railroads because they were already complying with this rule.'' The BLET noted that, ''achieving cost savings is a worthy goal,'' but urged that ''it cannot be a goal that comes at the risk of providing no additional safety benefits by preservation of the status quo.'' Further, the BLET contended that, ''[t]he use of distributed power is also currently being done for business purposes of being able to run longer, heavier trains due to more locomotive tractive effort provided at the rear or within a train.''

The Brotherhood of Maintenance of Way Employees Division (BMWED) and the Brotherhood of Railroad Signalmen (BRS) in their joint comment support ECP braking if the requirement also includes a restoration of the 1,000–1,500 mile interval for brake and mechanical inspections to be performed by a qualified inspector.

Concerned public, shippers, trade associations, other governmental organizations, and rail carriers were the main groups commenting in opposition to ECP brakes for HHFTs in favor of two-way EOT devices, DP systems, any enhanced braking or no enhanced braking. While these commenters represented a small minority of the overall number of signatories who identified braking systems in their response, several of these commenters provided cost analyses or brake system effectiveness data to compare against

[69] FRA, ''ECP Brake System for Freight Service: Final Report,'' Booz Allen Hamilton, 2006, *http://www.fra.dot.gov/eLib/Details/L02964*.

the data presented by PHMSA and FRA under the NPRM.

Comments on ECP Effectiveness

Prior to publication of the August 1, 2014, NPRM, FRA conducted simulations using the Train Energy & Dynamics Simulator (TEDS) program developed by Sharma & Associates to demonstrate the increased effectiveness of ECP brakes compared to conventional brakes, EOT devices, and DP systems. The simulations were conducted to better understand the effect on energy dissipation and stopping distance of different brake signal propagation systems. The results of these simulations suggested that advanced brake signal propagation systems, especially ECP brake systems, decrease brake signal propagation time(s) and decreased kinetic energy of a train in a derailment compared to the conventional air brake system. Many commenters in opposition to ECP brakes challenged PHMSA and FRA's effectiveness claims in the NPRM.

AAR challenged the modeling done by Sharma & Associates based on several factors. It states that the number of simulations was too limited and conducted on trains of 80 cars or less.[70] AAR's Transportation Technology Center, Inc. (TTCI) undertook its own modeling of the effect of ECP brakes, with an independent review by Applied Research Associates. According to AAR, the TTCI modeling considered additional factors that are not in the Sharma & Associates modeling. These include the force applied to cars past the point of derailment, potential for derailment to occur at different points on a train, and the variability in a train's response to different types of derailment. Using the Aliceville, AL, derailment as a proxy, TTCI concludes that the energy of the derailment would have been decreased by 12 percent had ECP brakes been used instead of the distributed power in use on that train. Utilizing simulated speeds of 30, 35, 40, 45, and 50 mph, respectively, as well as multiple advanced brake systems—such as conventional brakes with two-way EOT and head-end devices [71] and distributed power (rear, middle of the train, and buried 2/3)—TTCI's modeling suggests that a train using ECP brakes is 10.5–13.3 percent more effective as measured by the decrease in kinetic energy during the derailment, with a decrease in the number of cars expected to be derailed at 1.2–1.6 cars.

While these figures do tend to show that ECP brakes are more effective than DP systems, the figures developed by TTCI are indeed lower than those presented in the Sharma & Associates modeling. However, it is unclear what brake ratio TTCI used in its modeling.[72] The current maximum allowable brake ratio for conventional braking is 10–11 percent, depending on the car. The modeling for conventional braking that was done by Sharma & Associates used a simulated brake ratio of ten percent. Because the in-train forces are greatly reduced when using ECP brakes, AAR guidelines allow for a higher brake ratio for ECP brakes than conventional brakes. The maximum brake ratio for ECP brakes is about 13 percent. This should translate into shorter stopping distances and decreased energy in the event of a derailment for trains equipped with ECP braking systems, but it is not evident from the information provided by AAR whether TTCI accounted for the higher allowable brake ratio in its modeling.

Additionally, while TTCI ''reproduces'' certain recorded stopping distances in derailments, it does not actually simulate a derailment. Instead, the TTCI model simply calculates the energy dissipation as a train is slowed to stop when a blocking force is applied. The blocking force is intended to act as a surrogate for the force applied by the cars in a derailment, but this is a poor corollary to a derailment outcome because energy dissipation by itself is insufficient to quantify damages. It does not take into account other factors, such as location of impact and size of impactors that are of equal importance to energy. Therefore, we question the exactness of TTCI's results with respect to modeling the effectiveness of ECP brakes.

AAR also suggests that the conditional probability of release (CPR; the probability of a release if a tank car is in an accident), will also depend on the specific tank car specification selected by PHMSA. For example, if the CPR is five percent that means there will only be a five percent chance of a release from the 1.2 to 1.6 cars derailing due to the absence of ECP brakes, everything else being equal.

Union Pacific concluded that multiple remote trains (*i.e.* DP systems) have essentially the same stopping performance as ECP brakes, and that it makes little difference whether the brake commands are delivered within 2.5 seconds (using ECP) or within four seconds (using DP). Even though the delay in braking commands with ECP and DP can be as much as 4–5 seconds (a result of the difference in build-up time for the brake cylinder pressure), the difference in stop distance is ''virtually unnoticeable.'' Based on its 2009 testing, Union Pacific concluded that braking and train handling were virtually as good with DP systems as the ECP test train. Moreover, Union Pacific found that increasing its use of distributed power resulted in benefits nearly identical to using ECP braking, without the significant operating issues created by ECP brake systems. Specifically, it states that there are considerable compatibility and reliability issues with ECP brakes that make them a less effective option, such as power failures as well as hardware and software issues.

Honeywell Performance Materials and Technologies commented in opposition of ECP braking based on how ECP brake systems operate stating, ''the new design is not compatible with present fleet braking systems'' and ''[i]t is our understanding that all cars, including the locomotive, in a train would need to be equipped with the ECP brakes to be effective.'' Concerns that all cars in a train must be equipped with ECP brakes in order for the system to function was echoed by other commenters in opposition of ECP brakes. Bridger commented that ''cars equipped with ECP brakes cannot be intermixed with cars equipped with conventional airbrakes. Thus, any tank cars set out en-route for defects will be difficult to move to destination. This will slow the cycle times on the cars and may also add operational costs for the railroads in having to make special movements to 'rescue' stranded ECP equipped cars.''

BNSF submitted that the benefits of ECP brakes—in the context of avoiding the spillage or ignition of flammable liquids moved by rail—do not come close to justifying the costs, complexity and lost productivity that would result from an ECP brake requirement, especially when compared to realizing the benefits from a DP system, which is proven technology. BNSF goes on to state that a train equipped with ECP brakes, on average, would have approximately two fewer cars per train derail than a similar train equipped with DP. BNSF has experience with ECP brakes on unit trains in a captive, closed-loop environment. What BNSF has found is that the ECP braking equipment is more expensive to maintain, requires specialized skills and

[70] The initial round of simulations were, in fact, 80 car trains. For the final rule 100, 80, 50 and 20 car trains were modeled.

[71] A head-end device (also known as front-of-train unit or front unit) is placed in the locomotive. It receives data from the EOT device that is placed on the rear car of the train. In two-way EOT systems, the head-end device is able to initiate emergency braking at the rear of the train within one second. *See* 49 CFR 232.403 and 405.

[72] The braking ratio is the relation of the braking force to the weight of the car or locomotive.

shopping capabilities, and has not ever, in BNSF's experience, been successfully applied outside of a limited, closed-loop environment. BNSF goes on to say that while crude and ethanol make up five percent of its shipments they travel on 70 percent of the BNSF network. This will result in training and repair needs across a majority of their network for a commodity that is only a small fraction of their freight shipments.

Comments on Availability and Cost

The Independent Petroleum Association of America (IPAA), BNSF and Plains Marketing, LP opposed ECP brakes noting that there are only two known manufacturers of ECP brakes, and that all current sales are overseas. BNSF noted that the systems of the two manufacturers (New York Air Brake and Wabtec) are not believed to be interoperable. In addition, these manufacturers do not currently produce ECP brake components in sufficient volumes to handle this regulatory requirement. Amsted Rail stated that there are only six trains currently operating with ECP brakes in the United States.

AAR, Greenbrier, Amsted Rail, the National Grain & Feed Association, RSI and AFPM provided cost estimates per tank car for ECP brakes ranging from $5,300 to $15,000—above the PHMSA estimate of $3,000 for new construction and $5,000 for retrofits.

AAR, Bridger and AFPM provided cost estimates per locomotive for ECP brakes ranging from $20,000 to $88,000—in contrast to the PHMSA estimate of $79,000. These commenters also indicated that PHMSA underestimated the size of the affected locomotive fleet.

AAR commented that 9,849 carmen, 27,143 engineers, and 41,015 conductors would need training—above the PHMSA estimate of 4,500 engineers and 4,500 conductors. The majority of commenters in opposition to ECP brakes stated that the cost of equipping the system is too high. Additionally, many were concerned that the installation process and overlay of these braking systems is too complex. PHMSA and FRA discuss the cost-benefit analysis of ECP braking in further depth in the RIA.

Comments on Integration of ECP Brake Systems with Positive Train Control

Many commenters both in support of and opposition to ECP brakes mentioned positive train control (PTC) in their comments. PTC is a set of highly advanced technologies designed to automatically stop or slow a train before certain types of accidents occur. PTC is designed to prevent train-to-train collisions, derailments caused by excessive speed, unauthorized incursions by trains onto sections of track where maintenance activities are taking place, and movement of a train through a track switch left in the wrong position.[73] The Rail Safety Improvement Act (RSIA) of 2008 mandated an end of 2015 deadline to implement PTC across 70,000 miles of the rail network.[74] *See* ''Positive Train Control Systems,'' 75 FR 2598 (January 15, 2010), FRA Docket No. FRA–2008–0132; for further information.[75]

BNSF commented that ECP brake implementation would require a re-write of the PTC algorithm, which would then need to go through the FRA approval process. Furthermore, physical and logical interfaces between ECP brake and PTC equipment would have to be designed and tested. BNSF is not currently aware of any adverse interactions between the two systems. Additionally, it commented that rail shop capacity is already strained due to the PTC mandate, and would be further congested by a requirement for ECP brakes.

Analysis of the Final Rule Requirements Related to Advanced Brake Propagation Systems

This final rule requires all HHFTs operating in excess of 30 mph to have enhanced braking systems. The type of enhanced brake system that a railroad will be required to use is based on a refined approach that allows PHMSA and FRA to implement real brake system safety improvements by taking into consideration the amount of Class 3 flammable liquids being transported by a train as well as the type of operation that the train uses to transport Class 3 flammable liquids. At a baseline level, any train that contains a continuous block of 20 or more loaded tank cars or a total of at least 35 loaded tank cars throughout the train consist containing Class 3 flammable liquids must have in place, at a minimum, a functioning two-way EOT device or a DP system to assist in braking. Based on FRA analysis and modeling by Sharma & Associates conducted in March 2015, it is expected that a two-way EOT device or DP locomotive at the rear of a train can reduce the number of cars punctured by 13–16 percent compared to conventional air brakes. However, with longer, heavier trains it is necessary to factor in train control issues. Therefore, PHMSA and FRA have specific braking requirements for trains that are transporting 70 or more loaded tank cars of Class 3 flammable liquids at speeds in excess of 30 mph. These requirements are intended to further enhance safety based on the operations conducted for longer, heavier trains.

Any high-hazard flammable unit train (HHFUT) operating in excess of 30 mph must have a functioning ECP brake system that complies with the requirements of 49 CFR part 232, subpart G. PHMSA and FRA define an HHFUT as a single train consisting 70 or more tank cars loaded with Class 3 flammable liquids. This definition is intended to capture those operations where tank cars and locomotives are primarily used in captive service trains that are transporting large quantities of Class 3 flammable liquids (such as crude oil and ethanol) and are running in a continuous loop. The ECP braking requirement goes into effect as of January 1, 2021 for any HHFUT transporting one or more loaded tank car of a Packing Group I flammable liquid, and goes into effect as of May 1, 2023 for all other HHFUTs.

While PHMSA and FRA are establishing a requirement to implement ECP brake systems for certain operations, we recognize that the railroad industry may develop a new brake system technology or an upgrade to existing technology that is not addressed in 49 CFR part 232, subparts E (for two-way EOTs) and G (for ECP braking systems). This rulemaking is not intended to ''lock in'' the status quo with respect to ECP brake systems as the only form of brake system that can be used on unit trains operating in excess of 30 mph while transporting 70 or more loaded tank cars of flammable liquids. In the event that a new technology is developed, railroads should apply to FRA to obtain special approval for the technology pursuant to part 232, subpart F.

Finally, PHMSA and FRA believe that it makes practical sense to except trains operating at speeds not exceeding 30 mph from the requirements related to HHFUTs. This enables shortline and regional railroads and railroads without the capital necessary to equip unit trains with ECP brakes or that choose not to equip their trains with these systems to continue transporting Class 3 flammable liquids, albeit at slower speeds in order to protect public safety and the environment. It also is important to note that such railroads will be required to transport Class 3 flammable liquids in

[73] *https://www.aar.org/policy/positive-train-control.*

[74] Public Law 110–432—Rail Safety Improvement Act of 2008, *https://www.fra.dot.gov/eLib/Details/L03588.*

[75] *http://www.gpo.gov/fdsys/pkg/FR-2010-01-15/pdf/E9-31362.pdf.*

tank cars that comply with the new standards.

Effectiveness of ECP Brake Systems

ECP braking is a proven technology that is a reliable and effective way to slow and stop a train, and to prevent accidents from occurring, while also allowing for more efficient operations. ECP brakes have been used in North American railroad operations since at least 1998. PHMSA and FRA recognize that there have been hurdles in the deployment of ECP brakes. However, the technology has continued to improve since 1998 and carriers are in a better position now to ensure that ECP brakes are successfully implemented. The railroad industry has effectively addressed crosstalk and interoperability issues and has updated AAR Standard S–4200 accordingly. We expect that concerns related to maintenance and repair issues that arise during normal operations will be resolved through adequate training of operating crews and maintenance personnel, which has been factored into the cost of this rule.[76] These issues are discussed in detail in the ''Reliability and Technological Readiness'' section of the RIA, which has been added to the docket.

There are currently six unit coal trains being operated with ECP brake systems in the U.S. These began as waiver test trains; however, all but one are now in regular revenue service. NS began operating unit coal trains using ECP braking systems in 2007,[77] and it is currently operating five ECP-equipped unit coal trains. These trains presently make trips from coal mines in Southwestern Pennsylvania to the Keystone Generating Station near Shelocta, PA (two 100-car or more trains; approximately 350 miles round-trip) and to a generating station near Blairsville, PA. NS also operates unit coal trains originating in the mines of Southwest Virginia that transport coal to a power plant in Clover, VA (approximately 700 miles round-trip).[78] Additionally, in 2014, NS began operating a unit coal train with BNSF providing operating crews while the train operates over BNSF's rail line that travels between the Powder River Basin and Macon, GA. BNSF, independently, has operated a 135-car ECP-equipped unit coal train since 2008 that travels approximately 3,060 miles round-trip from the Powder River Basin to Palos, AL.[79] PHMSA and FRA are unaware of any accidents or incidents (such as a derailment) along these routes to date that could be attributed to operational issues with ECP brakes.

Some commenters have noted that there has not been widespread adoption of ECP brakes in the U.S. There are a number of factors that contribute to this. First, the positive train control (PTC) requirement diverted significant capital (financial and human) toward signal systems at a time when those resources might have otherwise been directed at ECP brakes. Second, it has been difficult to implement ECP brakes outside of a limited type of service in part because they are not compatible with the conventional air brakes (this is particularly true stand-alone systems, which are less expensive). This means that ECP brakes would only be used on unit trains that are in captured service and both the car owner and the railroad agree on its use. Further, the limited usage contributes to unfamiliarity with the technology and likely contributes to many of the operational and maintenance difficulties expressed by railroads in their comments. Third, there are market inefficiencies that have limited implementation of ECP brakes. ECP brakes are most likely to be implemented on a voluntary basis where owner of ECP-equipped cars has control over a seamless operation of unit trains from the originating location to the delivery location, such as what is found in Australia or South Africa. In the U.S. most cars owners have little incentive install ECP brakes because they tend to bear most of the upfront cost of installing the braking system, while most of the benefits (such as decreased fuel consumption) are realized by a separate entity, the operating railroad. Notwithstanding, car owners might still have an incentive to install ECP brakes if they were to realize greater utilization due to less inspections. However, FRA understands that railroads effectively eliminated the incentive to install ECP brakes by treating such cars as being in premium service, resulting in higher cost per use.

AAR contends that most of the benefits from ECP brakes, such as more efficient fuel consumption and reduced wheel wear, are currently realized through the widespread use of dynamic braking. PHMSA and FRA did not address this issue in the NPRM and it was not raised until after the close of the comment period.[80] While dynamic braking does provide an alternative to pneumatic brakes for slowing a train in non-emergency situation and allows a train to operate more efficiently, trains that use dynamic braking and not ECP brakes do not get business benefits from ECP brakes. AAR analyzed data from a small number of trips of ECP-equipped trains and found that 89 percent of the time that the train was braking, it was not using ECP brakes in whole or in part. AAR, therefore, estimated that 85 percent of the fuel and wheel savings benefits are currently realized through use of dynamic brakes. PHMSA and FRA accept that the fuel and wheel savings should be reduced to account for the use of dynamic braking, but the reduction should be smaller than 85 percent. The ability to use ECP brakes in conjunction with dynamic brakes further improves fuel efficiency by as much as five percent above dynamic braking alone, depending on the routes and railroad practices. For instance, Canadian Pacific achieved a fuel savings of 5.4 percent when ECP brakes were used along with dynamic brakes during testing in Golden, British Columbia, on a route that has particularly advantageous terrain for maximizing the fuel benefits associated with ECP braking.[81] Because not all terrain will be as advantageous as this test region, PHMSA and FRA have reduced the estimated fuel efficiency benefits by 50 percent, corresponding to a fuel improvement rate of 2.5 percent on top of dynamic braking. However, this estimate is conservative and likely understates the fuel efficiency benefits.

PHMSA and FRA also accept that benefits related to wheel savings should be reduced to account for the use of dynamic braking, but that they should be reduced by less than 85 percent suggested by AAR. Railroads will continue to experience brake induced wheel wear where pneumatic brakes are used, but if the railroads rely on dynamic braking they will face a cost not considered in other parts of the analysis, increased rail wear, with an attendant increased risk of broken rail accidents and increased track maintenance costs. PHMSA and FRA estimate that the use of dynamic braking

[76] PHMSA and FRA estimates that railroads will need to train approximately 51,500 employees.

[77] *ECP Brake Implementation on Norfolk Southern,* presentation to RSAC, October 25, 2007, *https://rsac.fra.dot.gov/meetings/20071025.php.*

[78] *Electronically Controlled Pneumatic Brake Rulemaking,* presentation to RSAC, February 20, 2008, *https://rsac.fra.dot.gov/meetings/20080220.php.*

[79] *BNSF Operates Southern Company Coal Train Equipped with New-Generation Braking System,* 25 January, 2008, *https://www.bnsf.com/media/news/articles/2008/01/2008-01-25a.html.*

[80] AAR gave a presentation on dynamic braking during meetings with the Office of Information and Regulatory Affairs of the Office of Management and Budget held under Executive Order 12,866.

[81] Wachs, K., Aronian, A., Bell, S. Electronically-Controlled Pneumatic (ECP) Brake Experience at Canadian Pacific. *Proceedings from the 2011 International Heavy Haul Conference,* Calgary AB, 2011, available at *http://www.ihha.net/IHA/uploads/assets/fin00258.pdf.*

in conjunction with ECP brakes would reduce the dynamic brake induced rail wear by at least 25 percent based on Canadian Pacific's experience.[82] Further, in spite of initial increases in thermal mechanical shelling due to heavy ''experimenting'' by train crews during the familiarization phase, Canadian Pacific found a four percent improvement in average wheel life.[83] Once operations ''settle in,'' improvements in wheel life may reach ten percent, thus reducing the estimated wheel wear benefit by 75 percent instead of the 85 percent estimated by AAR.

Although PHMSA and FRA agree with those commenters who support ECP braking on unit trains, we disagree with the suggestion from the BMWED and BRS that FRA should restore the 1,000–1,500 mile interval requirement for brake/mechanical inspections. The 3,500 mile interval has a proven record of safety in the seven years of operations on the NS and BNSF railroads. The use of real-time equipment health monitoring capabilities on ECP-equipped trains is an effective safety tool that justifies the extended inspection intervals. Allowing for longer distances between inspection stoppages provides a benefit to railroads without decreasing safety by keeping safe equipment in-service for longer periods of time (each brake test and mechanical inspection can take from two to eight hours to complete and may delay a train even longer depending on available personnel and scheduling). As of October 2014, NS initiated train operations under a 5,000 mile inspection waiver to test the effectiveness of a longer inspection interval on the unit coal train that it runs with BNSF in a loop between the Powder River Basin and Macon, GA.

ECP brake systems based on the AAR S–4200 standard also have been exported successfully for use in Canada, Australia, and South Africa. As an example, the Quebec Cartier Mining Railway (QCM) in Quebec, Canada began using ECP-equipped trains in 1998.[84] The use of ECP brake systems has allowed QCM to experience a 5.7 percent reduction in fuel usage and a 15 percent increase in throughput capacity.[85] As noted above, a report on an ECP-equipped Canadian Pacific train found that the railroad achieved a fuel savings of 5.4 percent from ECP brakes during testing in Golden, British Columbia. The Australian experience also is instructive because, in contrast to the experience in the U.S., a number of railroads in that country have voluntarily invested heavily in ECP brakes.[86] Australian railroads have been using ECP brakes on a portion of its fleet for over a decade,[87] and they currently operate more than 28,000 cars in ECP brake mode. The types of trains that Australian railroads have equipped with ECP brakes share many similarities to HHFUTs in the U.S. Both fleets operate in heavy haul service, stay in extend blocks, and transport commodities that are a substantial source of revenue for the railroad. These Australia railroads have adopted ECP brakes based on expected business benefits (*e.g.* heavier, longer trains), but have found that ECP brakes allow for shorter stopping distances and real time monitoring, which makes them safer than conventional brakes. These issues are discussed in detail in the ''Australian Experience'' section of the RIA, which is part of the docket.

By setting the HHFUT threshold at 70 tank cars of flammable liquids, we expect to maximize the benefits of ECP brakes on the higher risk trains whose tank cars are primarily in dedicated service, while reducing the implementation challenges that would be caused by requiring ECP brakes for any train meeting the definition of an HHFT. By focusing the ECP brake system requirements on trains over the 70-car threshold that travel in excess of 30 mph, we ensure that trains with the greatest associated risk (based on volume of product) will be equipped with the advanced brake signal propagation system that has the highest known effectiveness in reducing the kinetic energy of a train during a derailment. This will reduce the number of cars derailed and punctured. We base our decision on estimates related to an average 100-car unit train transporting Class 3 flammable liquids. FRA and PHMSA's modeling shows the risk posed by a 100-car ECP-equipped unit train made up of DOT–117 tank cars, traveling at 50 mph is approximately the same as a 64-car train of the same cars traveling at the same speed operating with a two-way EOT device. We have established a baseline cut-off at 70 cars in an effort to maximize the return on investment for ECP brakes, by capturing only those trains transporting Class 3 flammable liquids in dedicated service.

In the NPRM, PHMSA and FRA relied on data produced by Sharma & Associates that showed a 36 percent effectiveness rate of ECP brakes over conventional air brakes, as expressed in the probable number of cars punctured. In March 2015, Sharma & Associates performed additional modeling that takes into account the comments received after publication of the NPRM and additional accident information provided by FRA. *See* ''Letter Report: Objective Evaluation of Risk Reduction from Tank Car Design & Operations Improvement—Extended Study,'' Sharma & Associates, March 2015. This updated, purpose-built model from Sharma & Associates supports the view that ECP brakes provide a substantial safety benefit in emergency braking situations compared to conventional air brakes, two-way EOT devices, and DP systems. While a comprehensive discussion of effectiveness rates is provided in the March 2015 Letter Report (which has been added to the docket) and the RIA, some highlights are provided below.

Puncture hazards result from a variety of factors, including operating conditions, speed of the train, and the type of tank car involved, which can make it difficult to objectively quantify the overall safety improvement that ECP brakes provide. The updated model provided by Sharma & Associates encapsulates a variety of factors in an effort to assess the real-world impact of the various braking alternatives considered in the NPRM. The Sharma model is validated by the general agreement between the actual number of tank cars punctured in 22 hazardous material derailments provided by FRA and those predicted by the model.

The March 2015 Letter Report from Sharma & Associates used the most probable number of tank cars punctured to evaluate the benefits of the tank car enhancements, brake systems, and speed. The derailment scenarios were simulated for a 100-car train at different speeds with the first car subjected to a brief lateral force to initiate the derailment. At the point of derailment, Sharma & Associates applied a retarding force to all of the cars in the train that was equivalent to an emergency brake application. For a train with

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[82] Wachs, K., p. 4

[83] Wachs, K., p 6

[84] ''Stop that train!'' March 1, 2009, *http://spectrum.ieee.org/transportation/mass-transit/stop-that-train.*

[85] ''Quebec Cartier pioneers safer, more efficient railroad brakes,'' Canadian Mining Journal, December 12, 2006, accessed 12–22–2004 at *http://www.canadianminingjournal.com/news/quebec-cartier-pioneers-safer-more-efficient-railroad-brakes/1000208809/?&er=NAhttp://www.fra.dot.gov/us/content/1713*).

[86] South Africa is another strong adopter of ECP brakes, with about 7,000 railcars equipped with ECP brake technology. It is similar to Australia in that ECP brakes are being used in heavy haul coal service where the trains operate in a continuous loop and the railroads own their own railcars for this service.

[87] ''The ECP Brake—Now it's Arrived, What's the Consensus?,'' Sismey, B. and Day, L., Presented to the Conference on Railway Excellence, 2014, Adelaide, Australia.

conventional air brakes, Sharma & Associates modeled a brake initiation propagated from the front (point of derailment or ''POD'') to the rear of the train. For a train with a two-way EOT device or a DP locomotive at the rear of the train, the emergency brake signal propagation was initiated at both ends of the train. For a train with ECP brakes, the model had all cars simultaneously receiving the braking signal with a brake ratio of 12 percent. As reflected in the table below, for DOT–117 and DOT–117R type tank cars, the ECP braking system was consistently the top performer in terms of the most likely number of cars punctured, while two-way EOT devices and DP systems with a locomotive at the rear consistently out-performed conventional air brake systems.

TABLE 26—MOST LIKELY NUMBER OF PUNCTURES: 100-CAR TRAIN, WITH POD AT HEAD END

Tank type	Speed, mph	Conventional brakes	2-way EOT (DP: lead + rear)	ECP Brakes
7/16-inch TC128, 11 gauge jacket, 1/2-inch full-height head shield	30	4.7	3.9	3.3
	40	8.0	7.1	5.3
	50	12.2	9.8	9.1
9/16-inch TC128, 11 gauge jacket, 1/2-inch full-height head shield	30	3.8	3.2	2.6
	40	6.6	5.9	4.3
	50	10.2	8.2	7.6

Based on the analysis in the 2015 Letter Report from Sharma & Associates, PHMSA and FRA believe that ECP brakes, in isolation, can be expected to reduce the number of cars punctured by up to 30 percent when compared to conventional air brake systems (with a minimal variation based on train speed), while a two-way EOT device or DP locomotive at the rear of the train is projected to reduce the number of cars punctured by up to 16 percent. These numbers are reflected in the table below, for DOT–117 and DOT–117R type tank cars.

TABLE 27—RISK IMPROVEMENT DUE TO BRAKING WITH POD AT HEAD END

100 Cars behind POD		Most likely number of punctures			% Improvement due to brakes only		
Tank type	Speed, mph	Conventional brakes	2-way EOT (DP: lead + rear)	ECP brakes	Conventional brakes	2-way EOT (DP: lead + rear)	ECP brakes
7/16-inch TC128, 11 gauge jacket, 1/2-inch full-height head shield	30	4.7	3.9	3.3	0	17	30
	40	8.0	7.1	5.3	0	11	34
	50	12.2	9.8	9.1	0	20	25
9/16-inch TC128, 11 gauge jacket, 1/2-inch full-height head shield	30	3.8	3.2	2.6	0	16	32
	40	6.6	5.9	4.3	0	11	35
	50	10.2	8.2	7.6	0	20	25
Average						16	30

Sharma modeling indicates the ECP brake system always provides an advantage over the conventional air brake system in terms of likely number of tank cars punctured. This is true regardless of the location of the derailment within the train because the brakes are being applied to each car in the train at the same time. However, a number of commenters suggested that the scenarios modeled by Sharma & Associates may overstate the effectiveness of ECP brake systems because its model focused on measuring derailments at the front of a train. As a result, FRA conducted further analysis based on the simulations of derailments at different points in the train. FRA's simulations considered derailments at locations with 100, 80, 50, and 20 cars trailing the point of derailment. A polynomial fit of the resulting derailment and puncture results data from the simulations enabled FRA to evaluate the results of a derailment at any location in the train through interpolation and extrapolation. The results of the evaluation indicated that POD does impact the estimated number of cars punctured for any of the simulated brake systems, including a reduction in the estimated number of cars punctured for trains operated in ECP brake mode. This is expected given that if a derailment occurs at the 50th car in a train rather than the first car in the train, there are fewer cars to derail after the POD. However, in every simulation, the likely number of cars punctured on a train that uses ECP braking to effectuate an emergency stop was lower than the likely number of cars punctured on a train that uses a two-way EOT device or DP system with the locomotive at the rear to effectuate the same emergency stop. See Tables 29 and 30.

TABLE 28—MOST LIKELY NUMBER OF PUNCTURES: 100-CAR TRAIN, WITH POD DISTRIBUTED THROUGHOUT TRAIN

Tank type	Speed, mph	Conventional brakes	2-way EOT (DP: lead + rear)	ECP brakes
7/16-inch TC128, 11 gauge jacket, 1/2-inch full-height head shield	30	3.4	2.8	2.6

TABLE 28—MOST LIKELY NUMBER OF PUNCTURES: 100-CAR TRAIN, WITH POD DISTRIBUTED THROUGHOUT TRAIN—Continued

Tank type	Speed, mph	Conventional brakes	2-way EOT (DP: lead + rear)	ECP brakes
	40	6.8	6.2	4.65
	50	9.3	7.92	7.2
9/16-inch TC128, 11 gauge jacket, 1/2-inch full-height head shield	30	2.8	2.4	2.2
	40	5.6	5.1	3.8
	50	7.8	6.6	6.0

TABLE 29—RISK IMPROVEMENT DUE TO BRAKING, WITH POD DISTRIBUTED THROUGHOUT THE TRAIN

100 Cars behind POD		Most likely number of punctures			% Improvement due to brakes only		
Tank type	Speed, mph	Conventional brakes	2-way EOT (DP: lead + rear)	ECP brakes	Conventional brakes	2-way EOT (DP: lead + rear)	ECP brakes
7/16-inch TC128, 11 gauge jacket, 1/2-inch full-height head shield	30	3.4	2.8	2.6	0	18	24
		6.8	6.2	4.65	0	9	31
	50	9.3	7.92	7.2	0	15	23
9/16-inch TC128, 11 gauge jacket, 1/2-inch full-height head shield	30	2.8	2.4	2.2	0	14	21
	40	5.6	5.1	3.8	0	9	32
	50	7.8	6.6	6.0	0	15	23
Average						13	26

Using this information, PHMSA and FRA conducted further analysis of the data. We estimated effectiveness at 30, 40, and 50 mph, and took a weighted average of those results based on severity, using information about the quantity of product released that is in the historical record. PHMSA and FRA assigned historical derailments under 35 mph to the 30 mph effectiveness rate, assigning derailments between 35 and 45 mph to the 40 mph effectiveness rate, and assigning derailments over 45 mph to the 50 mph effectiveness rate. This analysis is reflected in Table 30, below.

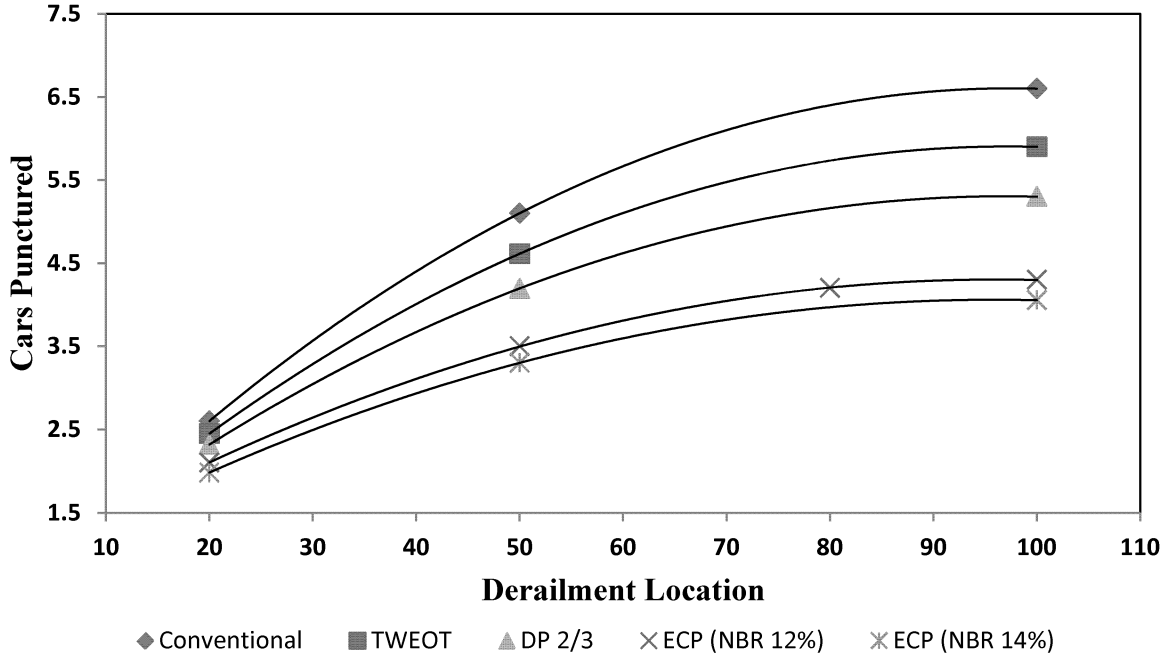
TABLE 30—EFFECTIVENESS RATE OF ECP BRAKES WEIGHTED BY VOLUME OF PRODUCT SPILLED IN A DERAILMENT

	Number of incidents	Total spill volume	Share of total volume (%)	ECP effectiveness rate at 30, 40, 50 mph (%)	Cumulative effectiveness rate (%)
Below 34 mph	33	798,433	22.8	20.10	4.6
35–44 mph	8	1488350	49.2	25.80	12.7
45 mph and above	5	980180	28	8.60	2.4
Total	46	3499656	100		19.7

Because the effectiveness rates are lower at 30 mph and at 50 mph than they are at 40 mph, this process would result in an effectiveness rate of about 20 percent, which signifies the benefit of ECP brakes compared to two-way EOT devices or DP systems, when weighted by severity using the amount of product spilled in a derailment.

As there were comments related to placing a DP locomotive in the middle of the train, approximately two-thirds from the front (*i.e.* DP 2/3), PHMSA and FRA also looked into this configuration. It found that ECP brakes also outperformed the DP 2/3 option. *See* Figure 3. This analysis is addressed more fully in the RIA.

Figure 3: Number of DOT 117 (9/16-inch) tank cars punctured based on location of first car derailed at 40 mph



The results of the simulations in the March 2015 Letter Report from Sharma & Associates and the FRA analysis of the data show that advanced brake signal propagation systems reduce the rates of puncture in derailing tank cars relative to a conventional air brake system, with ECP brake systems demonstrating the best overall performance. The risk reduction benefits for ECP brake systems are most pronounced for long trains. As trains become shorter, the differences in puncture rates become diminished between ECP brakes and two-EOT devices or DP systems with a locomotive at the rear because of the limited time needed to initiate emergency braking. Thus, additional requirements for advanced brake signal propagation systems are feasible for addressing risks related to HHFTs, and ECP brake systems are particularly appropriate for HHFUTs. A full explanation of the benefits calculation can be found in the RIA.

Availability and Costs of ECP Brake Systems

In the RIA for this final rule, PHMSA and FRA revised the assumptions made for the August 1, 2014, NPRM, including the following: Increased the estimate on the per car cost of installing ECP brakes, reduced the number of tank cars required to be equipped with ECP brakes, increased the number of locomotives required to be equipped with ECP brakes, and reduced the per locomotive cost for ECP-equipped locomotives.

Many of the commenters noted that our estimate for retrofitting a tank car with ECP brakes was low. In the NPRM, we estimated that the cost to implement the ECP brake system requirements would range between $3,000 and $5,000 per car. PHMSA and FRA now believe that the appropriate cost estimate is between $7,000 and $8,000. For our analysis we used $7,633 per car, which is based on the estimated number of new and retrofit cars that will need to have ECP brakes applied. Our updated cost estimate is for an overlay system and includes the cost of maintenance for the system.

For the NPRM, PHMSA and FRA determined that all of the tank cars in the fleet would need to be equipped with ECP brakes. To reduce the costs and for the purposes of this final rule, we have assumed that only tank cars that are part of unit trains carrying Class 3 flammable liquids would need ECP brakes, as they are the only train consists that would be required to operate with an ECP braking system. Thus, over a calculated 20-year period, we reduced the number of tank cars needing ECP brakes from more than 130,000 to 60,231.

Many of the commenters also noted that we were not equipping enough locomotives with ECP brakes in our cost estimates. In the NPRM, we estimated that 900 locomotives would need to be equipped with ECP brakes. For the purposes of the final rule, this number was increased to 2,532. This number was derived based on the determination that there would be approximately 633 HHFUTs on the U.S. rail network at peak crude oil production. PHMSA and FRA estimated that there would be an average of three locomotives per unit train and included a 25 percent spare ratio to account for locomotives that are out-of-service or potentially diverted to other uses. AAR suggested that the entire Class I locomotive fleet would need to be ECP-equipped, but with our revised estimates, which consider the number of locomotives needed operate 633 HHFUTs, we feel that AAR significantly overstates the number of locomotives that need to be ECP-equipped.

In the NPRM, we also assumed that all of the locomotives would be retrofitted with ECP brakes at a cost of $80,000 per locomotive. The rail industry currently purchases around 1,000 new locomotives every year due to retirements of older locomotives and growth in rail transport demand. PHMSA and FRA assume that new locomotives will be ordered with ECP

brakes, which reduces the costs to an incremental amount of to $40,000 per locomotive, after the base cost of electronic brake equipment (such as CCB–II or Fastbrake).[88] We also include additional costs such as battery replacement, cable replacement, and additional jumper cables to allow a locomotive not equipped with ECP brakes to assist in operating an ECP-equipped train.

Regarding the availability of ECP brakes, both known manufacturers of ECP systems (New York Air Brake and Wabtec) provided comments to the NPRM. Neither expressed the concern that they would be unable to manufacture the amount of components necessary to meet any regulatory requirements as other commenters claim. Regarding comments raising concerns about the interoperability of ECP braking systems from the two manufacturers, PHMSA and FRA believe that newly built systems will be built to the updated industry standard, AAR S–4200, which requires full compatibility (interoperability) of ECP braking systems in accordance with 49 CFR 232.603.

Implementation Schedule

Railroads are required to operate an HHFT with either a two-way EOT device or a DP system immediately once the final rule becomes effective. There are two deadlines for the implementation of the requirements pertaining to HHFUTs. The first requires that trains meeting the definition of an HHFUT comprised of at least one tank car loaded with a Packing Group I flammable liquid be operated with an ECP braking system by January 1, 2021, when traveling in excess of 30 mph. The second requires that all other trains meeting the definition of an HHFUT (*i.e.* those trains not transporting one or more tank car loaded with a Packing Group I flammable liquid) be operated with an ECP braking system by May 1, 2023, when traveling in excess of 30 mph. We believe a dual phase-in period is a practical timeline for effective implementation of the ECP braking system requirement, and it ensures that ECP braking systems will be installed to cover the expected peak year of crude oil production. This schedule takes into account feedback received during the comment period and estimates related to the retrofit schedule for DOT–117R tank cars.

ECP brake systems have not been installed on a widespread basis throughout the U.S. fleet of locomotives and rail cars. As discussed above, NS and BNSF have used ECP brakes on six unit coal trains, but U.S. railroads have not used ECP brake systems in conjunction with unit trains transporting flammable liquids, such as crude oil and ethanol. FRA and PHMSA estimate that there will be 633 HHFUTs on the U.S. rail network at peak crude oil production, and the railroad industry will need 2,532 locomotives and 60,231 tank cars to be ECP-equipped in order to comply with the ECP braking requirements. We revised our estimates from the NPRM based on comments received that manufacturers will produce approximately new 1,000 locomotives per year and more than 11,000 tank cars per year could be fitted with ECP brakes (with approximately one third of those being new car construction and two thirds of those being retrofits on existing tank cars). By establishing the dual implementation schedule for ECP brake systems, we are providing the railroads and manufacturers of locomotives and tank cars with the ability to establish a realistic schedule to equip the locomotives and tank cars with ECP brake systems in a timely and efficient manner. However, there is a possibility that as railroads amass ECP-equipped trains, some trains will be run in ECP brake mode in advance of the deadline. The expectation is that railroads will have incentives to put ECP-equipped trains in service once acquired to take advantage of the business benefits related to operating in ECP brake mode (*e.g.,* reduced fuel consumption, longer inspection intervals, etc.).

Training for ECP Brake Systems

Although there is not a specific training requirement in this final rule, FRA and PHMSA recognize that the implementation of ECP brake systems will require training for operating employees and inspection personnel that perform service on trains equipped with ECP brakes. The substantive training requirements for each railroad employee or contractor are addressed in 49 CFR 232.605. We expect that railroads will comply with the ECP braking system training requirements in § 232.605 to ensure that applicable railroad personnel have the knowledge and skill necessary to perform service related to ECP braking systems.

In the NPRM, we assumed that 9,000 employees would need to be trained on ECP brake systems. After a review of comments, we increased the estimate of additional people that need to be trained on ECP brake systems to about 51,500 employees based on a percentage of ton mileage. This includes carmen who had not been considered in the training calculations in the NPRM. Also, in the NPRM, we assumed a two-week training period; however, based on FRA participation in ECP brake training experience, we determined that the number of hours needed to trains these employees would be substantially less. Carmen that are not involved in performing single car tests can be trained in a one-day formal training session and a week of intermittent on the job training. Single car test users will need an additional half-day of formal training and an additional week of on the job training.

Implementing ECP Brake Systems With PTC Technology

ECP brake technology provides separate safety benefits not captured in FRA's PTC regulations. PTC-preventable overspeed derailments may occur because of an inadequate or improperly functioning brake system, but accidents involving brake failure were never counted among PTC-preventable accidents. Only one accident in the group of accidents reviewed by PHMSA and FRA for this rulemaking, at Rockford, IL, had the potential to have been prevented by PTC technology, and then only if ancillary features were adopted. In that accident, a flash flood caused the track's base to wash away. Railroad procedures require trains be warned of flash flood threats, which usually leads to a speed restriction. It is not a requirement of the PTC regulations, but if a railroad had its PTC system in place and the speed restriction warning was automated, it would have restricted the train's speed, making it likely the crew would have been able to stop in half the range of vision.

Although ECP braking systems typically are directed at different types of incidents than those that are PTC-preventable, PHMSA and FRA do believe that the use of ECP brakes coupled with the implementation of PTC technology could result in significant safety benefits. Trains equipped with electronics throughout the train consist will be able to use that electronic network as a platform for future safety innovations, such as hand brake and hatch sensors.

While commenters such as BNSF raised concerns, PHMSA and FRA do not believe that the implementation of the ECP brake system requirement will necessitate a rewrite of braking algorithms on HHFUTs operating over PTC routes. We do recognize that using ECP brakes systems will allow for real-time equipment health monitoring and

[88] CCB II and Fastbrake are the commercially available base brake equipment offered by New York Air Brake and Wabtec respectively.

higher permitted braking ratios. A railroad may find it beneficial to create a more efficient algorithm than is possible with conventionally braked trains in order to implement some of these ECP brake system benefits into its PTC system. The more efficient algorithm could allow for increased fluidity and more throughputs over railroad routes on ECP-equipped trains. If a railroad decided to edit its braking algorithms to account for the advanced braking capabilities of ECP brake systems on PTC routes, such changes likely would be considered ''safety critical'' modifications requiring FRA approval. *See* 49 CFR 236.1021. However, given that the ECP brake requirements for HHFUTs do not go into effect until January 1, 2021 at the earliest, railroads will have sufficient time to make desired edits to braking algorithms and submit any necessary requests for approval to FRA. Therefore, PHMSA and FRA do not view the editing of braking algorithms as an impediment to accomplishing the requirements of this rulemaking or complying with FRA's PTC regulations.

Conclusion

Based on the above discussion, a new section § 174.310(a)(3) is being created to adopt new braking requirements for HHFTs. Specifically, this provision requires that a HHFT (as defined in § 171.8) must be equipped and operated with a two-way EOT device or DP system. Heightened braking requirements are being adopted to cover trains that transport 70 or more tank cars of flammable liquids while operating over 30 mph. Unit trains that meet this threshold must be equipped with ECP brakes and must be operated in ECP brake mode based on a dual implementation schedule. The first requires that trains meeting the definition of an HHFUT comprised of at least one tank car loaded with a Packing Group I material be operated with an electronically controlled pneumatic (ECP) braking system after January 1, 2021. The second requires that all other trains meeting the definition of an HHFUT be operated with an ECP braking system after May 1, 2023.

PHMSA and FRA have made regulatory decisions within this final rule based upon the best currently available data and information. PHMSA and FRA are confident that ECP implementation can be accomplished by the compliance date adopted in this final rule. However, PHMSA and FRA will continue to gather and analyze additional data. Executive Order 13610 urges agencies to conduct retrospective analyses of existing rules to examine whether they remain justified and whether they should be modified or streamlined in light of changed circumstances, including the rise of new technologies. Consistent with its obligations under E.O. 13610, Identifying and Reducing Regulatory Burdens, PHMSA and FRA will retrospectively review all relevant provisions in this final rule, including industry progress toward ECP implementation.

E. Classification

In its recommendation, R–14–6, the NTSB recognized the importance of requiring ''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.'' PHMSA supports NTSB's recommendation. As discussed previously, PHMSA and FRA audits of crude oil facilities indicated the classification of crude oil transported by rail was often based solely on a generic Safety Data Sheet (SDS). PHMSA believes that establishing documentation and criteria for classification sampling and testing frequency will increase consistency and accuracy of the data and improve confidence in package selection, hazard communication, and ultimately safety in the transportation of hazardous materials. Considering the challenges posed by materials with variable composition and potentially variable properties, such as crude oil, providing criteria for sampling and testing a critical first-step in safe transportation.

Given the responsibility on the offeror to properly classify materials,[89] PHMSA proposed a new regulatory requirement in this area. The NPRM proposed to add a new § 173.41 that would explicitly require a sampling and testing program for mined gases and liquids, including crude oil. Under the proposed new § 173.41(a), this program would be required to address the following key elements that are designed to ensure proper classification and characterization of crude oil:

- Frequency of sampling and testing to account for appreciable variability of the material, including the time, temperature, means of extraction (including any use of a chemical),[90] and location of extraction;
- Sampling at various points along the supply chain to understand the variability of the material during transportation;
- Sampling methods that ensure a representative sample of the entire mixture, as packaged, is collected;
- Testing methods to enable complete analysis, classification, and characterization of the material under the HMR;
- Statistical justification for sample frequencies;
- Duplicate samples for quality assurance purposes; and
- Criteria for modifying the sampling and testing program.

This proposal would also add a § 173.41(b), linking the shipper's certification requirements, as prescribed in § 172.204, to this sampling and testing program for mined gases and liquids.

In addition, the proposed § 173.41(c) would require that the sampling and testing program be documented in writing and retained while the program remains in effect. The proposed section requires the sampling and testing program must be reviewed and revised and/or updated as necessary to reflect changing circumstances. The most recent version of the sampling and testing program, must be made available to the employees who are responsible for implementing it. When the sampling and testing program is updated or revised, all employees responsible for implementing it must be notified and all copies of the sampling and testing program must be maintained as of the date of the most recent version.

PHMSA further proposed to add a new § 173.41(d) that would mandate that each person required to develop and implement a sampling and testing program maintain a copy of the sampling and testing program documentation (or an electronic file thereof) that is accessible at, or through, its principal place of business and must make the documentation available upon request, at a reasonable time and location, to an authorized official of DOT.

In response to the proposed requirements for a sampling and testing program, we received a number of comments representing approximately 65,200 signatories. The majority of these signatories were part of write-in campaigns for environmental groups. Below is a table detailing the types and amounts of commenters on the classification plan proposal.

[89] Under 49 CFR 173.22.

[90] This accounting for the method of extraction would not require disclosure of confidential information.

TABLE 31—COMMENTER COMPOSITION: CLASSIFICATION COMMENTS

Commenter type	Signatories
Non-Government Organization	62,045
Individuals	3,098
Industry stakeholders	23
Government organizations or representatives	29
Totals	65,195

Most industry stakeholders were either content with the measures currently in place to classify mined gases or liquids or supported use of API RP 3000.[91] However, other commenters believed both the current and proposed regulations were insufficient. Environmental groups, the NTSB, local, tribal or state government organizations, and individuals felt that the DOT should clarify and expand the proposed requirements. Specifically, commenters addressed: The need for enhanced classification; use of the term ''characterization;'' inclusion of specific materials in the testing and sampling program; variability of mined liquids and gases; applicability and ''sampling along the supply chain''; sampling methodology and documentation; incorporation and use of API RP 3000 standards; specific testing methodology; and applicability of testing requirements.

Industry stakeholders questioned the need for regulatory amendments expanding the existing classification requirements. Several industry stakeholders stated that there is no justification for creating additional classification requirements because misclassification has had no role in the derailments or impact on safety. Specifically Exxon Mobil stated that Bakken crude oil is not different from other light crudes and is correctly classified. It referenced API modeling, which has indicated that Bakken crude will behave similarly to other crudes in a fire. AFPM further stated that the ''only misclassification'' PHMSA found during investigations was incorrect packing group on shipping papers for cargo tank motor vehicles, but crude oil was otherwise communicated and packaged appropriately. PHMSA received support for implementing an enhanced classification and characterization from a wide range of commenters including local governments, safety organizations, and individual citizens among others. Many comments in support of the rulemaking highlighted the importance of proper classification for emergency responders.

Although the classification of crude oil has not caused derailments, we disagree that expanding existing classification requirements will not impact transportation safety. In this rulemaking, PHMSA is proposing new or amended requirements as part of a comprehensive approach to improving the safe transportation of flammable liquids by rail. This includes ensuring that proper packaging, operational controls, and hazard communication requirements are met, all of which are important to mitigate the negative effects of derailment, and are determined by classification. As discussed previously, PHMSA and FRA audits of crude oil facilities indicated the classification of crude oil transported by rail was often based solely on a Safety Data Sheet (SDS). While the classification of manufactured products is generally well understood and consistent, unrefined petroleum-based products potentially have significant variability in their 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. Unrefined petroleum-based products refers to hazardous hydrocarbons that are extracted from the earth and have not yet been refined. These products may undergo initial processing such as for the removal of water and light gases, and which may undergo further processing, but have not gone through a quality assurance/quality control process such that the properties of the product being offered for transportation are known and consistent. As such, we believe it is necessary to require development and adherence to a consistent and comprehensive sampling and testing program, and to provide oversight for such a program.

Several commenters indicated that the term ''characterization'' was not defined, unnecessary, or requires clarification. This term was used in the March 6, 2014 Emergency Order regarding classification to highlight the comprehensive nature of the existing requirements. DGAC, API and other commenters stated that the term ''characterization'' is not used elsewhere in the regulations and is confusing. Industry stakeholders also expressed concern that the types of testing required for characterization was unclear. Local and other government representatives, environmental groups, individuals, and others supported use of the term ''characterization.''

As used in the NPRM and March 6, 2014 Emergency Order, the term characterization was intended to convey the comprehensive nature of the offeror's responsibility to fully classify and describe their material in accordance with Parts 172 and 173. This includes identifying additional properties of the hazardous material which are not specified by the proper shipping name, but are necessary to meet packaging requirements in Part 173. We agree that the current classification requirements as required by § 173.22 encompasses the requirement to fully describe the material, including considering all appropriate hazard classes, selecting the correct packing group, selecting the most appropriate proper shipping name, and obtaining complete information to follow all packaging instructions. However, we disagree that hazard class testing is sufficient to provide the information necessary to comply with § 173.22. Therefore, we are clarifying the sampling and testing program to include a requirement to ''identify properties relevant to the selection of packaging through testing or other appropriate means,'' in place of using the term ''characterization.'' This provides greater specificity and clarity to the purpose and type of testing required.

Several commenters addressed the inclusion of specific materials in the sampling and testing program requirements, with some commenters preferring broader applicability and some narrower. Comments ranged from supporting expanding the applicability of classification sampling and documentation requirement to all hazardous materials, clarifying the definition of ''mined liquids and gases'' to specify inclusion of hazardous byproducts and wastes or materials derived from hydraulic fracking or other methods of extraction, and limiting the applicability of the definition to only include petroleum crude oil. Commenters on both sides were concerned that the phrase ''mined liquids and gases'' did not clearly specify which materials were covered by the rulemaking. Trade Associations such as API, AFPM and DGAC stated that the term ''mined liquids and gases'' is ''not used by the petroleum industry.'' Other commenters questioned which specific materials met the definition of ''mined liquids and gases.''

We disagree with NTSB's request to expand the sampling and testing program to all hazardous materials.

[91] This recommend practice went through a public comment period in order to be designated as an American National Standard. The standard addresses the proper classification of crude oil for rail transportation and quantity measurement for overfill prevention when loading crude oil into rail tank cars.

PHMSA does not believe there is sufficient justification to expand the rule to all hazardous materials or manufactured liquids such as ethanol. The intent of the sampling and testing plan is to address materials that have inherent variability of properties. Further, we did not propose to expand the applicability beyond mined liquids and gases.

We disagree with commenters who suggested the sampling and testing program should be expanded to address all other byproducts or wastes created by the extraction process of all mined liquids and gases, including byproducts or wastes created by the hydraulic fracturing of natural gas. The HMR already requires classification of all hazardous materials before transportation and compliance with all packaging requirements. Commenters did not provide sufficient data to justify expanding costs and recordkeeping for a sampling and testing program to these additional materials.

We also disagree with commenters who suggested the testing and sampling requirements should be limited to only petroleum crude oil. As stated previously, the extraction process and initial conditioning of petroleum crude oil may include the production of other unrefined petroleum-based products, which may have variable properties that must be identified.

We agree with commenters that state the phrase 'mined liquids and gases' needs further clarification. As proposed, the term ''mined liquids and gases'' referred to liquids and gases extracted from the earth through methods such as wells, drilling, or hydraulic fracturing. While the term ''mined liquids and gases'' was proposed in the rulemaking, the RIA only included offerors related to the production and extraction of petroleum liquids, liquefied petroleum gases (including propane), and natural gases when measuring affected entities. No data was provided by commenters to justify benefits from expanding the definition beyond petroleum liquids, liquefied petroleum gases, and natural gases extracted from the earth. This list includes both unrefined and refined petroleum-based products. However, unrefined products have the greatest potential for variability of chemical and physical properties. The properties of refined petroleum-based products shipped from extraction sites are consistent. Therefore, we are clarifying the scope of this section to apply to unrefined petroleum based products. Specifying ''unrefined petroleum-based products'' refers to hazardous hydrocarbons that are extracted from the earth and have not yet been refined. This includes petroleum-based liquid and gas wastes and byproducts, such as condensates, which exhibit variability. Furthermore, use of the term ''unrefined'' provides greater clarification to the other requirements of the testing and sampling program. Therefore, specifying unrefined petroleum-based products clarifies the identification of mined liquids and gases with variable properties intended by the NPRM, without creating an undue burden.

Some commenters addressed the question in the NPRM asking for information on the variability within a region. API identified several factors that affect variability, not addressed in the NPRM, such as, ''stability of petroleum crude oil to be loaded, single source vs. multiple sources, type of tank car loading facility, changes in crude oil production characteristics.'' It further stated that the requirement to include factors affecting variability in § 173.41(a)(1) describe the materials in the form they are extracted from the ground, but not the form they are shipped. Similarly, API and other commenters express concern that the requirement in § 173.41(a)(3) to sample material ''as packaged'' suggests that sampling may only be performed after the crude oil has been loaded into a transport vehicle.

We agree with API, that the intent of these requirements is to capture factors that may contribute to variability of the material as offered for transportation. We are clarifying § 173.41(a)(1) to specify that the program must account for ''any appreciable variability of the material'' with a list of recommended factors. This provides offerors the flexibility to identify the factors contributing to variability in their specific operation. We are also amending § 173.41(a)(3) to replace ''as packaged'' with ''as offered'' to clarify that the sampling may occur before the crude oil has been loaded into a transport vehicle.

Commenters expressed interest in clarifying the responsibility for development and execution of the sampling and testing program. For example, one consultant stated, ''the term 'offeror' and sampling program requirements are too broad to effectively determine who is ultimately responsible for compliance.'' Individuals and environmental groups suggested specifying that ''each operator'' or ''custody transfer point'' should be responsible for complying with the sampling and testing program. Industry stakeholders, including AFPM, recommended ''less prescriptive mandates'' for the sampling program and suggested duplicate sampling provided an undue burden. Commenters also suggested providing statistical justification for sample frequencies was an undue burden, or that the provision should be delayed to allow time for compliance. Public and environmental groups supported more detailed mandates to ensure uniformity, thoroughness, and clarity. While some commenters supported certification requirements, others recommended removing the requirement or modifying the language. Commenters on both sides agreed the requirement to sample ''along the supply chain'' is not sufficiently clear, and should be clarified.

The one area where the concerned public, environmental groups, and industry stakeholders agreed was that API RP 3000 should be adopted or permitted as a method of compliance with the proposed requirements. API further described that many requirements in the proposed paragraph § 173.41(a)(1) would align with API RP 3000 requirements, if clarifications were made. API provided detailed recommendations for amending the requirements in § 173.41. In addition to areas mentioned elsewhere in the comment summary, API recommended changing the requirement for ''statistical justification'' to ''quality control justification'' to allow other equivalent methods for quality control, changing the requirement for duplicate sampling to allow other equivalent methods, and removing the requirement to specify criteria for changing the program.

We disagree that the responsibility for compliance with the program is unclear. It is the responsibility of the offeror to certify compliance with the sampling and testing program. The term ''offeror'' is used throughout the regulations to specify applicability for transportation functions and is defined under ''person who offers'' in § 171.8. In response to comments stating that ''sampling along the supply chain'' is unclear, we are clarifying this language. The intent of this provision is to require sampling both before the product is initially offered and when changes that may affect the properties of the material occur (*i.e.,* mixing of the material from multiple sources).

We disagree the other requirements of the program are unnecessary, unclear, or overly burdensome, as each provision is designed to ensure adequate sampling and testing to address the unique characteristics and variability of the properties of these materials. Moreover, these requirements align with and provide greater specificity regarding existing regulations requiring proper classification. However, we also agree

with API that an equivalent level of safety and quality control intended by the requirements for ''duplicate sampling'' and ''statistical justification'' can be reached through other measures. Therefore, we are adopting ''quality control measures for sampling frequencies,'' in place of ''statistical justification.'' We are also adding ''or equivalent measures for quality assurance'' to the requirement for ''duplicate sampling.''

Finally, we are not adopting API RP 3000 as a requirement at this time. As indicated in the NPRM, we did not contemplate or propose adopting API RP 3000 in the NPRM, as it had not yet been finalized. Furthermore, the boiling point test specified in the API RP 3000 does not align with the requirements currently authorized in the HMR. Shippers must continue to use the testing methods for classification of flammable liquids outlined in § 173.120 and flammable gases in § 173.115. However, API RP 3000 is otherwise consistent with the sampling program requirements in paragraph 173.41(a)(1)–(6) and may be used to satisfy these adopted sampling provisions. Furthermore, voluntary use of API RP 3000 provides guidance for compliance with these provisions, but still allows flexibility for meeting requirements through other methods.

Comments regarding the specific testing methodology ranged from specifying more limited sampling and testing program requirements to mandating a more robust, detailed sampling and testing program. Local and state governments, environmental groups, and individuals recommended mandating who performs testing (*e.g.,* requiring third-party oversight of testing program or specifying tests could only be performed by third party without financial interest in company). Commenters also recommended requiring dissemination of test results to third parties such as DOT, local governments, emergency responders, or the public. Industry stakeholders recommended limiting testing to flashpoint and boiling point determination. Other commenters recommended mandating specific, additional tests. Commenters expressed particular interest in either mandating that vapor pressure be tested or clarifying that it is never required for flammable liquids.

Requiring third-party oversight of testing program or specifying tests could only be performed by third party without financial interest in company is not necessary as PHMSA and FRA will already have oversight of the sampling and testing program requirements for unrefined petroleum-based products. As part of the requirements adopted in this rule, each person required to develop a sampling and testing program make the documentation available upon request to an authorized official of the Department of Transportation. This provides sufficient oversight and will ensure that offerors are complying with the requirements. Should an offeror not comply, PHMSA and FRA officials will be able to take enforcement action. In addition, requiring dissemination of test results to third parties is not necessary as the emergency response guidebook already provides information on the hazards of specific materials and through the routing requirements, fusion centers can provide a mechanism for authorized individuals to acquire information about the amount of those materials transported.

PHMSA did not propose requiring third-party involvement with testing or submitting test results to a third party in the NPRM and, as such, is not adopting any such requirements. PHMSA did not propose regulatory changes to classification test procedures, and as such, is not adopting any such requirements. Furthermore, in the NPRM, PHMSA stated that we are not proposing a requirement for the retention of test results.

PHMSA requested comments on the role of vapor pressure in classifying flammable liquids and selecting packagings, as well as whether vapor pressure thresholds should be established. Under existing requirements and those proposed in this final rule, shippers must select all appropriate tests for the changing factors appropriate to the location and nature of their activities, and follow requirements under § 173.115 relating to vapor pressure when applicable. Individuals, government organizations, and environmental groups such as Delaware Riverkeeper Network supported mandating vapor pressure testing to increase safety and accuracy. Environmental groups and offeror Quantum Energy also suggested packaging selection should be based on vapor pressure. Industry stakeholders, such as the Dangerous Goods Advisory Council (DGAC) and AFPM stated vapor pressure testing was unnecessary.

PHMSA did not propose any other specific changes related to vapor pressure in the NPRM and, as such, is not adopting any such requirements. We appreciate the comments received on this issue and will consider them in any future action.

PHMSA has continued its testing and sampling activities and refined the collection methods. As mentioned previously, PHMSA has purchased closed syringe-style cylinders and is collecting samples using these cylinders. Utilizing these types of cylinders minimizes the opportunity for any dissolved gases to be lost during collection, thus providing increased accuracy. In addition, PHMSA has taken samples at other shale play locations around the United States to compare their characteristics to that of crude oil from the Bakken region. PHMSA continues to examine the role of vapor pressure in the proper classification of crude oils and other flammable liquids. Further we continue to explore collaborative research opportunities examining the classification of flammable liquids. Any specific regulatory changes related to vapor pressure would consider further research and be handled in a future rulemaking.

Furthermore, since the publication of the NPRM, the North Dakota Industrial Commission issued Oil Conditioning Order No. 25417, which requires operators of Bakken crude oil produced in the state of North Dakota to separate the gaseous and light hydrocarbons from all Bakken crude oil that is to be transported. The order also prohibits blending of Bakken crude oil with specific materials.[92]

PHMSA appreciates any action that improves the safe transportation of crude oil or other hazardous material. As with any hazardous material put into transportation by any mode, safety is our top priority, and we will continue to conduct inspections or bring enforcement actions to assure that shippers comply with their responsibilities to properly characterize, classify, and package crude oil regardless of how it is treated prior to transport. We also continue to work with various stakeholders, including other government agencies such as the Department of Energy, to understand best practices for testing and classifying crude oil. See also Section VI ''Crude Oil Treatment'' for additional discussion on this issue.

This comprehensive rule seeks to improve the safety of bulk shipment of all flammable liquids across all packing groups, and is not limited to Bakken crude. The enhanced tank car standards and operational controls for high-hazard flammable trains are not directly impacted by the order recently imposed in North Dakota. Any specific regulatory changes related to treatment of crude oil would consider further research and be handled in a separate action.

[92] *https://www.dmr.nd.gov/oilgas/Approved-or25417.pdf.*

Commenters suggested other changes affecting the applicability of the sampling and testing program. AFPM recommended addressing ''exemptions'' or ''less prescriptive alternatives.'' Some trade associations suggested exempting materials from requirements for the classification program when transported in DOT–117s. Other commenters suggested exempting petroleum crude oil from the sampling requirements when assigned to packing group I or when crude oil is pre-treated. Commenters also recommended changes to the packing group assignment and classification process for Class 3. Environmental groups recommended requiring either Bakken crude oil or all petroleum crude oil to be classified as Packing Group I. Industry stakeholders agreed that crude oil should be permitted to be classified as packing group III. AAR recommended prohibiting use of the combustible liquid reclassification criteria for petroleum crude oil. Government representatives, environmental groups and individuals suggested prohibiting the use of Packing Group III for Class 3 flammable liquids.

In the NPRM, PHMSA asked how to provide flexibility and relax the sampling and testing requirements for offerors who voluntarily use the safest packaging and equipment replacement standards. However, we did not propose exemptions from the sampling and testing program or changes to the assignment of packing groups for petroleum crude oil or in the NPRM and, as such, is not adopting any such requirements. The current hazard classification criteria are sufficient for assigning packing group when proper sampling and testing occurs. We disagree that pre-treatment of crude oil, use of DOT–117 tank cars, or other exemptions discussed by commenters adequately ensures the safest packaging and equipment replacement standards to justify opting out of the sampling and testing requirements for the materials adopted by this rulemaking. Furthermore, these exemptions do not provide an equivalent level of safety for identifying properties to ensure compliance with packaging requirements in Part 173. The sampling and testing program is important to accurately classify these materials for transportation and fully comply with the packaging and operational controls in the HMR. Therefore, we are not limiting the assignment of packaging group for petroleum crude oil, or providing exceptions to the sampling and testing program for applicable materials.

Conclusion

Based on the justification above, PHMSA is adopting the proposed standardized sampling and testing program requirements for unrefined petroleum-based products with changes intended to clarify the intent of requirements. This sampling and testing program requirements for unrefined petroleum-based products will be codified in the new § 173.41. We are not incorporating API RP 3000 by reference. However, shippers may still use API RP 3000 as a voluntary way to comply with the newly adopted sampling requirements. It should be noted that all of the testing provisions of API RP 3000 do not align with the requirements in the HMR. As the testing provisions were not proposed to be modified, shippers must continue to use the testing methods for classification of flammable liquids outlined in § 173.120 and flammable gases in § 173.115. It should be noted that PHMSA may consider the adoption of the non-codified testing provisions of API RP 3000 in a future rulemaking.

F. Routing

PHMSA proposed in the August 1, 2014 NPRM, in § 174.310(a)(1), to modify the rail routing requirements specified in § 172.820 to apply to any HHFT. The routing requirements discussed in the NPRM reflect the practices recommended by the NTSB in recommendation R–14–4, and are in widespread use across the rail industry for security-sensitive hazardous materials (such as chlorine and anhydrous ammonia). As a result, rail carriers would be required to assess available routes using, at a minimum, the 27 factors listed in Appendix D to Part 172 (hereafter referred to as Appendix D) of the HMR to determine the safest, most secure routes for security-sensitive hazardous materials. Additionally, the requirements of § 172.820(g) require rail carriers to establish a point of contact with state and/or regional fusion centers who coordinate with state, local, and tribal officials on security issues as well as state, local, and tribal officials that may be affected by a rail carrier's routing decisions and who directly contact the railroad to discuss routing decisions. This requirement will in essence capture threshold notification requirements for HHFTs as discussed in further detail in the next section.

In response to the proposed amendments to routing, we received comments representing approximately 87,359 signatories. An overwhelming majority of commenters expressed support for additional routing requirements for HHFTs. The majority of commenters supported the amendment as proposed in the NPRM; however, some commenters supported the expansion of the routing requirements beyond what was in the NPRM. Some industry commenters expressed opposition to additional routing requirements for HHFTs. Commenters also took the opportunity to identify other issues related to routing beyond the proposal to require rail carriers who transport HHFTs to perform routing assessments. Below is a table detailing the types and amounts of commenters on the routing proposal.

TABLE 32—COMMENTER COMPOSITION: ROUTING COMMENTS

Commenter type	Signatories
Non-Government Organization	85,017
Individuals	2,292
Industry stakeholders	20
Government organizations or representatives	30
Totals	87,359

Commenters who either supported the proposal in the NPRM or the expansion of the proposal in the NPRM were primarily concerned members of the public, environmental groups, tribal communities, local governments, and Congressional representatives. Commenters in support, such as Congressman Michael E. Capuano, recognized the value of expanding the scope of the route planning regulations to include routing HHFTs away from dense population centers and environmentally sensitive areas, stating, ''I fully support requiring HHFT carriers to perform a routing risk analysis and then select their route based on the findings of that analysis.''

Additionally, the NTSB commented, ''we believe that the proposed rule, if implemented, would satisfy the intent of Safety Recommendation R–14–4,'' which urges an expansion of the route planning requirements to include trains transporting flammable liquids.

The Prairie Island Indian Community provided a specific example of a community that could be directly affected by the implementation of the routing requirements. They noted that their community is home to ''hundreds of tribal member residents, potentially thousands of visitors and employees at the Treasure Island Resort and Casino, a dry cask storage facility currently hosting 988 metric tons of spent nuclear fuel, an operating nuclear power plant with two reactors and approximately

635 metric tons of spent nuclear fuel in the fuel pool.'' They noted that ''if ever there was a case for rail routing risk assessment, this is it.'' With this, the Prairie Island Indian Community provided their support for implementing routing requirements for HHFTs.

Some commenters proposed expanding upon the existing risk factors listed in appendix D. Recommended expansions to appendix D included a factor to avoid routes that pass through areas that experience a high density of commuters at peak times. Additionally, environmental groups and concerned public urged considering a route's proximity to watersheds and water supplies. Environmental advocate Scenic Hudson, Inc. commented that the route assessment should include avoiding National Parks and other historical landmarks, such as those identified by the National Trust for Historic Preservation or designated as National Heritage Areas by Congress.

PHMSA and FRA recognize the assertion by some commenters that the list of 27 risk factors in appendix D should be expanded to address various additional specific risk factors. These comments are beyond the scope of this rulemaking. In the NPRM, PHMSA and FRA did not propose revisions to appendix D, nor did we solicit comments on revising the current list of risk factors in appendix D. However, given the number of concerns raised by commenters on this particular issue, PHMSA and FRA believe it is important to clarify that the 27 factors currently listed in appendix D are inclusive of the more specific factors that several commenters suggested adding to the list. For example, ''watersheds'' are expected to be considered under risk factor number 13 in appendix D entitled ''environmentally sensitive or significant areas'', and ''national landmarks'' are expected to be considered in risk factor number 12 entitled ''proximity to iconic targets.'' Also, it is important to emphasize that, in addition to numerous other factors, a route assessment must address venues along a route (stations, events, places of congregation), areas of high consequence, population density, and the presence of passenger traffic along a route. Hence, the concerns raised by commenters, while beyond the scope of this rulemaking, are generally already addressed by the risk factors in appendix D.

Commenters also expressed concerns regarding the risk analysis done by rail carriers and how that information is used, shared or evaluated. Many commenters shared concern that routing choices by carriers are not disclosed to the public and are kept secret. Some commenters also supported increased oversight of routing analyses, either through evaluation by a third party or governmental entities.

These route analysis and selection requirements exist for the transportation of security-sensitive materials, such as poisonous-by-inhalation materials, certain explosives and certain radioactive materials. As such, information about the analyses and routes of shipments should only be released to those with a need-to-know, in order to maintain confidentiality for both business and security purposes. In accordance with voluntary practices and existing requirements, including the Secretary's May 7, 2014 Emergency Order (Docket No. DOT–OST–2014–0067), routing information is shared with appropriate state, local, and Tribal authorities.

Furthermore, as § 172.820(e) states, rail carriers must restrict the distribution, disclosure, and availability of information contained in all route review and selection decision documentation (including, but not limited to, comparative analyses, charts, graphics or rail system maps) to covered persons with a need-to-know, as described in 49 U.S.C. Parts 15 and 1520, which govern the protection of sensitive security information. DOT provides oversight for route analysis, selection and updating. As § 172.820(e) provides, rail carriers must maintain all route review and selection documentation, which DOT may review in the course of its regulatory and enforcement authority. Specifically, FRA personnel oversee compliance with routing regulations by completion of regular security audits of Class I and shortline railroads (Class II and III). Part of the security audit involves review of route selection documentation to ensure that the selection was completed, documented, and considered the appropriate risk factors specified in appendix D to part 172.

Additionally, PHMSA and FRA received comments that supported allowing an ''opt out'' for communities to choose not to allow HHFTs to be transported through their areas. Additionally, King County, WA voiced support for the proposed requirements, but urged the use of the information gathered from the route analyses to identify critical infrastructure needs along a route such as additional crossing gates, signals and track integrity to avoid collision and derailment.

PHMSA believes these comments are outside the scope of the requirements proposed in the NPRM. PHMSA did not propose any provisions for communities to make unilateral decisions to disallow HHFT shipments, and such a requirement may call into question issues of preemption. Also, local government crude by rail prohibitions could have detrimental impacts on the fluidity of the entire national rail network, including passenger service. With respect to the use of route analysis information for the purpose of improving infrastructure, PHMSA and FRA believe that by expanding the routing requirements to HHFTs, more routes will be analyzed, and infrastructure needs will be identified by the railroads as an indirect benefit. However, codifying the use of this information for purposes beyond route analysis and selection was not proposed and is outside the scope of this rulemaking.

Commenters who opposed additional routing requirements for HHFTs include trade associations, rail carriers and rail-carrier related businesses. While these commenters represented a minority of those who responded to routing proposals from the NPRM, concerns and issues were raised. The AAR, the Institute for Policy Integrity and the Illinois Commerce Commission (ICC) state that PHMSA needs to be aware of the implications of expanding the additional routing requirements to HHFTs. These commenters assert that such an expansion will narrow the routes over which HHFTs may operate and will force HHFTs to travel the same lines thus causing distributional effects on the network. AAR stated that network fluidity would be negatively impacted by clogging certain routes. In addition, the ICC stated that the AAR and ASLRRA have put in place voluntary agreements with the Department to mitigate the consequences of an incident, should one occur, and that those are sufficient. A concerned public commenter noted that the number of factors a route analysis should be narrowed from 27 to 5–7.

PHMSA and FRA disagree with comments in opposition to expanding routing requirements to rail carriers transporting HHFTs. We believe that any effects on the network that negatively impact fluidity or distributional effects will be minor compared to the safety benefits of the proposed requirements. Commenters who expressed concern regarding the negative impact that applying routing requirements to HHFTs would have on the rail network did not provide data to support their claims. Additionally, comments implying a strain on the network caused by increased operational requirements focused on

speed restrictions proposed in the NPRM. A route selection performed in accordance with § 172.820(e) does not expressly prohibit a carrier from selecting a particular route. Instead, carriers must use their analysis to select the practicable route posing the least overall safety and security risk. Carriers may also choose to install or activate mitigating measures to address any of the safety and security risks found. Additionally, rail carriers must identify and analyze practicable alternative routes over which it has authority to operate if such an alternate route exists. Furthermore, in accordance with Appendix D, carriers are required to assess a number of factors that would generally be representative of potential network strains or congestion, including assessment of ''rail traffic density'' and ''trip length for route.''

Also, as required by § 172.820(g), a carrier transporting an HHFT will be required to establish a point of contact with a State or regional fusion center, which have been established to coordinate with state, local and tribal officials on security issues. Additionally, a carrier transporting an HHFT will be required to establish a point of contact with state, local, and tribal officials in jurisdictions that may be affected by a rail carrier's routing decisions and who directly contact the railroad to discuss routing decisions. In turn, state, local, and tribal officials can use this to inform local emergency responders along routes traveled by HHFTs. By limiting the routes HHFTs travel on, it will allow resources for emergency response capabilities to be focused on heavily trafficked routes while minimizing risk to vulnerabilities adjacent to the rail network. PHMSA and FRA believe that this will further bolster the ability for state and local officials to respond to rail related incidents while furthering communication between the railroads and state and local governments and the availability of this information to first responders through established emergency communication networks, such as fusion centers.

Conclusion

Based on the above justification, PHMSA and FRA are modifying the rail routing requirements specified in § 172.820 to apply to any HHFT, as the term is defined in this final rule (§ 171.8; See discussion in HHFT section). We estimate the cost impact to be approximately $15 million, as Class 1 railroads have already been required to perform these analyses for materials already subject to routing requirements (poisonous-by-inhalation, certain explosives, and certain radioactive materials). Therefore, the cost impact is primarily limited to shortline and regional railroads (Class 2 and Class 3). We anticipate this to be a minimal burden on shortline railroads, as they typically operate a single route and therefore would lack alternative routes to analyze. It should be noted that ASLRRA did not comment on this specific proposal.

The amendments in this final rulemaking relating to rail routing will require rail carriers transporting an HHFT to: (1) Conduct an annual route analysis considering, at a minimum, 27 risk factors listed in Appendix D prior to route selection; and (2) identify a point of contact for routing issues, and who to directly contact the railroad to discuss routing decisions, and provide this information to state and/or regional fusion centers and state, local, and tribal officials in jurisdictions that may be affected by a rail carrier's routing decisions. In addition, PHMSA and FRA believe that the requirement for rail carriers to establish fusion center contacts will address the need for notification requirements, as discussed in further detail in the ''Notification'' section below. By not adopting the separate notification requirements proposed in the NPRM and instead relying on the expansion of the existing route analysis and consultation requirements of § 172.820, to include HHFTs, we are focusing on the overall hazardous materials regulatory scheme.

G. Notification

On May 7, 2014, DOT issued an Emergency Order (''the Order'') requiring each railroad transporting one million gallons or more of Bakken crude oil in a single train in commerce within the U.S. to provide certain information in writing to the State Emergency Response Commissions (SERCs) for each state in which it operates such a train. The notification made under the Order must include estimated frequencies of affected trains transporting Bakken crude oil through each county in the state, the routes over which it is transported, a description of the petroleum crude oil and applicable emergency response information, and contact information for at least one responsible party at the host railroads. In addition, the Order required that railroads provide copies of notifications made to each SERC to FRA upon request and to update the notifications when Bakken crude oil traffic materially changes within a particular county or state (a material change consists of 25 percent or greater difference from the estimate conveyed to a state in the current notification). DOT issued the Order under the Secretary's authority to stop imminent hazards at 49 U.S.C. 5121(d). The Order was issued in response to the crude oil railroad accidents previously described, and it is in effect until DOT rescinds the Order or a final rule codifies requirements and supplants the requirements in the Order.

In the August 1, 2014, NPRM, PHMSA proposed to codify and clarify the requirements of the Order and requested public comment on the various parts of the proposal. As also previously discussed, there have been several significant train accidents involving crude oil in the U.S. and Canada over the past several years, resulting in deaths, injuries, and property and environmental damage. These accidents have demonstrated the need for improved awareness of communities and first responders of train movements carrying large quantities of hazardous materials through their communities, and thus being prepared for any necessary emergency response.

In the August 1, 2014, NPRM, PHMSA specifically proposed to add a new section (§ 174.310), ''Requirements for the operation of high-hazard flammable trains,'' to subpart G of part 174. We proposed notification requirements in paragraph (a)(2) of this section. Unlike many other requirements in the August 1, 2014 NPRM the notification requirements were specific to a single train that contains one million gallons or more of UN 1267, Petroleum crude oil, Class 3, as described by § 172.101 of this subchapter and sourced from the Bakken shale formation in the Williston Basin (North Dakota, South Dakota, and Montana in the United States, or Saskatchewan or Manitoba in Canada). As proposed rail carriers operating trains that transport these materials in this amount would be required to within 30 days of the effective date of the final rule to provide notification to the SERC or other appropriate state delegated entities in which it operates within 30 days of the effective date of the final rule. Information required to be shared with SERCs or other appropriate state delegated entity would include the following:

- A reasonable estimate of the number of affected trains that are expected to travel, per week, through each county within the State;
- The routes over which the affected trains will be transported;
- A description of the petroleum crude oil and applicable emergency response information required by subparts C and G of part 172 of this subchapter; and,

• At least one point of contact at the railroad (including name, title, phone number and address) responsible for serving as the point of contact for the State Emergency Response Commission and relevant emergency responders related to the railroad's transportation of affected trains.

In addition, as proposed in the August 1, 2014 NPRM, railroads would be required to update notifications prior to making any material changes in the estimated volumes or frequencies of trains traveling through a county and provide copies to FRA upon request. In response to the proposed notification requirement for rail shipments of crude oil, we received a number of comments representing approximately 99,856 signatories.

TABLE 33—COMMENTER COMPOSITION: NOTIFICATION

Commenter type	Signatories
Non-Government Organization	90,869
Individuals	8,888
Industry stakeholders	22
Government organizations or representatives	77
Totals	99,856

Overall, the vast majority of commenters support PHMSA's efforts to establish some level of notification requirements for the operation of trains carrying crude oil as proposed in 49 CFR 174.310(a)(2). However, they are divided on certain aspects of the proposed notification to SERCs of petroleum crude oil train transportation. The overwhelming majority of commenters suggested a lower threshold to trigger the notification requirements. In the NPRM, PHMSA proposed a threshold of one million gallons for a single train containing UN1267, Petroleum crude oil, Class III, sourced from the Bakken region. With near unanimity, commenters believe the one million gallons threshold is too high and the idea of limiting it to just Bakken crude oil was too narrow (*e.g.,* include all crude oils from all areas, or include all Class III flammable liquids). In general, comments fell into one of four categories related to proposed notification requirements: (1) Defining threshold requirements that trigger notification; (2) notification applicability and emergency response; (3) public dissemination/sensitive information; and 4) defining commodity type for notification purposes. These comments are discussed in further detail below.

In the NPRM, PHMSA proposed regulations consistent with the Order (*i.e.,* trains transporting one million gallons or more of Bakken crude oil). Assuming that 29,000-gallons of crude oil are contained in each tank car, approximately 35 tank cars in a train would trigger the notification requirement. For purposes of the Order, DOT had previously assumed that this was a reasonable threshold when considering that the major incidents described in the NPRM all involved trains consisting of more than 70 tank car tanks carrying petroleum crude oil, or well above the threshold of one million gallons. The threshold in the Order was based on a Federal Water Pollution Control Act mandate for regulations requiring a comprehensive spill response plan to be prepared by an owner or operator of an onshore facility.[93]

Again, the majority of commenters who expressed their viewpoints regarding the proposed notification requirements asked for PHMSA to lower the threshold and therefore expand the applicability of notification requirements. For example, the NTSB commented that ''[a] threshold of one million gallons (approximately 35 tank car loads) is significantly above a reasonable risk threshold and should be lower. At a minimum the threshold should be set no higher than the value of an HHFT (20 cars).'' These proposals were echoed by the environmental groups, congressional interest, the concerned public, and in particular the Massachusetts Water Resources Authority and Division of Emergency Management. Other commenters such as Flat Head Lakers suggested an even lower threshold; for example, ''[t]he threshold for this reporting requirement should be 35,000 gallons per train; the amount carried by one tank car, rather than one million gallons.'' To further illustrate the point, some commenters such as Powder River Basin wanted the notification threshold reduced even more by stating ''[w]e ask DOT to broaden its advance notification requirements to include all trains transporting any quantity of Class III (flammable liquid) material.'' Finally, the Wasatch Clean Air Coalition suggested the lowest threshold possible, stating ''SERCs should be notified of residue'' when crude oil trains are passing through their States. We received only one opposing comment that the requirements were too strict from AFPM, which said ''SERC notifications should be tied to shipments of crude oil or ethanol in 'unit trains,' meaning trains that have 75 cars or more shipping crude oil or ethanol.'' This viewpoint is significantly greater than the one million gallons trigger proposed in the NPRM.

DOT agrees with the majority of commenters who believe the one million gallons threshold for triggering the notification requirements is too lenient. As previously noted, the order required ''each railroad transporting one million gallons or more of Bakken crude oil in a single train in commerce within the U.S. provide certain information in writing to SERCs for each state in which it operates such a train.'' After careful consideration of the comments and after discussions within PHMSA and FRA, we believe that using the definition of the HHFT for notification applicability is a more conservative approach for affecting safer rail transportation of flammable liquid material, and it is a more consistent approach because it aligns with the proposed changes to other operational requirements, including routing. Furthermore, the routing requirements adopted in this final rule reflect the substance of NTSB Safety Recommendation R–14–4, and are in widespread use across the rail industry for security-sensitive hazardous materials (such as chlorine and anhydrous ammonia).

Each state is required to have a SERC under the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA). 42 U.S.C. 11001(a). The EPCRA is intended to help local entities plan for emergencies involving hazardous substances.[94] Generally, SERCs are responsible for supervising and coordinating with the local emergency planning committees (LEPC) in states, and are best situated to convey information regarding hazardous materials shipments to LEPCs and state and local emergency response agencies. At the time of the issuance of the Order, DOT determined that SERCs were the most appropriate recipient of written notifications regarding the trains transporting large quantities of Bakken crude oil. After issuance of the Order, the railroads requested that the fusion centers be permitted as an appropriate point of contact to satisfy notification requirements. Railroads already share information with fusion centers under

[93] *See* 40 CFR 112.20. The Federal Water Pollution Control Act, as amended by the Oil Pollution Act of 1990, directs the President, at section 311(j)(1)(C) (33 U.S.C. 1321(j)(1)(C)) and section 311(j)(5) (33 U.S.C. 1321(j)(5)), respectively, to issue regulations ''establishing procedures, methods, and equipment and other requirements for equipment to prevent discharges of oil and hazardous substances from vessels and from onshore facilities and offshore facilities, and to contain such discharges.''

[94] *http://www2.epa.gov/epcra.*

existing § 172.820 of the HMR, PHMSA's regulation governing additional planning requirements for transportation by rail of certain hazardous materials and thus many have an established relationship with these entities. DOT had also received inquiries regarding the Order's implications for Tribal Emergency Response Commissions (TERCs). TERCs have the same responsibilities as SERCs, with the Chief Executive Office of the Tribe appointing the TERC.[95]

In response to this request and other questions regarding the order, DOT issued a Frequently Asked Questions (FAQs) guidance document to address these inquiries.[96] In that document, DOT explained that if a State agrees it would be advantageous for the information required by the Order to be shared with a fusion center or other State agency involved with emergency response planning and/or preparedness, as opposed to the SERC, a railroad may share the required information with that agency instead of the SERC. DOT also explained that railroads were not required to make notification under the Order to TERCs, but, rather, that DOT would be reaching out to Tribal leaders to inform them that TERCs could coordinate with the appropriate SERC in a state for access to data supplied under the Order.

In the NPRM, PHMSA proposed requirements for notification to SERCs consistent with the notification language of the Order (*i.e.,* trains transporting one million gallons or more of Bakken crude oil). Notification made under the Order had to include estimated frequencies of affected trains in each county in the state, their routes, a product description and emergency response information, and contact information.

Commenters had varied opinions regarding who the appropriate recipient of this information should be (*e.g.* SERCs, fusion centers, emergency responders, etc.). For example, the NTSB stated that DOT should ''codify Safety Recommendation R–14–14, which recommends that PHMSA 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 development of emergency operations and response plans.'' The NTSB further stated that DOT should ''codify Safety Recommendation R–14–19, which recommends that PHMSA require railroads transporting hazardous materials to develop, implement, and periodically evaluate a public education program similar to 49 CFR 192.616 and 195.440 for the communities along railroad hazardous materials routes.''

Environmental groups such as the Sierra Club commented that ''rail operators carrying volatile crude in any amount must be required to notify states and emergency responders of the crude compositions, quantities, and frequency of transport; and that this information must be made available to the public.'' Some commenters wanted the notification applicability expanded greatly, and Delaware Riverkeeper Network noted that SERCs should be ''notified of sampling and testing results, and that those results should be made available to the general public, SERCs, the DOT, fusion centers, Tribal emergency responders, and local [emergency responders] ERs.'' Numerous commenters also stated that they believed ''local emergency responders should be provided with information about all hazmat traveling through their jurisdictions,'' including villages, towns, and cities. Some commenters also provided general support for notification requirements described in AAR Circular No. OT–55–N,[97] which contains the recommended railroad operating practices for transportation of hazardous materials. Finally, the Prairie Island Indian Community touched on the issue of including TERCs in that ''unfortunately there was no mention of notifying Tribal Emergency Response Commissions (TERC). Indian tribes have the same responsibilities and obligations under the Emergency Preparedness and Community Right-to-Know Act (EPCRA) passed by Congress in 1986. EPCRA established requirements for federal, state and local governments, Indian tribes, and industry regarding emergency planning and Community Right-to-Know reporting on hazardous and toxic chemicals. The Community Right-to-Know provisions were meant to increase public knowledge and access to information on chemicals at individual facilities, their uses, and releases into the environment.''

DOT agrees with the general scope of the commenters who suggested making more information available for first responders and emergency planners, but we disagree on the best method to disseminate the information to the members of this community. As previously noted, the Order required ''each railroad transporting one million gallons or more of Bakken crude oil in a single train in commerce within the U.S. provide certain information in writing to the SERCs for each state in which it operates such a train.'' While we proposed the same language in the NPRM as it related to setting up the notification requirements and the SERCs, after careful review of the comments and discussions within PHMSA and FRA, we believe that using the definition of the HHFT for notification applicability and emergency response is appropriate. This will align it with the proposed changes to the § 172.820 requirements, and since those will be expanded to apply to HHFTs, the notification requirements in paragraph (g) of § 172.820 will now cover all flammable liquids transported in an HHFT, including crude oil and ethanol. The expansion of the routing requirements and deferring to the reporting requirements therein, as adopted in this final rule, reflect the NTSB recommendation R–14–4, and enable industry to make use of current practices for security-sensitive hazardous materials (such as chlorine and anhydrous ammonia).

After issuance of the Order, railroads were concerned that certain routing and traffic information about crude oil transport required to be provided to SERCs would be made available to the public under individual states' ''Sunshine'' laws. DOT engaged in discussions with railroads and invited states to participate to address this valid concern, and the FAQ document was the outcome of those discussions. As is explained in the aforementioned FAQ document, DOT preferred that this information be kept confidential, and acknowledged that railroads may have an appropriate claim that this information constitutes confidential business information, but that such claims may differ by state depending on each state's applicable laws. DOT also encouraged the railroads to work with states to find the most appropriate means for sharing this information (including fusion centers or other mechanisms that may have established confidentiality protocols). However, the Order and DOT's subsequent guidance did not require nor clarify that states sign confidentiality agreements to receive this information, and did not designate or clarify that the information could be considered Sensitive Security Information (SSI) under the procedures governing such information at 49 CFR part 15. DOT understands that despite confidentiality concerns, railroads are complying with the requirements of the

[95] *http://www2.epa.gov/sites/production/files/2013-08/documents/epcra_fact_sheet.pdf.*

[96] *http://www.fra.dot.gov/eLib/Details/L05237.*

[97] *http://www.regulations.gov/#!documentDetail;D=PHMSA-2012-0082-0009.*

Order and have provided the required information to States.

In the NPRM, PHMSA proposed notification requirements consistent with the Order. However, we did not include any specific language regarding public access to sensitive information requirements, but we did ask readers to comment on two questions: (1) Whether PHMSA should place restrictions in the HMR on the disclosure of the notification information provided to SERCs or to another state or local government entity; and (2) Whether such information should be deemed SSI, and the reasons indicating why such a determination is appropriate, considering safety, security, and the public's interest in this information.

Commenters had varying opinions on this issue. A concerned member of the public indicated, ''I do NOT recommend that the public be informed of train schedules due to terrorism concerns,'' while others asserted, ''I support the community's right to know,'' and ''residents within the zone around train routes that could be affected need to know what's going through their communities and over their water supplies, where it will pass and when, in order to make decisions about personal exposure.'' Environmental groups including Earthjustice, Forest Ethics, Sierra Club, NRDC, and Oil Change International commented, ''[t]here should be no restrictions on the disclosure of information provided to SERCs or other emergency responders.'' The NTSB stated, ''[c]lassifying route information about hazardous materials as SSI would unreasonably restrict the public's access to information that is important to safety. While the general public may not require detailed information such as: Numbers, dates, and times — people should know if they live or work near a hazardous materials route.''

Certain industry groups, like the AFPM, suggested that ''PHMSA should clarify that SERC notifications are sensitive security information exempt from state Freedom of Information Acts and sunshine laws.'' As for rail carriers, many of them supported Great Northern Midstream's assertion that ''disclosing private information in the public domain with respect to origination and destination, shipper designation or otherwise, introduces the potential for act of terrorism with no corresponding benefit from such disclosure.'' It went on to say that PHMSA must ''mandate to preempt state law requiring notification to any party other than emergency response (*i.e.,* no public dissemination).'' Petroleum storage and distribution services companies like Plains Marketing said that while it ''recognize[s] that providing this information allows local first responders to better prepare to respond to accidents, we do caution PHMSA that providing this information could be in conflict with confidentiality requirements, and that PHMSA should ensure that the disclosure is limited to only emergency responders and related agencies.'' Other government groups, like the National Association of SARA Title III said, ''rail carriers may designate the information being provided as a trade secret or as security sensitive, but may not demand that the SERCs or other recipients sign nondisclosure agreements.'' However, concerned public commenter K. Denise Rucker Krepp, former MARAD Chief Counsel and former Senior Counsel, U.S. House of Representatives Homeland Security Committee, said:

> The Department of Transportation cannot limit the sharing of information to State Emergency Response Commissions to trains containing more than one million gallons of Bakken crude oil. Railroad carriers are required by the Implementing Recommendations of the 9/11 Commission Act of 2007 (9/11 Act, Public Law 110–53) to share all routing and cargo shipment information with state, local, and tribal authorities. Section 1512 of the 9/11 Act requires railroad carriers to conduct vulnerability assessments and draft security plans. The Department of Homeland Security (DHS) is required to review these assessments and plans in consultation with public safety and law enforcement officials. DHS can't properly consult with these officials if they don't know what is being transported through their jurisdiction. Similarly, DHS can't seek input from state and local officials if they don't know the routes by which the goods are being transported.

Finally, Senators Wyden, Merkley, Boxer, and Feinstein stated, ''[b]ecause railroads provide crude oil routes online, reporting information to emergency responders (with no limits on 'information sharing') should not pose additional security concern.''

DOT agrees with the commenters that this is a difficult and complex issue, and widespread access to security sensitive information could be used for criminal purposes when it comes to crude oil by rail transportation. For example, the FBI and the federal Bureau of Alcohol, Tobacco, Firearms and Explosives are participating in a vandalism investigation of a November 2014 incident in Vivian, S.D., where a two-foot piece of the rail line was blown up using the explosive tannerite.[98] As discussed before, DOT prefers that this information be kept confidential for security reasons, and acknowledges that railroads may have an appropriate claim that this information constitutes confidential business information, but that such claims may differ by state depending on each state's applicable laws. DOT has also encouraged the railroads to work with states to find the most appropriate means for sharing this information (including fusion centers or other mechanisms that may have established confidentiality protocols). After careful review of the comments and after discussions within PHMSA and FRA, we believe that adopting the notification (and information sharing) process associated with the additional planning requirements under § 172.820 is the best approach. Under this approach, the transportation of crude oil by rail (or any other flammable liquid carried as part of a HHFT) can: (1) Avoid the negative security and business implications of widespread public disclosure of routing and volume data; and (2) preserve the intent of the Order to enhance information sharing with emergency responders by utilizing fusion centers as they have established protocols for communicating with emergency responders on hazmat rail issues as indicated in the following passage from the Frequently Asked Questions on DOT's May 7, 2014 Emergency Order Regarding Notification to Communities of Bakken Crude Oil Shipments: [99]

> Fusion Centers are established on a State and regional basis, with one of their purposes being to share emergency response information. Railroads currently routinely share data on their shipments with Fusion Centers. Given that railroads and Fusion Centers have already established protocols for sharing information under existing confidentiality agreements, in some situations, there might be advantages to States and railroads in utilizing Fusion Centers instead of SERCs for the sharing of information required by this EO. DOT also noted that there is an existing mechanism for Tribal Nations to interact with the Fusion Centers through the State, Local, Tribal and Territorial Government Coordinating Council. Similarly, DOT recognizes that individual States may have an agency other than the SERC or Fusion Center that is more directly involved in emergency response planning and preparedness than either the SERC or Fusion Center.[100]

Expansion of the routing requirements in this final rule addresses the NTSB's recommendation R–14–4 and are in widespread use across the rail industry

[98] ''Railroad Vandalism in South Dakota Under Investigation,'' *http://www.ksfy.com/home/headlines/Railroad-vandalism-in-South-Dakota-under-investigation-285018691.html.*

[99] *http://www.fra.dot.gov/Elib/Document/3873.*

[100] *http://www.fra.dot.gov/Elib/Document/3873.*

for security-sensitive hazardous materials (such as chlorine and anhydrous ammonia). Additionally, AAR Circular OT–55–N outlines a procedure whereby a community may request a list of the types and volumes of hazardous materials that are transported through the community so that emergency responders can plan and prepare.

In addition, on January 27, 2015, AAR's Safety and Operations Management Committee approved changes to OT–55 (AAR Circular No. OT–55–O), and those changes became effective January 27, 2015, and superseded OT–55–N, which was previously issued August 5, 2013. AAR's OT–55–O revised the Transportation Community Awareness and Emergency Response Implementation (TRANSCAER®) program listed in Section V. Section V 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 ''[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.''

The request must be made using the form included as Appendix 3 by an official emergency response or planning group with a cover letter on appropriate letterhead bearing an authorized signature. The form reflects the fact that the railroad industry considers this information to be restricted information of a security sensitive nature and that 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 individual railroad's express written permission. It should be noted that commercial requirements change over time, and it is possible that a hazardous materials transported tomorrow might not be included in the specific commodity flow information provided upon request, since that information was not available at the time the list was provided.

In summary, Section V is now revised to require ''all hazardous commodities transported through the community for a 12 month period in rank order'' instead of just the top 25 commodities. In addition, Section V was inserted with a 12 month period, which will help emergency response agencies or planning groups in planning for a whole year.

In the NPRM, PHMSA proposed regulatory text consistent with the Order which specified notification of information regarding the transportation specific to Bakken crude oil. With regard to singling out Bakken crude oil from crude oil extracted from other geographic locations, DOT acknowledges that under the current shipping paper requirements there is no distinction between Bakken crude oil and crude oil sourced from other locations. This may present compliance and enforcement difficulties, particularly with regard to downstream transportation of Bakken crude oil by railroads after interchange(s) with an originating or subsequent rail carrier. Previously, DOT explained in the FAQs document that railroads and offerors should work together to develop a means for identifying Bakken crude oil prior to transport, such as a designating a Standard Transportation Commodity Code (STCC) that would identify crude oil by its geographic source. DOT also stated that for purposes of compliance with the Order, crude oil tendered to railroads for transportation from any facility directly located within the Williston Basin (North Dakota, South Dakota, and Montana in the United States, or Saskatchewan or Manitoba in Canada) is Bakken crude oil.

In the NPRM, PHMSA solicited comments surrounding commodity type, and if the applicability of notification requirements should be expanded to include threshold quantities of all petroleum crude oils or all HHFTs (versus only trains transporting threshold quantities of Bakken crude oil), and even commodity types (*e.g.,* ethanol, etc.).

Commenters generally stated that crude oil sourced from the Bakken shale formation should not be the only determining factor of commodity type for notification purposes. Congressman Michael Capuano stated that he ''supports carrier notification for both Bakken crude oil and ethanol shipments.'' Environmental groups, like Powder River Basin, have the view that ''any quantity of Class III (flammable liquid) material, including combustible liquids'' should be included, ''not just Bakken crude oil.'' Trade associations, like the Independent Petroleum Association of America (IPAA), assert that it ''do[es] not support any distinction between Bakken crude and other oil types.'' The NTSB echoed these opinions and said, ''SERC notification requirements should extend to ethanol due to similar risks in a pool fire to crude oil,'' and that ''SERC notification requirements should extend to crude oil sourced from other regions, not just the Bakken formation, since Bakken crude is not significantly different from other crude oil or flammable liquids.'' Local communities, cities, and towns were consistent in their belief as expressed by the City and County of Denver that ''notification requirement should be extended to apply to all HHFTs, not only those transporting Bakken petroleum crude oil.'' NGO's like the National Fire Protection Association (NFPA) thought that ''all crude oil and ethanol should be included'' and that ''NFPA has not found any reference to similar requirements on notification of SERCs regarding ethanol train transportation. This seems to be an omission in this proposed rulemaking and NFPA questions whether there should be a companion requirement that applies specifically to ethanol.'' Rail carriers believe, as expressed by Continental Resources, Inc., that ''all petroleum crude oil'' should be included, and that there is ''no significant difference between Bakken and other crude. Also, [we] do not support a separate STC code for Bakken.''

DOT agrees with comments that Bakken crude oil should not be the determining factor (with respect to a commodity type) for notification requirements. As previously noted, the Order required ''each railroad transporting one million gallons or more of Bakken crude oil in a single train in commerce within the U.S. provide certain information in writing to the SERCs for each state in which it operates such a train.'' Although we were consistent with this instruction in the NPRM, we now agree with the vast majority of commenters that applicability should be broadened to include more commodity types and/or source locations of crude oil. This final rule invokes the notification requirements for HHFT. This aligns it with the proposed changes to the § 172.820 requirements which also will now apply to HHFTs, and thus, the associated notification requirements in paragraph (g) of § 172.820 will now cover more than crude oil sourced from the Bakken formation and more commodity types (*e.g.,* ethanol).

Conclusion

Based on the above discussion, PHMSA and FRA are removing the notification requirement language proposed in the NPRM under § 174.310(a)(2) and is instead using as a substitute the contact information

language requirement that is already part of the additional planning requirements for transportation by rail found in § 172.820 of the HMR that now applies to HHFTs. As provided in § 172.820(g), each HHFT must identify a point of contact (including the name, title, phone number and email address) related to routing of materials identified in § 172.820 in its security plan and provide this information to: (1) State and/or regional fusion centers (established to coordinate with state, local and tribal officials on security issues and which are located within the area encompassed by the rail carrier's system); and (2) State, local, and tribal officials in jurisdictions that may be affected by a rail carrier's routing decisions and who directly contact the railroad to discuss routing decisions.

Not adopting the separate notification requirements proposed in the NPRM and instead relying on the expansion of the existing route analysis and consultation requirements of § 172.820 to include HHFTs would allow this change to function within the overall hazardous materials regulatory scheme. This provides for consistency of notification requirements for rail carriers transporting material subject to routing requirements, *i.e.,* trains carrying: (1) More than 2,268 kg (5,000 lbs.) in a single carload of a Division 1.1, 1.2 or 1.3 explosive; (2) a quantity of a material poisonous by inhalation in a single bulk packaging; (3) a highway route-controlled quantity of a Class 7 (radioactive) material; and now (4) Class 3 flammable liquid as part of a high-hazard flammable train (as defined in § 171.8). Specifically, a single train carrying 20 or more carloads of a Class III flammable liquid in a continuous block or a single train carrying 35 or more tank cars of a Class III flammable liquid across the train consist will have to comply with the additional planning requirements for transportation by rail in § 172.820.

VIII. Section by Section Review

Section 171.7

The National Technology Transfer and Advancement Act of 1995 (15 U.S.C. 272) directs agencies to use voluntary consensus standards in lieu of government-unique standards except where inconsistent with law or otherwise impractical. Section 171.7 lists all standards incorporated by reference into the HMR and informational materials not requiring incorporation by reference. The informational materials not requiring incorporation by reference are noted throughout the HMR and provide best practices and additional safety measures that while not mandatory, may enhance safety and compliance. In this final rule, we are redesignating paragraphs (k)(2) through (k)(4) as (k)(3) through (k)(5) and adding a new paragraph (k)(2) to incorporate by reference the AAR Manual of Standards and Recommended Practices, Section C—III, Specifications for Tank Cars, Specification M–1002 (AAR Specifications for Tank Cars), Appendix E, Design Details implemented April 2010.

Section 171.8

Section 171.8 provides definitions and abbreviations used within the HMR. In this final rule, we are adding a new definition for *high-hazard flammable train* meaning, a single train transporting 20 or more loaded tank cars of a Class 3 flammable liquid in a continuous block or a single train carrying 35 or more loaded tank cars of a Class 3 flammable liquid throughout the train consist. In addition, in this final rule, we are adding a new definition for *high-hazard flammable unit train* meaning a single train transporting 70 or more loaded tank cars containing Class 3 flammable liquid.

Section 172.820

Section 172.820 prescribes additional safety and security planning requirements for transportation by rail. Paragraph (a) of this section provides the applicability for when a rail carrier must comply with the requirements of this section. In this final rule, we are revising § 172.820(a) to add a new applicability requiring that any rail carrier transporting an HHFT (as defined in § 171.8) must comply with the additional safety and security planning requirements for transportation by rail.

Paragraph (b) of this section requires rail carriers compile commodity data to inform their route analyses. PHMSA is revising this paragraph to account for rail carriers' initial analysis and require that commodity data be compiled no later than 90 days after the end of the calendar year; and that in 2016, the data must be compiled by March 31. In addition, this section requires the initial data cover six months, from July 1, 2015 to December 31, 2015. For their initial analysis, rail carriers are only required to collect data from the six-month period described in this section, additional data may be included, but is not required by this final rule. In this final rule we are providing rail carriers the option to use data for all of 2015 in conducting their initial route analyses. Regardless if six or 12 months of data are used, a rail carrier's initial route analysis and selection process must be completed by March 31, 2016. For subsequent route analyses, commodity data from the entire previous calendar year (*i.e.* 12 months) must be used. PHMSA will amend the HMR in a future action to remove the transitional provision.

Section 173.41

In this final rule, we are adding a new section 173.41 prescribing a sampling and testing program for unrefined petroleum-based products. This section specifies what must be included in a sampling and testing program in paragraph (a). Paragraph (b) of this section requires shippers to certify that unrefined petroleum-based products are offered in accordance with this subchapter, to include the requirements prescribed in paragraph (a). Paragraph (c) provides the requirements for documentation, retention, review and dissemination of the sampling and testing program. Finally, paragraph (d) of this section states that each person required to develop a sampling and testing program make the documentation available upon request to an authorized official of the Department of Transportation.

Section 173.241

Section 173.241 prescribes the bulk packaging requirements for certain low hazard liquids and solid materials which pose a moderate risk. Paragraph (a) provides which specifications of rail tank cars may be used to transport hazardous materials when directed to this section by Column (8C) of the § 172.101 HMT. In this final rule, we are revising paragraph (a) to add an authorization for DOT Specification 117 tank cars and to prohibit the use of DOT Specification 111 tank cars for Class 3 (flammable liquids) in Packing Group III in HHFT service, after May 2025. Additionally, we are authorizing the retrofitting of DOT Specification 111 tank cars to allow their use after May 2025 provided they meet the requirements of the DOT–117R specification or the DOT–117P performance standard as specified. Finally, the section notes that conforming retrofitted tank cars are to be marked ''DOT–117R'' and conforming performance standard tank cars are to be marked ''DOT–117P.''

Section 173.242

Section 173.242 prescribes the bulk packaging requirements for certain medium hazard liquids and solids, including solids with dual hazards. Paragraph (a) provides which specifications of rail tank cars may be

used to transport hazardous materials when directed to this section by Column (8C) of the § 172.101 HMT. In this final rule, we are revising paragraph (a) to add an authorization for DOT Specification 117 tank cars and to prohibit the use of DOT Specification 111 tank cars for Class 3 (flammable liquids) in Packing Group II and III, in HHFT service, after the dates in the following table unless they meet the performance standard DOT–117P or are retrofitted to meet the requirements of the DOT–117R specification as specified:

Packing group	DOT 111 not authorized after	DOT 111 built to the CPC–1232 industry standard not authorized after
II	May 1, 2023 (non-jacketed and jacketed)	July 1, 2023 (non-jacketed) May 1, 2025 (jacketed).
III	May 1, 2025	May 1, 2025.

Finally, the section notes that conforming retrofitted tank cars are to be marked ''DOT–117R'' and conforming performance standard tank cars are to be marked ''DOT–117P.''

Section 173.243

Section 173.243 prescribes the bulk packaging requirements for certain high-hazard liquids and dual hazard materials which pose a moderate risk. Paragraph (a) provides which specifications of rail cars may be used to transport hazardous materials when directed to this section by Column (8C) of the § 172.101 HMT. In this final rule, we are revising paragraph (a) to add an authorization for DOT Specification 117 tank cars and to prohibit the use of DOT Specification 111 tank cars for Class 3 (flammable liquids) in Packing Group I, in HHFT service, after the dates in the following table unless they are retrofitted to meet the performance standard DOT–117P or the requirements of the DOT–117R specification as specified:

Packing group	DOT 111 not authorized after	DOT 111 built to the CPC–1232 industry standard not authorized after
I	January 1, 2017 (non-jacketed report trigger) January 1, 2018 (non-jacketed) March 1, 2018 (jacketed)	April 1, 2020 (non-jacketed). May 1, 2025 (jacketed).

Finally, the section notes that conforming retrofitted tank cars are to be marked ''DOT–117R'' and conforming performance standard tank cars are to be marked ''DOT–117P.''

Section 174.310

In this final rule, we are adding a new section 174.310 prescribing requirements for the operation of HHFTs. A rail carrier must comply with these additional requirements if they operate an HHFT (as defined in § 171.8). Paragraph (a)(1) requires that any rail carrier operating an HHFT is subject to the additional safety and security planning requirements in § 172.820 (*i.e.* routing). Additionally, Paragraph (a)(2) requires that all trains are limited to a maximum speed of 50 mph. The train is further limited to a maximum speed of 40 mph while that train travels within the limits of high-threat urban areas (HTUAs) as defined in § 1580.3 of this title, unless all tank cars containing a Class 3 flammable liquid meet or exceed the retrofit standard DOT Specification 117R, the DOT Specification 117P performance standards, or the standard for the DOT Specification 117 tank car. Paragraph (a)(3) requires HHFTs and HHFUTs must also be equipped with advanced brake signal propagation systems as specified. Paragraph (a)(4) states this new section also requires that a tank car manufactured for use in a HHFT must meet DOT Specification 117, or 117P in part 179, subpart D of this subchapter or an authorized tank specification as specified in part 173, subpart F of this subchapter. Finally, Paragraph (a)(5) requires owners of Non-Jacketed DOT–111 tank cars in PG I service in an HHFT, who are unable to meet the January 1, 2017 retrofit deadline specified in § 173.243 (a)(1) to submit a report by March 1, 2017 to Department of Transportation. The report must include information regarding the retrofitting progress.

Section 179.200

The heading for § 179.200 is revised to include the DOT–117 specification.

Section 179.200–1

The heading for § 179.200–1 is revised by stating that tank cars built under the DOT–117 specification must meet the applicable requirements of §§ 179.200, 179.201, and 179.202.

Section 179.202–1

Section 179.202–1 prescribes the applicability of the DOT–117 tank car standards and specifies that each tank built under such specification must conform to the general requirements of § 179.200 and the prescriptive standards in §§ 179.202–1 through 179.202–11, or the performance standard requirements of § 179.202–12.

Section 179.202–3

Section 179.202–3 authorizes a DOT–117 tank car to be loaded to a gross weight on rail of up to 286,000 pounds (129,727 kg) upon approval by the Associate Administrator for Safety, Federal Railroad Administration (FRA). This section also provides a reference to § 179.13 which provides authorization for a gross weight on rail of up to 286,000 pounds (129,727 kg).

Section 179.202–4

Section 179.202–4 specifies that the wall thickness after forming of the tank shell and heads on a DOT–117 tank car must be, at a minimum, 9/16 of an inch of AAR TC–128 Grade B normalized steel. Although not proposed in the NPRM, in this final rule, we are also authorizing 5/8 of an inch of ASTM A 516–70 in accordance with § 179.200–7(b) that is currently allowed by the HMR. Both grades of steel must be normalized.

Section 179.202–5

Section 179.202–5 specifies that the DOT–117 specification tank car must have a tank head puncture resistance system constructed in conformance with the requirements in § 179.16(c). Additionally, the section specifies the tank car must be equipped with full height head shields with a minimum thickness of ½ inch.

Section 179.202–6

Section 179.202–6 specifies that the DOT–117 specification tank car must be equipped with a thermal protection system. The thermal protection system

must conform to the performance standard in § 179.18 and include a reclosing PRD in accordance with § 173.31 of this subchapter.

Section 179.202–7

Section 179.202–7 specifies that the thermal protection system on a DOT–117 specification tank car must be covered with a metal jacket of a thickness not less than 11 gauge A 1011 steel or equivalent and flashed around all openings to be weather tight. It also requires that a protective coating be applied to the exterior surface of a carbon steel tank and the inside surface of a carbon steel jacket.

Section 179.202–8

Section 179.202–8 prescribes minimum standards for bottom outlet handle protection on a DOT–117 specification tank car. In this final rule, we are requiring that if the tank car is equipped with a bottom outlet, the handle must be removed prior to train movement or be designed with protection safety system(s) to prevent unintended actuation during train accident scenarios.

Section 179.202–9

Section 179.202–9 prescribes the top fittings protection standard for DOT–117 specification tank cars. In this final rule, we are adopting as proposed, to incorporate by reference in § 171.7, Appendix E 10.2.1 of the 2010 version of the AAR Manual of Standards and Recommended Practices, Section C—Part III, Specifications for Tank Cars, Specification M–1002, (AAR Specifications for Tank Cars). Thus, a DOT–117 specification tank car must be equipped with top fittings protection in accordance with the incorporated standard.

Section 179.102–10

Section 179.102–10 prescribes ECP braking construction standards for DOT–117 specification tank cars. Specifically, paragraph (a) requires by January 1, 2021, each rail carrier operating a high-hazard flammable unit train as defined in § 171.8, comprised of at least one tank car loaded with a Packing Group I material must ensure the train meets the ECP braking capability requirements. In addition paragraph (b) requires by May 1, 2023, each rail carrier operating a high-hazard flammable unit train as defined in § 171.8, and not described in paragraph (a) of this section, must ensure the train meets the ECP braking capability requirements. Finally, paragraph (c) permits alternate brake systems to be submitted for approval through the processes and procedures outlined in 49 CFR part 232, subpart F.

Section 179.202–11

A table is provided in § 179.202–11 to indicate the individual specification requirements for a DOT–117 specification tank car.

Section 179.202–12

Section 179.202–12 provides an optional performance standard that a DOT–117 specification tank car may be manufactured to and is designated and marked as ''DOT–117P.'' Paragraph (a) describes the approval process for the design, testing, and modeling results that must be reviewed and approved by the Associate Administrator for Railroad Safety/Chief Safety Officer of the FRA. Paragraph (b) describes the approval process to operate at 286,000 gross rail load (GRL). Paragraph (c) specifies that a DOT–117P specification tank car must be equipped with a tank-head puncture-resistance system in accordance with the performance standard in § 179.18. Paragraph (d) specifies that a DOT–117P specification tank car must be equipped with a thermal protection system. The thermal protection system must be designed in accordance with the performance standard in § 179.18 and include a reclosing PRD conforming to § 173.31 of this subchapter. Paragraph (e) specifies that if the tank car is equipped with a bottom outlet, the handle must be removed prior to train movement or be designed with protection safety system(s) to prevent unintended actuation during train accident scenarios. Paragraph (f) specifies that the tank car tank must be equipped with top fittings protection conforming to AAR Specifications Tank Cars, appendix E paragraph 10.2.1. Paragraph (g) prescribes ECP braking construction standards for DOT–117P specification tank cars. Specifically, paragraph (g)(1) requires by January 1, 2021, each rail carrier operating a high-hazard flammable unit train as defined in § 171.8, comprised of at least one tank car loaded with a Packing Group I material must ensure the train meets the ECP braking capability requirements. In addition paragraph (g)(2) requires by May 1, 2023 each rail carrier operating a high-hazard flammable unit train as defined in § 171.8, not described in paragraph (g)(1) of this section must ensure the train meets the ECP braking capability requirements. Finally, paragraph (g)(3) permits alternate brake systems to be submitted for approval through the processes and procedures outlined in 49 CFR part 232, subpart F.

Section 179.202–13

Section 179.202–13 prescribes the retrofit standards for existing non-pressure tank cars. Non-pressure tank cars retrofitted to meet the standards prescribed in this section are designated and marked ''DOT–117R.'' Paragraph (a) prescribes the applicability of the DOT–117R tank car standards and specifies that each tank retrofitted under such specification must conform to the general requirements of § 179.200 and the retrofit standards in this section, or the performance standard requirements of § 179.202–12. Paragraph (b) authorizes a DOT–117 tank car to be loaded to a gross weight on rail of up to 286,000 pounds (129,727 kg) upon approval by the Associate Administrator for Safety, Federal Railroad Administration (FRA). Paragraph (c) requires that the original construction provided a wall thickness after forming of the tank shell and heads at a minimum of 7/16 of an inch, and constructed with steel authorized by the HMR at the time of construction. Paragraph (d) specifies that the DOT–117R specification tank car must have a tank head puncture resistance system constructed in conformance with § 179.16(c). Additionally, the section specifies the tank car must be equipped with full height head shields with a minimum thickness of ½ inch. Paragraph (e) specifies that the DOT–117R specification tank car must be equipped with a thermal protection system. The thermal protection system must conform to the performance standard in § 179.18 and include a reclosing PRD in accordance with § 173.31 of this subchapter. Paragraph (f) specifies that the DOT–117R specification tank car must be covered with a metal jacket of a thickness not less than 11 gauge A 1011 steel or equivalent and flashed around all openings to be weather tight. It also requires that a protective coating be applied to the exterior surface of a carbon steel tank and the inside surface of a carbon steel jacket. Paragraph (g) prescribes minimum standards for bottom outlet handle protection on a DOT–117R specification tank car. In this final rule, we are requiring that if the tank car is equipped with a bottom outlet, the handle must be removed prior to train movement or be designed with protection safety system(s) to prevent unintended actuation during train accident scenarios. Paragraph (h) authorizes existing tank car tanks to rely on any top fittings protection installed at the time of original manufacture. Paragraph (i) prescribes ECP braking construction standards for DOT–117R

specification tank cars. Specifically, paragraph (i)(1) requires by January 1, 2021, each rail carrier operating a high-hazard flammable unit train as defined in § 171.8, comprised of at least one tank car loaded with a Packing Group I material must ensure the train meets the ECP braking capability requirements. In addition paragraph (i)(2) requires by May 1, 2023 each rail carrier operating a high-hazard flammable unit train as defined in § 171.8, not described in paragraph (i)(1) of this section must ensure the train meets the ECP braking capability requirements. Finally, paragraph (i)(3) permits alternate brake systems to be submitted for approval through the processes and procedures outlined in 49 CFR part 232, subpart F.

IX. Impact of Adopted Regulation on Existing Emergency Orders

As previously mentioned Emergency Order authority is granted to the Department and permits the Department to take action on safety issues that constitute an imminent hazard to the safe transportation of hazardous materials. Railroad transportation of hazardous materials in commerce is subject to the authority and jurisdiction of the Secretary of Transportation (Secretary), including the authority to impose emergency restrictions, prohibitions, recalls, or out-of-service orders, without notice or an opportunity for hearing, to the extent necessary to abate the imminent hazard. 49 U.S.C. 5121(d). Therefore an emergency order can be issued if the Secretary has found that an unsafe condition or an unsafe practice is causing or otherwise constitutes an imminent hazard to the safe transportation of hazardous materials.

Currently the Department has four emergency orders in affect that are relevant to rail shipment of large quantities of flammable liquids. Below we will discuss those orders and how the amendments adopted in this rulemaking affect those Emergency Orders. Emergency Orders remain in effect until the Secretary determines that an imminent hazard no longer exits or a change in applicable statute or Federal regulation occurs that supersedes the requirements of the Order, in which case the Secretary will issue a Rescission Order.

Emergency Order 28

Emergency Order 28 was issued on August 7, 2013 and addressed safety issues related to securement of certain hazardous materials trains. Specifically, this order requires trains with (1) Five or more tank carloads of any one or any combination of materials poisonous by inhalation as defined in Title 49 CFR 171.8, and including anhydrous ammonia (UN1005) and ammonia solutions (UN3318); or (2) 20 rail carloads or intermodal portable tank loads of any one or any combination of materials listed in (1) above, or, any Division 2.1 flammable gas, Class 3 flammable liquid or combustible liquid, Class 1.1 or 1.2 explosive,[101] or hazardous substance listed in 49 CFR 173.31(f)(2). To see the specific provisions of this emergency order see the August 7, 2013, **Federal Register** (78 FR 48218).[102]

While this final rulemaking does not address train securement, on August 9, 2014, FRA published an NPRM that proposed amendments to the brake system safety standards for freight and other non-passenger trains and equipment to strengthen the requirements relating to the securement of unattended equipment. Specifically, FRA proposed to codify many of the requirements already included in emergency order 28. FRA proposed to amend existing regulations to include additional securement requirements for unattended equipment, primarily for trains transporting poisonous by inhalation hazardous materials or large volumes of Division 2.1 (flammable gases), Class 3 (flammable or combustible liquids, including crude oil and ethanol), and Class 1.1 or 1.2 (explosives) hazardous materials. For these trains, FRA also proposed additional communication requirements relating to job briefings and securement verification. Finally, FRA proposed to require all locomotives left unattended outside of a yard to be equipped with an operative exterior locking mechanism. Attendance on trains would be required on equipment not capable of being secured in accordance with the proposed and existing requirements.

As this final rulemaking does not address train securement emergency order 28 remains currently unaffected. The upcoming final rule in response to comments from FRA's August 9, 2014 NPRM that proposed amendments to the brake system safety standards for freight and other non-passenger trains and equipment to strengthen the requirements relating to the securement of unattended equipment will address the status of emergency order 28 upon adoption.

[101] Should have read ''Division'' instead of ''Class.''

[102] See *http://www.gpo.gov/fdsys/pkg/FR-2013-08-07/pdf/2013-19215.pdf.*

DOT–OST–2014–0025

This emergency order was published on February 25, 2014. Subsequently a revised and amended emergency order was published on March 6, 2014. This emergency order required those who offer crude oil for transportation by rail to ensure that the product is properly tested and classified in accordance with Federal safety regulations. Further the EO required that all rail shipments of crude oil are properly classed as a flammable liquid in Packing Group (PG) III material be treated as a PG I or II material, until further notice. The Amended Emergency Order also authorized PG III materials to be described as PG III for the purposes of hazard communication.

The primary intent of this emergency order was to address unsafe practices related to the classification and packaging of petroleum crude oil. Misclassification is one of the most dangerous mistakes to be made when dealing with hazardous materials because proper classification is the critical first step in determining how to package, handle, communicate about, and safely transport hazardous materials. Misclassification may indicate larger problems with company management, oversight, and quality control. Petroleum crude oil may contain dissolved gases or other unanticipated hazardous constituents, may exhibit corrosive properties and also may exhibit toxic properties.

In this rulemaking we have adopted requirements for a testing and sampling program to ensure better classification and characterization of unrefined petroleum-based products. As part of this requirement the HMR now require an offeror to prepare a written sampling and testing program for unrefined petroleum-based products. This program must address: (1) A frequency of sampling and testing that accounts for any appreciable variability of the material (2) Sampling prior to the initial offering of the material for transportation and when changes that may affect the properties of the material occur; (3) Sampling methods that ensures a representative sample of the entire mixture, as offered, is collected; (4) Testing methods that enable classification of the material under the HMR; (5) Quality control measures for sample frequencies; (6) Duplicate samples or equivalent measures for quality assurance; (7) Criteria for modifying the sampling and testing program; (8) Testing or other appropriate methods used to identify properties of the mixture relevant to packaging requirements.

Furthermore the offeror is required to certify that program is in place, document the testing and sampling program, and make program information available to DOT personnel, upon request. The primary intent of this requirement is of address unsafe practices related to the classification and packaging of mined products.

As the March 6, 2014 emergency order and the requirements adopted in this rulemaking related to classification and characterization address the same safety issue the March 6, 2014 emergency order is no longer necessary. Therefore the requirements adopted in this rule supersede the March 6, 2014 emergency order and make it no longer necessary once the rule becomes effective.

DOT–OST–2014–0067

This emergency order was published on May 7, 2014. This emergency order required all railroads that operate trains containing one million gallons of Bakken crude oil to notify SERCs about the operation of these trains through their States. Specifically, this notification should identify each county, or a particular state or commonwealth's equivalent jurisdiction (*e.g.,* Louisiana parishes, Alaska boroughs, Virginia independent cities), in the state through which the trains will operate.

The primary intent of this emergency order was to eliminate unsafe conditions and practices that create an imminent hazard to public health and safety and the environment. Specifically, this emergency order was designed to inform communities of large volumes of crude oil transported by rail through their areas and to provide information to better prepare emergency responders for accidents involving large volumes of crude oil.

In this rulemaking we have adopted notification requirements for large volumes of crude oil transported by rail. These requirements were designed to codify the requirements of the May 7, 2014 EO. While some amendments to the original proposal are made, the requirements adopted in this rulemaking align with the intent of the May 7, 2014 emergency order.

As the May 7, 2014 emergency order and the requirements adopted in this rulemaking related to notification address the same safety issue, the May 7, 2014 emergency order is no longer necessary. Therefore the requirements adopted in this rule supersede the May 7, 2014 emergency order and make it no longer necessary once the information sharing portion of the routing requirements come into full force. Therefore this emergency order will remain in effect until March 31, 2016.

FRA Emergency Order No. 30

FRA Emergency Order No. 30 (''Emergency Order 30'' or ''order'') was issued on April 27, 2015 and mandated that trains affected by this order not exceed 40 miles per hour (mph) in high-threat urban areas (HTUAs) as defined in 49 CFR part 1580. Under the order, an affected train is one that contains: 1) 20 or more loaded tank cars in a continuous block, or 35 or more loaded tank cars, of Class 3 flammable liquid; and, 2) at least one DOT Specification 111 (DOT–111) tank car (including those built in accordance with Association of American Railroads (AAR) Casualty Prevention Circular 1232 (CPC–1232)) loaded with a Class 3 flammable liquid. FRA determined at that time that public safety compelled the issuance of Emergency Order 30 due to the recent railroad accidents involving trains transporting petroleum crude oil and ethanol and the increasing reliance on railroads to transport voluminous amounts of these flammable liquids in recent years. For more information regarding this order, see the April 27, 2015, publication in the **Federal Register** (80 FR 23321).

The final rule will implement speed restrictions for HHFTs, including a maximum operating speed of 40 mph for HHFTs in HTUAs, with an effective date of July 7, 2015. As such, the final rule affects the same population of tank cars as defined above and codifies the same speed restriction that was implemented through Emergency Order 30. Thus, the final rule replaces Emergency Order 30 upon the effective date of the final rule.

X. Regulatory Review and Notices

A. Executive Order 12866, Executive Order 13563, Executive Order 13610 and DOT Regulatory Policies and Procedures

This final rule is considered an economically significant regulatory action under section 3(f) of Executive Order 12866 and was reviewed by the Office of Management and Budget (OMB), because it has an expected annual impact of more than $100 million. The final rule is considered a significant regulatory action under the Regulatory Policies and Procedures order issued by the Department of Transportation (DOT) (44 FR 11034, February 26, 1979). PHMSA prepared a Regulatory Impact Analysis addressing the economic impact of this final rule, and placed it in the docket for this rulemaking.

Executive Orders 12866 (''Regulatory Planning and Review'') and 13563 (''Improving Regulation and Regulatory Review'') require agencies to regulate in the ''most cost-effective manner,'' to make a ''reasoned determination that the benefits of the intended regulation justify its costs,'' and to develop regulations that ''impose the least burden on society.'' Executive Order 13610, issued May 10, 2012, urges agencies to conduct retrospective analyses of existing rules to examine whether they remain justified and whether they should be modified or streamlined in light of changed circumstances, including the rise of new technologies. DOT believes that streamlined and clear regulations are important to ensure compliance with important safety regulations. As such DOT has developed a plan detailing how such reviews are conducted.[103]

Additionally, Executive Orders 12866, 13563, and 13610 require agencies to provide a meaningful opportunity for public participation. Accordingly, PHMSA invited public comment twice (the September 6, 2013, ANPRM and August 1, 2014, NPRM) on these considerations, including any cost or benefit figures or factors, alternative approaches, and relevant scientific, technical and economic data. These comments aided PHMSA and FRA in the evaluation of the proposed requirements. PHMSA and FRA have since revised our evaluation and analysis to address the public comments received.

Flammable liquids include a wide variety of chemical products. In accordance with this action, Class 3 (Flammable liquids) are subject to the provisions contained in this final rule when shipped in a HHFT. Class 3 (Combustible liquids) are not subject to the provisions of the final rule (*e.g.,* diesel fuel). Some materials like crude oil display a wide range of flash points and as such may not be subject to the provisions in all cases. In other cases, a flammable liquid may be mixed with a non-hazardous material to the point that the flash point is within the range of a Combustible liquid and would not be subject to the provisions of this final rule (*e.g.,* dilute solutions of alcohol). Approximately 68% of the flammable liquids transported by rail are comprised of crude oil, ethanol, and petrochemical or petroleum refinery products. Further, ethanol and crude oil

[103] Department of Transportation's plan for retrospective regulatory reviews is available: *http://www.dot.gov/regulations/dot-retrospective-reviews-rules.*

comprise approximately 65% of the flammable liquids transported by rail.

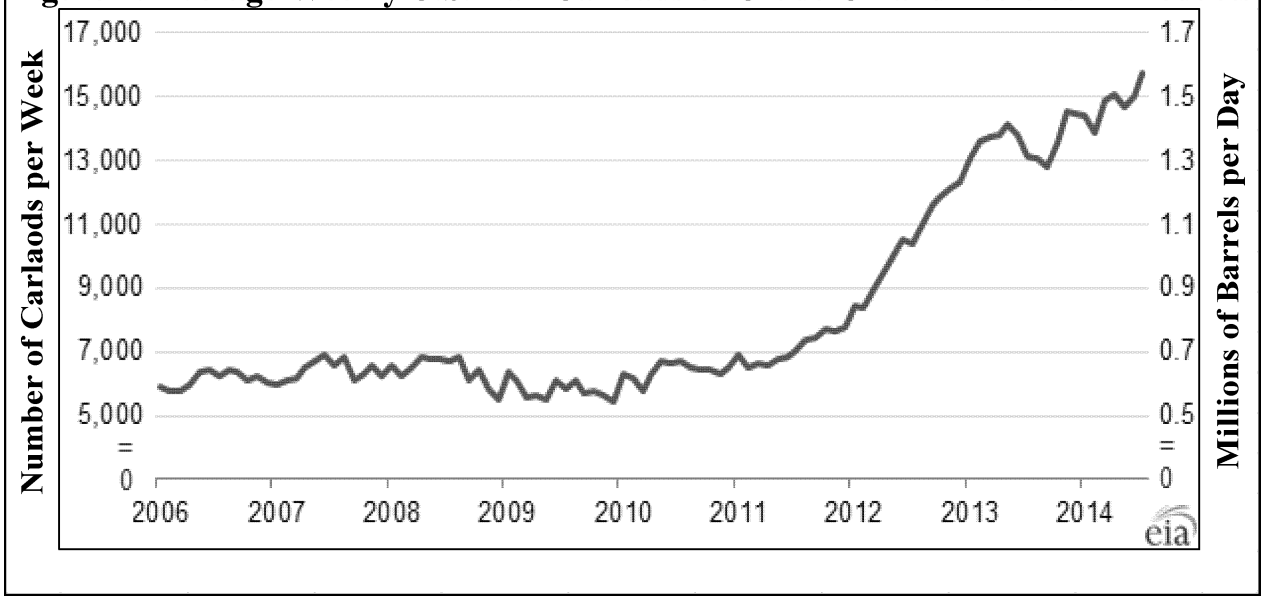
Crude Oil Transport by Rail

The U.S. is now the global leader in crude oil production growth. With a growing domestic supply, rail transportation, in particular, has emerged as a flexible alternative to transportation by pipeline or vessel. The volume of crude oil carried by rail increased 423 percent between 2011 and 2012.[104] [105] In 2013, as the number of rail carloads of crude oil surpassed 400,000.[106]

The Bakken region of the Williston basin is now producing over one million barrels of oil per day [107], most of which is transported by rail. The U.S. Energy Information Administration's *''Annual Survey of Domestic Oil and Gas Reserves''* reports that in addition to North Dakota's Bakken region, the shale plays in reserves in North America are extensive.[108]

Expansion in oil production has led to increasing volumes of product transported to refineries. Traditionally, pipelines and oceangoing tankers have delivered the vast majority of crude oil to U.S. refineries, accounting for approximately 93 percent of total receipts (in barrels) in 2012. Although other modes of transportation—rail, barge, and truck—have accounted for a relatively minor portion of crude oil shipments, volumes have been rising very rapidly. With a growing domestic supply, rail transportation, in particular, has emerged as a flexible alternative to transportation by pipeline or vessel. The transportation of large volumes of flammable liquids by poses a risk to life, property, and the environment. The volume of flammable liquids shipped by rail unit trains has been increasing rapidly since 2006, representing a growing risk. Figure 1 (restated here) provides the Average weekly U.S. rail carloads of crude oil and petroleum products from 2006 through 2014. The figure below visually demonstrates the considerable increase in crude oil and petroleum shipments by rail.[109]

Figure 1: Average Weekly U.S. Rail Carloads of Crude Oil and Petroleum Products



[104] See U.S. Rail Transportation of Crude Oil: Background and Issues for Congress; *http://fas.org/sgp/crs/misc/R43390.pdf.*

[105] *See Table 9 of EIA refinery report http://www.eia.gov/petroleum/refinerycapacity/.*

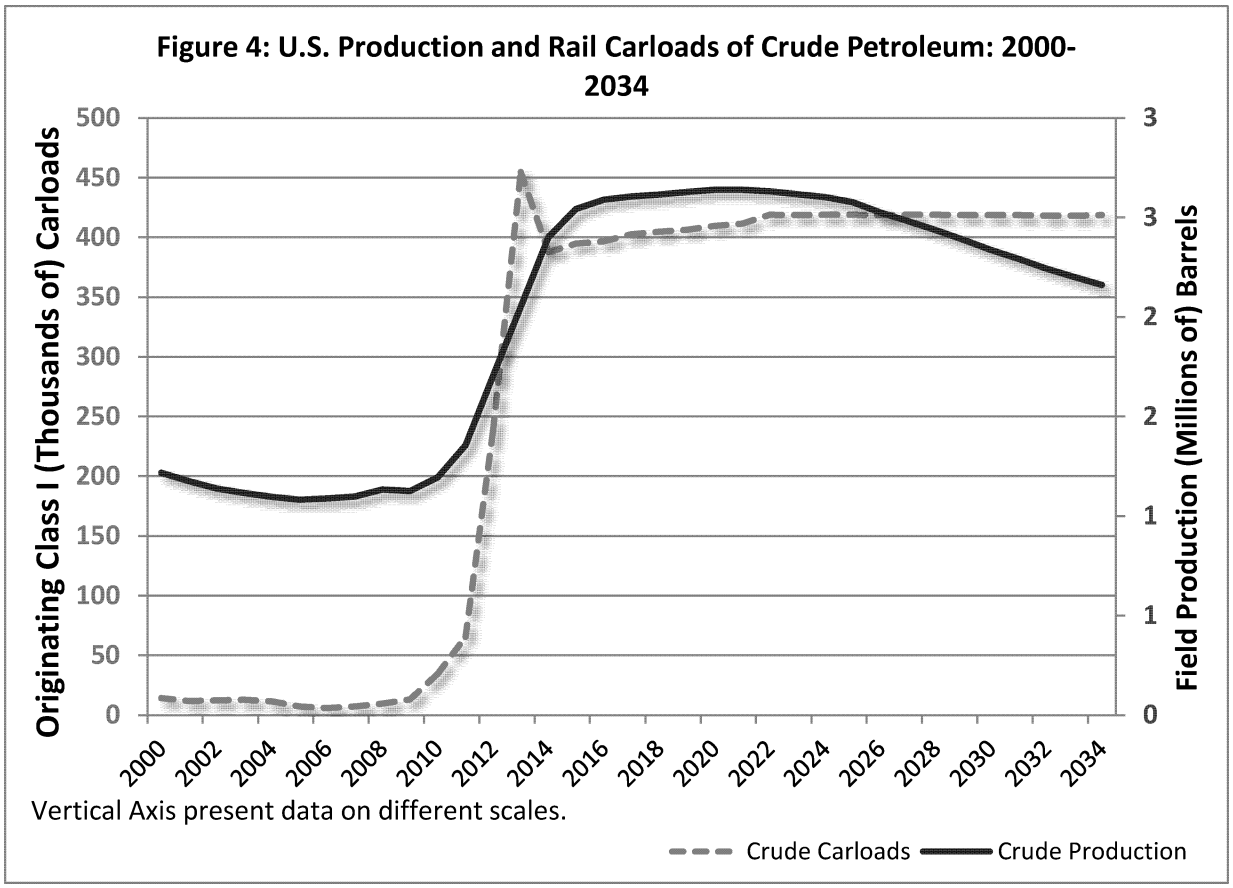
[106] *http://www.stb.dot.gov/stb/industry/econ_waybill.html.*

[107] Information regarding oil and gas production is available at the following URL: *http://www.eia.gov/petroleum/drilling/#tabs-summary-2.*

[108] EIA ''U.S. Crude Oil and Natural Gas Proved Reserves, 2013,'' available at: *http://www.eia.gov/naturalgas/crudeoilreserves/pdf/uscrudeoil.pdf.*

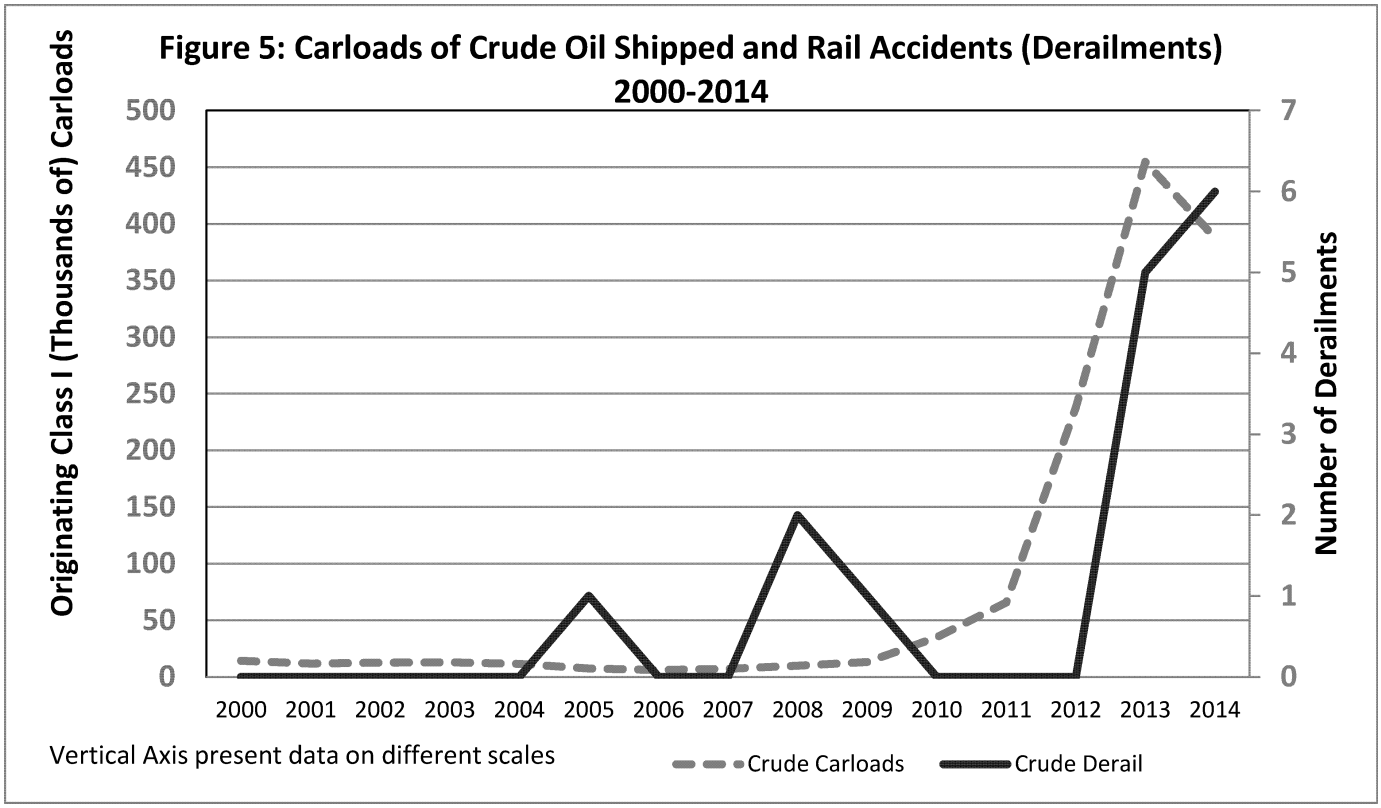
[109] U.S. Energy Information Administration, *Rail deliveries of U.S. oil continue to increase in 2014,* (August 28, 2014) available at *http://www.eia.gov/todayinenergy/detail.cfm?id=17751.*

Figure 4 shows the recent strong growth in crude oil production in the U.S., as well as growth in the number of rail carloads shipped. Figure 4 also shows forecasted domestic crude oil production from the Energy Information Administration (EIA) and PHMSA's projected strong demand for the rail shipment of crude oil.



SOURCES AND NOTES: Originating Carloads for 2000–2013 obtained from the Surface Transportation Board waybill sample. Forecasts of overall domestic crude oil production and carload figures from 2014–2034 are taken from the report prepared by the Brattle Group on behalf of RSI [Table 14]. Production figures were derived from the EIA domestic crude production from 2014 Annual Energy Outlook then converted to carloads.

Rail accidents involving crude oil have risen along with the increase in crude oil production and rail shipments of crude oil. Figure 5 shows this rise.



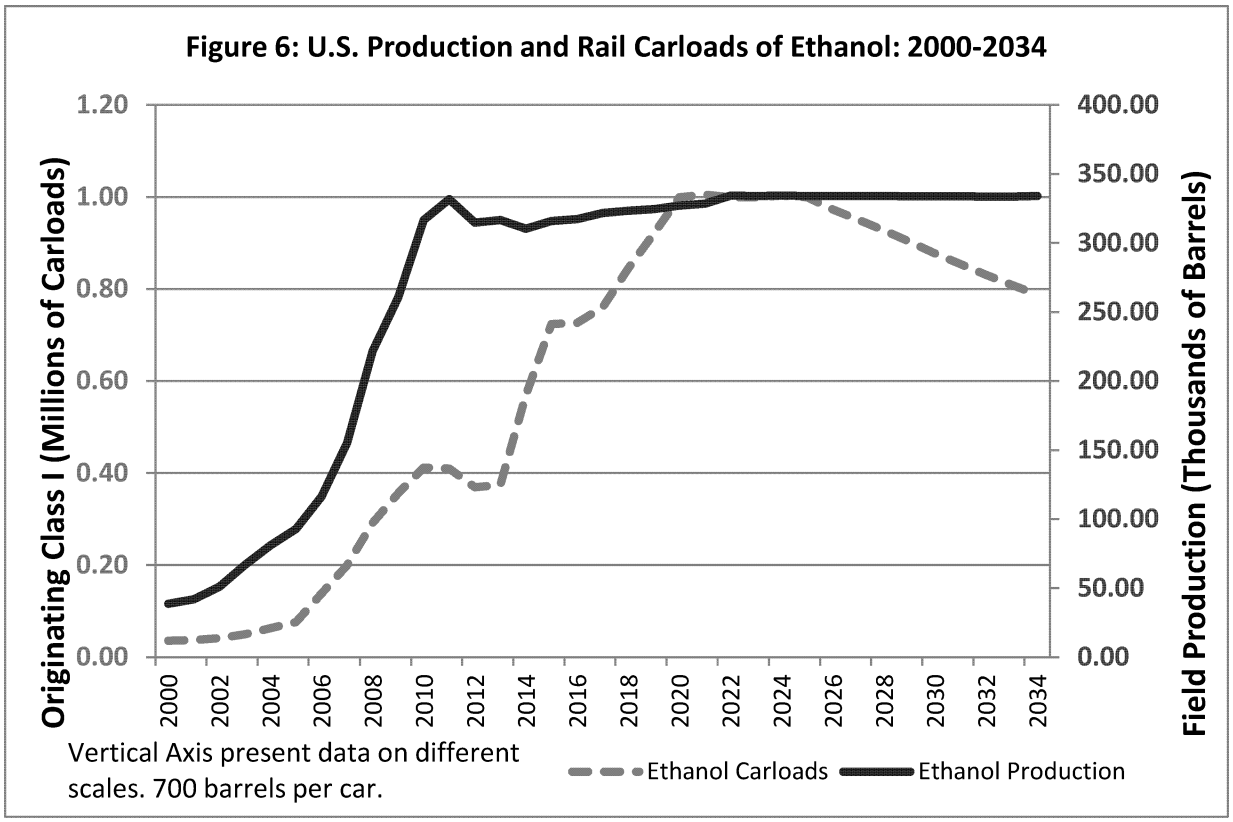
SOURCES AND NOTES: Originating Carloads for 2000–2013 obtained from the Surface Transportation Board waybill sample 2014 originating carloads is an estimate based on EIA production forecast. Incident counts are from the PHMSA and FRA Incident Report Databases.

Based on these train accidents, the projected continued growth of domestic crude oil production, and the growing number of train accidents involving crude oil, PHMSA concludes that the potential for a train accident involving crude oil has increased, which has raised the likelihood of a catastrophic train accident that would cause substantial damage to life, property, and the environment.

Ethanol Transport by Rail

In the last ten years, the production of ethanol has increased dramatically due to the demand for ethanol-blend fuels. U.S. production of ethanol was 14.3 billion gallons in 2014.[110] Ethanol is largely shipped from production facilities by rail and is now the largest volume hazardous material shipped by rail. Large volumes of ethanol are commonly shipped by unit trains, up to 3.2 million gallons, and the larger barges can transport up to 2.5 million gallons.

Ethanol is a flammable colorless liquid; a polar solvent that is completely miscible in water. It is heavier than air, and has a wider flammable range than gasoline, with a Lower Explosive Limit (LEL) to an Upper Explosive Limit (UEL) range of 3.3% to 19%. The flash point for pure ethanol is 55 °F, and for denatured ethanol it can be much lower depending on the amount of denaturant used. Ethanol is still considered a flammable liquid in solutions as dilute as 20%, with a flash point of 97 °F. At colder temperatures (below about 51 °F), the vapor pressure of ethanol is outside the flammable range. Ethanol is shipped with a flammable liquids placard and North American 1987 designation.[111] As shown in the Figure 6, EIA projects strong demand for ethanol in the future.

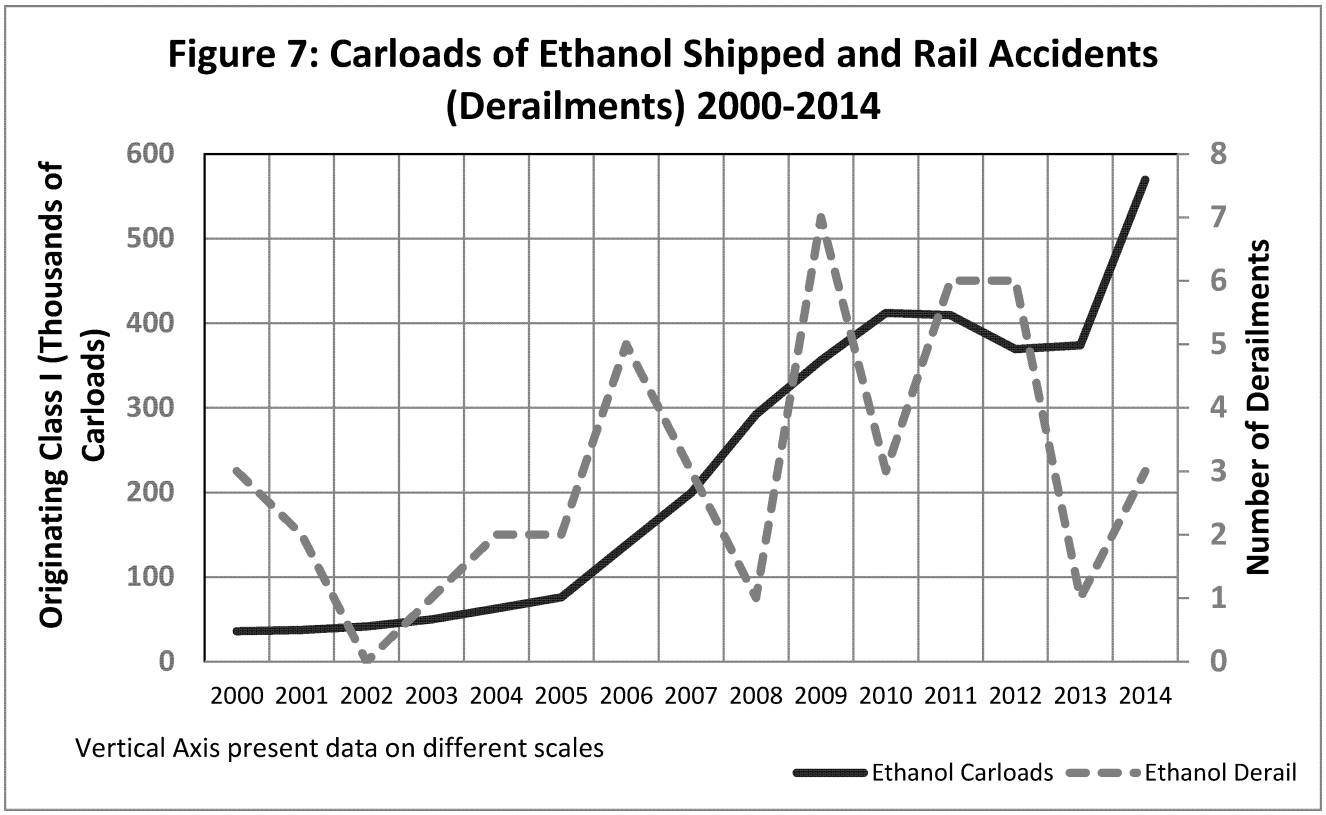


SOURCES AND NOTES: Originating Carloads for 2000–2013 were obtained from the Surface Transportation Board Waybill sample. Forecasts of overall domestic ethanol production are obtained from the EIA. The carload forecast from 2014–2034 is based on production using Excel's Forecast function using an estimated linear trend of historic ethanol carloads based on historic production.

According to a June 2012 white paper by the AAR, U.S. ethanol production has increased considerably during the last 10 years and has generated similar growth in the transportation of ethanol by rail. Between 2001 and 2012, the number of rail carloads of ethanol increased by 650 percent. Similarly the number of rail carloads of crude oil has also exponentially increased. Unfortunately, this growth in rail traffic has been accompanied by an increase in the number of rail accidents involving ethanol and crude oil. Figure 7 below plots the total number of rail accidents involving ethanol during the last 13 years compared to the total carloads of ethanol. The left axis shows the total number of rail derailments and the right axis shows total carloads shipped.

[110] Source: U.S. Energy Information Administration : ''January 2015 Monthly Energy Review. U.S. Energy Information Administration ''January 2015 Monthly Energy Review'' Annual Data: *www.eia.gov/totalenergy/data/browser/xls.cfm?tbl=T10.03&freq=m.*

[111] Large Volume Ethanol Spills—Environmental Impacts and Response Options, MassDEP, *http://www.mass.gov/eopss/docs/dfs/emergencyresponse/special-ops/ethanol-spill-impacts-and-response-7-11.pdf.*



SOURCES AND NOTES: Originating Carloads for 2000–2013 obtained from the Surface Transportation Board waybill sample 2014 originating carloads is an estimate based on EIA production forecast. Incident counts are from the PHMSA and FRA Incident Report Databases.

Summary of Regulatory Changes

In the final RIA PHMSA and FRA analyzed the impacts associated with a system-wide, comprehensive final rule that addresses the risk associated with the transportation of flammable liquids in HHFTs. Final rule provisions include:

- Routing Requirements
- Tank Car Specifications;
- Speed Restrictions;
- Advanced Brake Signal Propagation Systems; and
- Classification of Unrefined Petroleum-based Products.

This approach is designed to mitigate damages of rail accidents involving flammable materials, though some provisions could also prevent accidents. The RIA discusses, consistent with this final rule, five requirement areas. Although we analyze the effects of individual requirements separately, this final rule is a system-wide approach covering all requirement areas.

PHMSA received over 3,200 public comments representing over 182,000 signatories in response to the August 1, 2014 NPRM and initial RIA. This final rule has been revised in response to the comments received and the final RIA has been revised to align with the changes made to the final rule. Specifically, the RIA explains adjustments to the methodology used to estimate the benefits and costs resulting from the final rule.

The analysis shows that expected damages based on the historical safety record are expected to exceed $4.1 billion (undiscounted) and that damages from high-consequence events could reach $12.6 billion (undiscounted) over a 20-year period in the absence of the rule.

The revised RIA is in the docket and supports the amendments made in this final rule. Table 4 (restated here) shows the costs and benefits by affected section and rule provision over a 20-year period, discounted at a 7% rate. Table 4 (restated here) also shows an explanation of the comprehensive benefits and costs (*i.e.,* the combined effects of individual provisions), and the estimated benefits, costs, and net benefits of each amendment.

Please also note that, given the uncertainty associated with the risks of HHFT shipments, Table 4 (restated here) contains a range of benefits estimates. The low-end of the range of estimated benefits estimates risk from 2015 to 2034 based on the U.S. safety record for crude oil and ethanol from 2006 to 2013, adjusting for the projected increase in shipment volume over the next 20 years. The upper end of the range of estimated benefits is the 95th percentile from a Monte Carlo simulation.

TABLE 4—20 YEAR COSTS AND BENEFITS BY STAND-ALONE REGULATORY AMENDMENTS 2015–2034 [112]

Affected section [113]	Provision	Benefits (7%)	Costs (7%)
49 CFR 172.820	Rail Routing +	Cost effective if routing were to reduce risk of an incident by 0.41%.	$8.8 million.
49 CFR 173.41	Classification Plan	Cost effective if this requirement reduces risk by 1.29%.	$18.9 million.

TABLE 4—20 YEAR COSTS AND BENEFITS BY STAND-ALONE REGULATORY AMENDMENTS 2015–2034 [112]—Continued

Affected section [113]	Provision	Benefits (7%)	Costs (7%)
49 CFR 174.310	Speed Restriction: 40 mph speed limit in HTUA*.	$56 million–$242 million**	$180 million.
	Advanced Brake Signal Propagation Systems.	$470.3 million–$1,114 million**	$492 million.
49 CFR part 179	Existing Tank Car Retrofit/ Retirement.	$426 million—$1,706 million**	$1,747 million.
	New Car Construction	$23.9 million–$97.4 million**	$34.8 million.
Cumulative Total		$912 million–$2,905 million**	$2,482 million.

"*" indicates voluntary compliance regarding crude oil trains in high-threat urban areas (HTUA).
"+" indicates voluntary actions that will be taken by shippers and railroads.
"**" Indicates that the low end of the benefits range is based solely on lower consequence events, while the high end of the range includes benefits from mitigating high consequence events.

B. Unfunded Mandates Reform Act

The Unfunded Mandates Reform Act of 1995 (Public Law 104–4, 2 U.S.C. 1531) (UMRA) requires each agency to prepare a written statement for any proposed or final rule that includes a ''Federal mandate that may result in the expenditure by State, local, and Native American Indian tribal governments, in the aggregate, or by the private sector, of $100,000,000 or more (adjusted annually for inflation) in any one year.'' The value equivalent of $100 million in 1995, adjusted for inflation to 2012 levels, is $151 million. This final rule will not impose enforceable duties on State, local, or Native American Indian tribal governments. UMRA was designed to ensure that Congress and Executive Branch agencies consider the impact of legislation and regulations on States, local governments, and tribal governments, and the private sector. With respect to States and localities, UMRA was an important step in recognizing State and local governments as partners in our intergovernmental system, rather than mere entities to be regulated or extensions of the Federal government.

As described in greater detail throughout this document, the final rule is a system-wide, comprehensive approach consistent with the risks posed by high-hazard flammable materials transported by rail. Specifically, requirements address: (1) Proper classification and characterization, (2) operational controls to lessen the likelihood and consequences of train accidents and (3) tank car integrity. The RIA discusses, consistent with this final rule, five requirement areas: Rail Routing, Enhanced Tank Car Standards, Speed Restrictions, Braking, and Classification of unrefined petroleum-based products.

The final rule would result in costs to the private sector that exceed $151 million in any one year and those costs and benefits associated with this rulemaking have been discussed under paragraph A, Executive Order 12866, Executive Order 13563, Executive Order 13610 and DOT Regulatory Policies and Procedures, of this section. In addition, the RIA provides a detailed analysis of the public sector costs associated with the proposed requirements. The RIA is available in the public docket for this rulemaking. PHMSA invites comments on these considerations, including any unfunded mandates related to this rulemaking.

C. Executive Order 13132: Federalism

Executive Order 13132 requires agencies to assure meaningful and timely input by state and local officials in the development of regulatory policies that may have ''substantial direct effects on the states, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.''

This final rule has been analyzed in accordance with the principles and criteria contained in Executive Orders 13132 (''Federalism''). The amendments in the final rule will not have any direct effect on the states, or their political subdivisions; it will not impose any compliance costs; and it will not affect the relationships between the national government and the states, or political subdivisions, or the distribution of power and responsibilities among the various levels of government.

Several of the issues addressed in this final rule are subject to our preemption authority, *i.e.,* classification, packaging, and rail routing. In regard to rail routing, for example, in a March 25, 2003 final rule (68 FR 14509), we concluded that the specifics of routing rail shipments of hazardous materials preempts all states, their political subdivisions, and Indian tribes from prescribing or restricting routes for rail shipments of hazardous materials, under Federal hazardous material transportation law (49 U.S.C. 5125) and the Federal Rail Safety Act (49 U.S.C. 20106). We would expect the same preemptive effect as a result of this rulemaking, and thus, the consultation and funding requirements of Executive Orders 13132 and 13175 do not apply. Nonetheless, we invited state and local governments with an interest in this rulemaking to comment on any effect that proposed requirements could have on them, if adopted.

We received comments from state and local governments representing approximately 200 signatories. State and local governments unanimously supported the goal of this rulemaking to enhance safety of rail transportation for flammable liquids. Many local and state governments acknowledged the preemption authority of the federal government. Local and state governments also provided comments on specific proposals in the NPRM, which are discussed in the ''Summary and Discussion of Comments'' portion of this rulemaking. Therefore, the amendments in the final rule will not have any direct effect on the states, or their political subdivisions; it will not impose any compliance costs; and it will not affect the relationships between the national government and the states, or political subdivisions, or the distribution of power and responsibilities among the various levels of government.

D. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

Executive Order (E.O.) 13175 (''Consultation and Coordination with Indian Tribal Governments'') requires

[112] All costs and benefits are in millions over 20 years, and are discounted to present value using a seven percent rate and rounded.

[113] All affected sections of the Code of Federal Regulations (CFR) are in Title 49.

agencies to assure meaningful and timely input from Indian tribal government representatives in the development of rules that significantly or uniquely affect Indian communities. In complying with this E.O., agencies must determine whether a proposed rulemaking has tribal implications, which include any rulemaking that imposes ''substantial direct effects'' on one or more Indian communities, on the relationship between the federal government and Indian tribes, or on the distribution of power between the Federal Government and Indian tribes. Further, to the extent practicable and permitted by law, agencies cannot promulgate two types of rules unless they meet certain conditions. The two types of rules are: (1) Rules with tribal implications, substantial direct compliance costs on Indian tribal governments that are not required by statute; and (2) rules with tribal implications that preempt tribal law.

PHMSA analyzed this final rule in accordance with the principles and criteria prescribed in E.O. 13175. As a result, PHMSA has determined that this rulemaking does not significantly or uniquely affect tribes, and does not impose substantial direct effects or compliance costs on such governments. Moreover, under Federal hazardous material transportation law (49 U.S.C. 5125) and the Federal Rail Safety Act (49 U.S.C. 20106), the federal government has a superseding preemption with regard to hazardous materials regulation and railroad safety. Therefore, the funding and consultation requirements of E.O. 13175 do not apply, and a tribal summary impact statement is not required.

We received approximately 6 comments from tribal governments addressing the NPRM. All the comments from Indian tribal governments addressed concerns about the environmental, economic, and safety impacts of crude oil train derailments in tribal lands. In general, comments from Indian tribal governments provided support for specific proposals in the NPRM or suggested stricter measures than proposed. For example, multiple tribal governments supported the 40-mph speed limit in all areas or recommended that speed restrictions be slower than proposed. Some comments submitted by Indian tribal governments provided recommendations that were beyond the scope of this rulemaking.

In the August 1, 2014 NPRM preceding this rulemaking, PHMSA asked for comment on the possible impacts of the notification requirements on Tribal Emergency Response Commissions (TERCs) or other tribal institutions. Overall, Indian tribal governments supported enhanced notification requirements on the basis that tribal governments or local communities have the right-to-know about hazardous materials shipments within their jurisdictions. We also received several comments from environmental groups and individuals that supported notification to TERCS or other tribal authorities. However, as stated in the ''Summary and Discussion of Comments'' PHMSA believes adopting the notification (and information sharing) requirements under § 172.820 for HHFTs constitutes a better approach than adopting the notification requirements proposed in the NPRM. Section 172.820 requires notification to Fusion Centers, which includes an existing mechanism for Tribal Nations to interact with the Fusion Centers through the State, Local, Tribal and Territorial Government Coordinating Council. Please refer to the aforementioned ''Summary and Discussion of Comments'' section for additional summary and discussion related to the notification issue.

Based upon on the discussion of comments throughout this rule, including those of Indian Tribal Governments, and the corresponding analysis of those comments, PHMSA and FRA are confident we have been responsive to the concerns of all our stakeholders including Indian Tribal Governments. As previously stated, we expect that several issues addressed in this final rule are subject to federal preemption authority, *i.e.,* classification, packaging, and rail routing. Furthermore, this rulemaking does not significantly or uniquely affect Indian tribal governments, and it does not impose substantial direct effects or compliance costs on such governments.

Other NPRM proposals that were discussed within the comments submitted by Indian tribal governments do not uniquely affect Indian tribal governments and were addressed by a wide variety of commenters. PHMSA has discussed these proposals in the appropriate comment summaries found in other sections of this rulemaking.

E. Regulatory Flexibility Act, Executive Order 13272, and DOT Policies and Procedures

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) and Executive Order 13272 require a review of proposed and final rules to assess their impacts on small entities. An agency must prepare an initial regulatory flexibility analysis (IRFA) unless it determines and certifies that a rule, if promulgated, would not have a significant impact on a substantial number of small entities. During the Notice of Proposed Rulemaking (NPRM) stage, PHMSA and FRA had not determined whether the proposed rule would have a significant economic impact on a substantial number of small entities. Therefore, PHMSA published an IRFA to aid the public in commenting on the potential small business impacts of the proposals in the NPRM. All interested parties were invited to submit data and information regarding the potential economic impact that would result from adoption of the proposals in the NPRM.

The Regulatory Flexibility Act also requires an agency to conduct a final regulatory flexibility assessment (FRFA) unless it determines and certifies that a rule is not expected to have a significant impact on a substantial number of small entities. PHMSA is not able to certify that the final rule will not have a significant economic impact on a substantial number of small entities. PHMSA and FRA received comments and data from several commenters on the IRFA, and that information was used to make this determination. Therefore, PHMSA is publishing this FRFA that discusses the requirement areas of this final rule and provides the rationale the agencies used for assessing what impacts will be borne by small entities. PHMSA considered comments received in the public comment process when making a determination in the FRFA.

This FRFA was developed in accordance with the Regulatory Flexibility Act.

(1) A succinct statement of the need for and objectives of the rule.

PHMSA and FRA are promulgating the final rule in response to recent train accidents involving the derailment of HHFTs. Shipments of large volumes of flammable liquids pose a significant risk to life, property, and the environment. For example, on December 30, 2013, a train carrying crude oil derailed and ignited near Casselton, North Dakota, prompting authorities to issue a voluntary evacuation of the city and surrounding area. On November 8, 2013, a train carrying crude oil to the Gulf Coast from North Dakota derailed in Alabama, spilling crude oil in a nearby wetland and igniting into flames. On July 6, 2013, a catastrophic railroad accident occurred in Lac-Mégantic, Quebec, Canada when an unattended freight train containing hazardous materials rolled down a descending grade and subsequently derailed. The derailment resulted in a fire and multiple energetic ruptures of tank cars, which, along with other effects of the accident, caused the confirmed death of 47 people. In addition, this derailment

caused extensive damage to the town center, clean-up costs, and the evacuation of approximately 2,000 people from the surrounding area. Although this regulatory action would not prevent such accidents involving unattended trains, the Lac-Mégantic incident demonstrates that very large economic losses occur with catastrophic derailments. PHMSA is taking this regulatory action to minimize the risks the damages of catastrophic accidents in the United States.

In this final rule, PHMSA and FRA are adopting revisions to the HMR to ensure that the rail requirements address the risks posed by the transportation on railroads of HHFTs. This rulemaking addresses risks in three areas: (1) Proper classification and characterization of the product being transported, (2) operational controls to decrease the likelihood and consequences of train accidents, and (3) tank car integrity to decrease the consequences of train accidents. Promulgating this rulemaking in these areas is consistent with the goals of the HMR: (1) To ensure that hazardous materials are packaged and handled safely and securely during transportation; (2) to provide effective communication to transportation workers and emergency responders of the hazardous materials being transferred; and (3) to minimize the consequences of an incident should one occur.

(2) A summary of the significant issues raised by the public comments in response to the IRFA, a summary of the assessment of the agency of such issues, and a statement of any changes made to the proposed rule as a result of such comments.

For an extensive review of the comments raised please see the preamble discussion for this rule. The only issue raised in direct response to the IRFA itself was the number of entities that would be affected. Bridger, LLC expressed the concern that the use of ''offerors'' and ''railroads'' excluded entities such as bulk terminals. The following section provides a detailed estimate of the number of entities affected. Commenters also questioned the number of small railroads that would be affected. ASLRRA commented that 160 small railroads would be affected, not 64 as estimated in the IRFA. To the extent those railroads would be affected, as discussed below, the only impact would be the cost of conducting the required routing analysis and some rerouting.

(3) A description and an estimate of the number of small entities to which the rule will apply or an explanation of why no such estimate is available.

The universe of the entities considered in an FRFA generally includes only those small entities that can reasonably expect to be directly regulated by the regulatory action. Small railroads and offerors are the types of small entities potentially affected by this final rule.

A ''small entity'' is defined in 5 U.S.C. 601(3) as having the same meaning as ''small business concern'' under section 3 of the Small Business Act. This includes any small business concern that is independently owned and operated, and is not dominant in its field of operation. Title 49 U.S.C. 601(4) likewise includes within the definition of small entities non-profit enterprises that are independently owned and operated, and are not dominant in their field of operation.

The U.S. Small Business Administration (SBA) stipulates in its size standards that the largest a ''for-profit'' railroad business firm may be, and still be classified as a small entity, is 1,500 employees for ''line haul operating railroads'' and 500 employees for ''switching and terminal establishments.'' Additionally, 5 U.S.C. 601(5) defines as small entities governments of cities, counties, towns, townships, villages, school districts, or special districts with populations less than 50,000.

Federal agencies may adopt their own size standards for small entities in consultation with SBA and in conjunction with public comment. Pursuant to that authority, FRA has published a final Statement of Agency Policy that formally establishes small entities or small businesses as being railroads, contractors, and hazardous materials offerors that meet the revenue requirements of a Class III railroad as set forth in 49 CFR 1201.1–1, which is $20 million or less in inflation-adjusted annual revenues, and commuter railroads or small governmental jurisdictions that serve populations of 50,000 or less. See 68 FR 24891 (May 9, 2003) (codified as appendix C to 49 CFR part 209). The $20 million limit is based on the Surface Transportation Board's revenue threshold for a Class III railroad. Railroad revenue is adjusted for inflation by applying a revenue deflator formula in accordance with 49 CFR 1201.1–1. This definition is what PHMSA is using for the rulemaking.

Railroads

Not all small railroads would be required to comply with the provisions of this rule. Most of the approximately 738 small railroads that operate in the United States do not transport hazardous materials. Based on comments from ASLRRA, the rule could potentially affect 160 small railroads because they transport flammable liquids in HHFTs. Therefore, this final rule would impact 22 percent of the universe of 738 small railroads.

Offerors

Almost all hazardous materials tank cars, including those cars that transport crude oil, ethanol, and other flammable liquids, are owned or leased by offerors. The adopted requirements for a testing and sampling program will directly affect shippers as they will now be required to create a document with a sampling and testing program for unrefined petroleum-based products. In addition, some of the other provisions in this rulemaking may indirectly affect offerors. DOT believes that a majority, if not all, of these offerors are large entities. DOT used data from the DOT/PHMSA Hazardous Materials Information System (HMIS) database to screen for offerors that may be small entities.

In analyzing the NPRM, from the DOT/PHMSA HMIS database and from industry sources, DOT found 731 small offerors that might be impacted. Based on further information available on the companies' Web sites, all other offerors appeared to be subsidiaries of large businesses. Also, in analyzing the NPRM, PHMSA found that out of these 731, only 297 owned tank cars that would be affected. All the other 434 offerors either did not own tank cars or have tank cars that would not be affected by the final rule. Additionally, no small offerors commented on PHMSA's ANPRM or NPRM for this proceeding. In both the ANPRM and the NPRM, PHMSA invited commenters to bring forth information that might assist it in assessing the number of small offerors that may be economically impacted by the requirement set forth in the proposed rule for development of the FRFA, but received no comments.

In reviewing SBA guidance for compliance with the Regulatory Flexibility Act, PHMSA determined that the appropriate standard for determining whether a small entity is impacted by the final rule is not whether the entity owns an affected tank car, but whether the entity is required to provide a tank car that conforms to the final rule when it loads the product. No entity, other the shipper loading the product, is required to provide a tank car that conforms to the final rule. Thus an entity leasing a tank car to load it is impacted as much as an entity owning a tank car to load it.

In addition, offerors of unrefined petroleum-based products may be subject to the newly adopted sampling and testing plan for all modes of transportation. The DOT/PHMSA HMIS database lists 1,568 entities described using NAICS 424710 for ''Petroleum Bulk Stations and Terminals.'' Of these, 1,444, or 92.09 percent are small entities. In addition, offerors of unrefined petroleum-based products may also include additional entities. The DOT/PHMSA HMIS database lists 186 entities described using NAICS 211111 for ''Crude Petroleum and Natural Gas Extraction.'' Of these, 122 are small entities. The DOT/PHMSA HMIS database lists 58 entities described using NAICS 211112 for ''Natural Gas Liquid Extraction.'' Of these, 34 are small entities. It is impossible to tell from the database if an entity has been recorded multiple times because of a name change or other corporate reorganization, such as a merger or acquisition. Likewise, entities that have ceased business may remain on the list. The important number is the percentage of entities, as both small entities and large entities may either have multiple listings or have ceased business. For purposes of this analysis, PHMSA assumes that half of the 1,444 small entities recorded in the database, or 722 small entities, are actually in business and affected by the final rule. In the analysis below, assuming a smaller number of entities results in a larger impact per entity, and is therefore more conservative.

(4) A description of the projected reporting, recordkeeping, and other compliance requirements of the rule, including an estimate of the classes of small entities that will be subject to the requirement and the type of professional skills necessary for preparation of the report or record.

For a thorough presentation of cost estimates, please refer to the RIA, which has been placed in the docket for this rulemaking.

This rulemaking has requirements in three areas that address the potential risks: (1) Proper classification and characterization of the product being transported, (2) operational controls to decrease the likelihood of accidents, and (3) tank car integrity. Requirements for braking, speed restrictions, and tank car production would not impact any small entities. Most small railroads affected by this rule do not operate at speeds higher than those imposed for speed restrictions or travel long distances over which the reduced speed would cause a significant economic impact. Any small railroad that operates at speeds 30 mph or less would also not be impacted by the braking requirement. Additionally, in a February 12, 2014, letter to the Secretary, ASLRRA announced that it recommended to its members to voluntarily operate unit trains of crude oil at a top speed of no more than 25 mph on all routes.

PHMSA and FRA believe that offerors may see modest increases in their lease rates as a result of enhanced tank car standards. PHMSA and FRA recognize that new tank car standards could potentially increase the rate charged to lessees since tank cars will cost more to construct and tank cars owners will seek similar returns on their investments. Given competition among suppliers of tank cars, the rates charged will be the prevailing market rate, and there will be a tendency for this rate to decrease as the supply of enhanced tank cars increases over time due to new manufacturing and effective retrofitting practices. To that effect, the implementation timeline has been specifically designed to incorporate industry data on the current manufacturing and retrofit capacity and to minimize short run supply impacts that may increase rates before the supply of enhanced tank cars expands.

Further, commenters have noted that lease rates have gone up in recent years. PHMSA and FRA believe, and commenters have confirmed, that the primary driver of recent increases in lease rates is due to the growth of the transport of crude oil by rail. In other words, increased demand for tank cars capable of carrying crude oil, relative to their supply, is responsible for most of the increase in lease rates. Once this regulation is promulgated and the industry has certainty on the new car standard for moving high volume flammable liquid shipments, we believe the industry will ramp up construction and lease rates will decrease. Additionally, also in the February 12th letter to the Secretary, the ASLRRA noted that it will support and encourage the development of new tank car standards including, but not limited to, adoption of a 9/16-inch tank car shell.

Section 174.310(a)(3) would expand hazardous materials route planning and selection requirements for railroads. This would include HHFTs transporting flammable materials and, where technically feasible, require rerouting to avoid transportation of such hazardous materials through populated and other sensitive areas. Approximately 160 short line and regional railroads carry crude oil and ethanol in train consists large enough that they would potentially be affected by this rule. While PHMSA and FRA believe this number may be an overestimation of the number of affected small entities affected this figure was used in the FRFA as a conservative estimate.

The NPRM stated that the affected Class III railroads are already compliant with the routing requirements established by HM–232E (71 FR 76834), and there were no comments on this statement. In general, at the time that rule was promulgated, it was assumed that the small railroads impacted, due to their limited size, would, on average, have no more than two primary routes to analyze. Thus, the potential lack of an alternative route to consider would minimize the impact of this requirement. Because the distance covered by the small railroads' routes is likely contained within a limited geographic region, the hours estimated for analyses are fewer than those estimated for the larger railroads. Further, because the industry associations have developed simplified forms for the routing analysis for use by small railroads, and because small railroads usually have a very limited number of routing choices, the level of skill required to complete the routing analysis for a small railroad is much lower than would be required on a larger railroad.

Finally, this final rule will also require any offeror who offers a hazardous material for transportation to develop, implement, and update its sampling and testing programs related to classification and characterization of the hazardous material if it is an unrefined petroleum-based product. PHMSA believes that there would be an initial cost for each offeror of approximately $3,200 for the first year, and additional costs of $800 annually thereafter. PHMSA believes that this section would not significantly burden any of these small entities.

PHMSA estimates the total cost to each small railroad to be $8,715 in the first year and $3,637 for subsequent years, with costs growing with increases in real wages.[114] Based on small railroads' annual operating revenues, these costs are not significant. Small railroads' annual operating revenues range from $3 million to $20 million. Previously, FRA sampled small railroads and found that revenue averaged approximately $4.7 million (not discounted) in 2006. One percent of average annual revenue per small railroad is $47,000. Thus, the costs associated with this rule amount to

[114] Costs per railroad are derived in the RIA, with line costs for all Class III railroads divided by the 160 railroads affected. Those costs were $1,394,476 for Year 1, and $581,991 for Year 2. Values for subsequent years are increased for anticipated increases in real wages.

significantly less than one percent of the railroad's annual operating revenue. PHMSA realizes that some small railroads will have lower annual revenue than $4.7 million. However, PHMSA is confident that this estimate of total cost per small railroad provides a good representation of the cost applicable to small railroads, in general.

In conclusion, PHMSA believes that although some small railroads will be directly impacted, they will not be impacted significantly as the impact will amount to significantly less than one percent of an average small railroad's annual operating revenue. Information available indicates that none of the offerors will be significantly affected by the burdens of the rule. Therefore, these requirements will likely not have a significant economic impact on any small entities' operations. In the NPRM, PHMSA had sought information and comments from the industry that might assist in quantifying the number of small offerors who may be economically impacted by the requirements set forth in the proposed rule, but did not receive any comments.

(5) A description of the steps the agency has taken to minimize the significant adverse economic impact on small entities consistent with the objectives of applicable statutes, including a statement of factual, policy, and legal reasons for selecting the alternative adopted in the final rule, and why each of the other significant alternatives to the rule considered by the agency was rejected.

PHMSA re-evaluated and re-defined ''High-Hazard Flammable Train'' to minimize the significant adverse economic impact on small entities. This definition served as the basis for many of the requirements in the NPRM and in this final rule. Be revising this definition we have narrowed the scope of the rulemaking to more appropriately focus on the risks of the transport of large volumes of flammable liquids by rail. This narrowing of the scope also limits the impact on small entities. We believe the new definition excludes the inclusion of manifest trains (which could represent a larger portion of smaller railroads) from the requirements of this rule.

Specifically, PHMSA and FRA revised the definition from ''20 or more tank cars in a train loaded with a flammable liquid'' to ''a continuous block of 20 or more tank cars or 35 or more cars dispersed through a train loaded with a flammable liquid'' based on public comment.

PHMSA and FRA did not intend the NPRM proposed definition to include lower risk manifest trains and had crafted the definition with the idea of capturing the higher risk bulk shipments seen in unit trains. Based on FRA modeling and analysis, 20 tank cars in a continuous block loaded with a flammable liquid and 35 tank cars or more total dispersed throughout a train loaded with a flammable liquid display consistent characteristics as to the number of tank cars likely to be breached in a derailment. See ''Definition of High-Hazard Flammable Train'' section of this rule for a description of the modeling. The operating railroads commented that this threshold will exclude lower risk manifest trains and focus on higher risk unit trains. It should be noted that commenters also suggested this threshold, as it would eliminate the inclusion of most manifest trains and focus on unit trains.

In addition to the above change that effects the entire rulemaking action, PHMSA is addressing six requirements areas in this final rule, and believes it is appropriate to address the impacts on small entities separately for each requirement area.

1. Requirement Area 1—Rail Routing

Adopted Action

PHMSA and FRA are requiring rail carriers develop and implement a plan that will result in the use of a safer and more secure route for certain trains transporting an HHFT. This may appear more burdensome than it will be, because FRA has helped to develop tools to facilitate analysis of routing, working with both the AAR and ASLRRA, ensuring that the tool will be readily available to small railroads. To assist railroads with evaluating primary and alternative routes for origin-destination pairs, the U.S. Department of Transportation awarded the Railroad Research Foundation (RRF), a non-profit affiliate of AAR, a Railroad Safety Technology Grant for a risk management tool that will help with the analysis of the 27 factors required in analyzing rail routing. The grant provided $1.54 million for enhancement and ongoing implementation of the Rail Corridor Risk Management System (RCRMS). RCRMS was developed for railroads with alternative routing and is therefore not effective for smaller or Class II/III railroads with limited route or no alternative routes. These railroads were responsible for developing their own analysis and documentation. Accordingly the Hazmat Transportation Analytical Risk Model (H–TRAM) model was developed as a result of an FRA Grant provided to RRF on behalf of ASLRRA. More recently, FRA funded an independent verification and validation of the model.

The rail routing requirements specified in § 172.820 are being modified to apply to any HHFT, as the term is defined in this final rule (§ 171.8; See discussion in HHFT section). Rail carriers would be required to assess available routes using, at a minimum, the 27 factors listed in Appendix D to Part 172 of the HMR to determine the safest, most secure routes for security-sensitive hazardous materials. Additionally, the requirements of § 172.820(g) require rail carriers to establish a point of contact with state and/or regional Fusion Centers who coordinate with state, local and tribal officials on security issues as well as state, local, and tribal officials that may be affected by a rail carrier's routing decisions and who directly contact the railroad to discuss routing decisions.

To assist railroads with evaluating primary and alternative routes for origin-destination (OD) pairs, the U.S. Department of Transportation awarded the Railroad Research Foundation (RRF), a non-profit affiliate of the AAR, a Railroad Safety Technology Grant for a risk management tool that will help with the analysis of the 27 minimum factors to consider. The grant provided $1.54 million for enhancement and ongoing implementation of the Rail Corridor Risk Management System (RCRMS). RCRMS was developed for railroads with alternative routing and is, therefore, not effective for smaller or Class II or Class III railroads with limited or no alternative routes. These railroads were responsible for developing their own analysis and documentation. Accordingly, the Hazmat Transportation Analytical Risk Model (H–TRAM) was developed through an FRA Grant provided to RRF on behalf of the ASLRRA. Most recently, FRA funded an independent verification and validation of the model.

Determination of Need

There has long been considerable public and Congressional interest in the safe and secure rail routing of security-sensitive hazardous materials. In 2008, PHMSA, in coordination with FRA and the Transportation Security Administration (TSA), issued a final rule requiring, among other things, that rail carriers compile annual data on certain shipments of explosive, toxic by inhalation (TIH or PIH), and Class 7 (radioactive) materials; use the data to analyze safety and security risks along rail routes where those materials are transported; assess alternative routing options; and make routing decisions

based on those assessments, 73 FR 20752. These requirements were codified at 49 CFR 172.820.

The 2008 rule also requires rail carriers transporting ''security sensitive materials'' to select the safest and most secure route to be used in transporting those materials, based on the carrier's analysis of the safety and security risks on primary and alternate transportation routes over which the carrier has authority to operate.

The NTSB report of January 23, 2014, stated that at a minimum, the route assessments, alternative route analysis, and route selection requirements should be extended to key trains transporting large volumes of flammable liquid (NTSB Recommendation R–14–4). Additionally, in their comment on the NPRM, NTSB stated that the proposal to subject carriers transporting HHFTs to the routing requirements in 172.820 would satisfy the intent of R–14–4.

Although Class I rail carriers committed to voluntarily apply routing requirements to trains carrying 20 carloads or more of crude oil as a result of the Secretary's Call-to-Action:

- The voluntary actions do not extend beyond Class I railroads;
- The voluntary actions do not apply to all HHFTs;
- The proposed routing requirements would have provided a check on higher risk routes or companies; and
- The routing requirements would ensure that rail carriers continue their voluntary actions in the future.

Alternatives Considered

Alternative 1: No Action Alternative—Status Quo

Route planning and route selection provisions currently required for explosive, PIH, or Class 7 (radioactive) materials are not required for HHFTs. If the rule is not adopted, railroads would not be required to conduct route risk analysis nor are they required to reroute shipments over lower-risk routes. Specific identified criteria for the route and alternate route analyses may not be uniformly considered by all railroads, and written analyses of primary and alternate routes including safety and security risks would not be required. While the railroads are expected to continue voluntarily implementing these measures for crude oil, they have not made a similar commitment for ethanol trains (though PHMSA believes some of them may do so). The costs to society, the government, and the rail industry of an accident involving large shipments of flammable liquid are high. If no action is taken, the threat of catastrophic accidents in large populated areas or other sensitive environments will continue. This option would not result in any modification of § 172.820 to include HHFTs. PHMSA and FRA are not considering this alternative.

Alternative 2: Apply Routing to HHFTs

This alternative, adopted in the final rule, applies safety and security routing assessments and rerouting to HHFTs. Railroads would be required to assess current routing of these trains as well as practical alternative routes. Railroads would have to choose the lowest risk practical route to move HHFTs. This alternative focuses the routing requirements on the flammable liquid shipments that pose the greatest risk to public safety. Additionally, the final rule requires rail carriers to establish a point of contact with (1) state and/or regional Fusion Centers who coordinate with state, local and tribal officials on security issues and (2) state, local, and tribal officials that may be affected by a rail carrier's routing decisions and who directly contact the railroad to discuss routing decisions.

This alternative requires railroads to balance these factors to identify the route that poses the lower risk. As such, they may, in certain cases, choose a route that eliminates exposure in areas with high population densities but poses a risk for more frequent events in areas with very low densities. In other cases the risk of derailment may be so low along a section of track that, even though it runs through a densely populated area, it poses the lowest total risk when severity and likelihood are considered. Glickman's estimate of safety improvements achievable by routing changes is based on an examination of how routing might vary as a rail carrier applies progressively heavier weights on various safety factors.[115] In practice, it is impossible to know how much weight rail carriers will give to safety when making routing decisions. As noted above, based on past routing plans submitted by rail carriers to FRA for approval, application of the routing requirements resulted in modest changes to company routing decisions. It is therefore unclear to what extent these requirements would improve safety. However, PHMSA believes applying these routing requirements to HHFTs would result in a net positive safety benefit.

Based on the determination of need, minimal cost of implementation and a vast majority of commenters supporting the proposal, PHMSA and FRA have chosen this alternative. It should be noted that the definition of HHFT has been narrowed to a train carrying 20 or more loaded tank cars in a continuous block or 35 or more loaded tank cars throughout the train consist loaded with flammable liquids (see above for discussion on HHFTs). PHMSA and FRA anticipate that this will lessen the impact on small businesses such as short line and regional railroads by eliminating a large percentage of manifest or mixed freight trains.

Impact on Small Entities

The costs of this alternative are discussed in great detail in the RIA. The total burden on small railroads over 20 years, for 160 small railroads affected, the cost, discounted at 7 percent. will be $7,236,778. The average cost per small railroad will be $45,230 over 20 years, discounted at 7 percent.

2. Requirement Area 2—Tank Car

Adopted Action

In this final rule, we are adopting requirements for new tank cars constructed after October 1, 2015, used to transport Class 3 flammable liquids in an HHFT to meet either the prescriptive standards for the DOT Specification 117 tank car (consistent with Option 2 of the NPRM except for the braking component) or the performance standards for the DOT Specification 117P tank car. Other authorized tank specification as specified in part 173, subpart F will also be permitted however, manufacture of a DOT specification 111 tank car for use in an HHFT is prohibited. In this final rule, we are also adopting retrofit requirements for existing tank cars in accordance with proposed Option 3 from the NPRM (excluding top fittings protection and steel grade). If existing cars do not meet the retrofit standard, they will not be authorized use in HHFT service after a packing group and tank car specification-based implementation timeline. This in effect would adopt different constructions standards for new and retrofitted cars used in an HHFT.

Tank cars built to the new standards as adopted in this final rule will be designated ''DOT Specification 117.'' In addition, we are adopting a performance standard for the design and construction of new tank cars or retrofitting of existing tank cars equivalent to the prescriptive DOT Specification 117 standards. Thus, a new or retrofitted tank car meeting the performance criteria will be designated as ''DOT

[115] Glickman, Theodore S. Erkut, Efhan, and Zschocke, Mark S. 2007. The cost and risk impacts of rerouting railroad shipments of hazardous materials. Accident Analysis and Prevention. 39. 1015–1025.

Specification 117P.'' Additionally, we are adopting a retrofit standard for existing tank cars meeting the DOT Specification 111 or CPC–1232 standard. A retrofitted tank car meeting the prescriptive standard will be designated as ''DOT Specification 117R.'' Please see ''Tank Car Specification'' portion of this rulemaking for further detail.

Determination of Need

Under the HMR, the offeror (shipper) must select a packaging that is suitable for the properties of the material. The DOT Specification 111 tank car is one of several cars authorized by the HMR for the rail transportation of many hazardous materials. The DOT Specification 111 tank car, which can be jacketed or unjacketed, is used for the almost all of crude oil and ethanol service by rail.

The alternatives proposed in the August 1, 2014 NPRM were intended to address the survivability of a tank car and to mitigate the damages of rail accidents far superior to those of the current DOT Specification 111 tank car. Specifically, the alternatives incorporate several enhancements to increase tank head and shell puncture resistance; thermal protection to survive a pool fire environment; and improved top fitting and bottom outlet protection during a derailment. These improvements are consistent with several NTSB safety recommendations. Under all alternatives, the proposed system of design enhancements would reduce the consequences of a derailment of tank cars transporting flammable liquids in an HHFT. There will be fewer tank car punctures, fewer releases from service equipment (top and bottom fittings), and delayed release of flammable liquid from the tank cars through pressure relief devices and thermal protection systems.

Alternatives Considered

On August 1, 2014, PHMSA, in consultation with the FRA, issued an NPRM in response to comments submitted as a result of an ANPRM. In the NPRM, we proposed three alternatives for newly manufactured tank cars to address the risks associated with the rail transportation of Class 3 flammable liquids in HHFTs. In this final rule, PHMSA considered the three tank car options and the status quo to address this emerging risk and they are as follows:

No-Action Alternative

This alternative would continue to authorize the use of the non-jacketed and jacketed DOT Specification 111 tank cars, including upgraded CPC–1232 non-jacketed and jacketed tank cars, for the transportation of crude oil and ethanol. This alternative imposes no benefits or costs to society as it would require no change to the current crude oil and ethanol tank car packaging.

Option 1: PHMSA and FRA Designed Tank Car

This alternative would mandate that newly manufactured and existing tank cars used for flammable liquids in a HHFT meet the Option 1 prescriptive or performance standard after a certain date in accordance with the following:

- 286,000 lb. GRL tank car that is designed and constructed in accordance with AAR Standard 286;
- Wall thickness after forming of the tank shell and heads must be a minimum of 9/16-inch constructed from TC–128 Grade B, normalized steel;
- Thermal protection system in accordance with § 179.18, including a reclosing pressure relief device;
- Minimum 11-gauge jacket constructed from A1011 steel or equivalent. The jacket must be weather-tight as required in § 179.200–4;
- Full-height, ½-inch thick head shield meeting the requirements of § 179.16(c)(1);
- Bottom outlet handle removed or designed to prevent unintended actuation during a train accident;
- ECP brakes; and
- Roll-over protection (*i.e.,* tank car would be equipped with a top fittings protection system and nozzle capable of sustaining, without failure, a rollover accident at a speed of 9 mph, in which the rolling protective housing strikes a stationary surface assumed to be flat, level, and rigid and the speed is determined as a linear velocity, measured at the geometric center of the loaded tank car as a transverse vector) (not applicable to existing tank cars).

This alternative achieves the highest safety enhancements of any of the options considered, and thus is expected to yield the highest benefit to safety and the environment. It also has the highest cost of any of the three tank car alternatives.

Option 2: AAR 2014 Tank Car (Selected for New Tank Car Construction)

The second alternative considered is described as the AAR 2014 car. This proposed standard was based on the AAR's updated new tank car standard, and approximately 5,000 of these new cars have been ordered by BNSF Rail Corporation.

As proposed in the NPRM, the Option 2 car would be required for both newly manufactured tank cars and existing tank cars used for flammable liquids in a HHFT. Tank cars could meet either the prescriptive or an equivalent performance standard. Under this alternative, tank cars have most of the safety features as the Option 1 tank car, including the same increase in shell thickness, but lack TIH top fittings protection and ECP brake equipment. In essence, examining these cars side by side in the following analysis provides a de facto comparison of the costs and benefits of equipping HHFTs with ECP braking.

This alternative provides the second highest benefits and the second highest costs of the three tank car options. This option was selected for new constructions (See braking section for discussion on braking required).

Option 3: Enhanced Jacketed CPC–1232 Tank Car (Selected as Retrofit Standard)

The third alternative considered is an enhanced, jacketed CPC–1232 tank car. It also has the same improvements made to the bottom outlet handle and pressure relieve valve as the Option 1 and Option 2 tank cars. This standard is the new tank car configuration PHMSA believes would have been built for HHFT service in the absence of regulation, based on commitments from two of the largest rail car manufacturers/leasers.

As proposed, the Option 3 car would be required for both newly manufactured tank cars and existing tank cars used for flammable liquids in a HHFT. Tank cars must meet either the prescriptive or performance standard in accordance with the proposed phase-out schedule. Because the industry has committed to building Enhanced Jacketed CPC–1232 standard tank cars for HHFT service, this alternative would not impose higher costs for newly manufactured tank cars. It would, however, impose costs associated with retrofitting older DOT Specification 111 tank cars to the new prescriptive or performance standard.

This alternative tank car design car has all of the safety features of the Option 2 car, except that it has ⅛-inch less shell thickness. Additionally, this tank car has most of the safety features of the Option 1 tank car, but it also has ⅛-inch less shell thickness, does not have ECP brakes, and does not have TIH top fittings protection.

Although this tank car design is a substantial safety improvement over the current DOT Specification 111 tank car, it does not achieve the same level of safety as the first two mandated alternatives considered. It is, however, the least costly alternative considered. This option was selected for retrofitting

existing tank cars (See braking section for discussion on braking required).

Impact on Small Entities

All small shippers will be directly impacted by this requirement, as the shipper is the regulated entity that must provide the packaging for shipping, in this case, the tank cars. It does not matter whether the small shipper owns the tank cars or leases them. The burden of the rulemaking and therefore the cost of tank cars will be imposed on the shippers, either through purchase costs, retrofit costs, or through higher lease payments. The estimated cost per tank car is a good estimate of the final cost to the shippers. A lease transaction only changes the method by which a shipper pays for the tank cars.

As noted above, small shippers are about 92 percent of all shippers. PHMSA assumes that small shippers on average ship half as much as the average shipper. Therefore, for this analysis, PHMSA estimates that small shippers ship 46 percent, half of 92 percent of the affected hazardous materials, and PHMSA assumes that they use the same percentage of tank cars, and therefore incur as a group, the same percentage of the total costs estimated in the economic analysis for retrofit of all tank cars. PHMSA's RIA cost estimate for the Final Rule tank car mandate is $1.78 billion discounted at 7 percent, and $2.27 billion discounted at 3 percent. The total burden on small shippers will therefore be 46 percent of that, or $0.819 billion discounted at 7 percent, and $1.04 billion discounted at 3 percent. The average cost per small shipper would be $0.819 billion discounted at 7 percent, and $1.04 billion discounted at 3 percent divided by 722 shippers, which yields costs per small shipper of $1.134 million discounted at 7 percent, and $1.672 million discounted at 3 percent. However, PHMSA believes that small shippers can pass on those costs to other parties in the supply chain, because all shippers face the same cost constraints. PHMSA believes this is not a substantial burden on any affected entity.

3. Requirement Area 3—Speed Restrictions

Adopted Action

PHMSA is requiring a 50-mph maximum speed limit for HHFTs in all areas. This action aligns with existing operational requirements imposed by AAR Circular No. OT–55–N. PHMSA expects there will be no costs associated with a speed restriction of 50 mph, as this action codifies current industry best practices. As such, PHMSA does not believe the 50-mph maximum speed limit for HHFTs will affect small entities, including small offerors and small railroads that qualify as small businesses. Small railroads (Class II and Class III railroads) customarily do not operate at speeds in excess of 50 mph, so the impact of reducing the maximum speed of HHFTs to 50 mph is expected to be minimal and potentially costless.

In further support of this view, PHMSA refers to a February 12, 2014 letter to the Secretary from the American Short Line and Regional Railroad Association (ASLRRA). In this letter, ASLRRA announced that they would recommend a 25-mph speed limit for unit trains carrying crude oil on all routes. Thus, small railroads will not be burdened by the 50-mph speed limit provided they are adhering to ASLRRA's recommended speed restriction.

PHMSA is also requiring a 40-mph speed limit for HHFTs within the limits of a High Threat Urban Area (HTUA), unless all tank cars containing flammable liquids meet or exceed the retrofit standards or the standards for the DOT Specification 117 tank car. Similar to the aforementioned 50-mph speed limit, the 40-mph speed limit for HHFTs in HTUAs is also generally consistent with voluntary commitments made by AAR ''Railroad Subscribers'' as a result of recent cooperation with the Department. Further, given ASLRRA's additional recommendation of a 25-mph speed limit for certain short line and regional trains carrying crude oil, small railroads should not be burdened by the 40-mph speed limit in HTUAs. PHMSA believes that most small railroads are adhering to ASLRRA's recommendation.

Determination of Need

Speed is a factor that contributes to derailments. Speed can influence the probability of an accident, as it may allow for a brake application to stop the train before a collision. Speed also increases the kinetic energy of a train resulting in a greater possibility of the tank cars being punctured in the event of a derailment. As more tank cars are punctured in a derailment, the likelihood and severity of releases of hazardous materials into the environment increases. Conversely, lower speeds reduce kinetic energy, reducing the possibility of puncture in a derailment, which in turn reduces the severity of hazardous material releases into the environment.

The growth in the production and transport of crude oil and ethanol in recent years has been accompanied by an increase in the number of rail derailments involving crude oil and ethanol. Given the projected continued growth of domestic crude oil and ethanol production and transport, and the growing number of train accidents involving crude oil and ethanol, PHMSA concludes that the potential for future severe train accidents involving HHFTs has increased substantially. As our organizational mission, PHMSA seeks to improve the safety of the transportation of hazardous materials in commerce, which includes reducing the incidence and severity of train derailments involving hazardous materials. Therefore, PHMSA has adopted certain speed restrictions as a way to lessen damages that would occur in the event of a derailment and to improve the overall safety of rail transportation of large quantities of Class 3 flammable liquids.

Alternatives Considered

PHMSA considered a range of alternatives relative to the adopted speed restrictions. Namely, PHMSA considered; the ''no action'' alternative, the various speed restrictions proposed in the NPRM, and different speed restrictions proposed by commenters.

Alternative 1: No Action Alternative—Status Quo

The ''no action'' alternative is the choice to uphold the status quo and forego new regulation related to speed restrictions. It is equivalent to the current regulatory environment absent this rulemaking. There is reason to believe that the ''no action'' alternative has some merit. Chiefly, trade associations and the industry at-large have made significant efforts to improve railroad safety, including the issuance of voluntary or recommended speed restrictions. If voluntary speed restrictions were indistinguishable to the adopted speed restrictions, and small railroads perfectly and uniformly adhered to these voluntary speed restrictions, PHMSA might not need to codify the adopted speed restrictions. However, these voluntary or recommended speed restrictions are inferior to the codified adopted speed restrictions in that they do not carry the weight of law. Further, PHMSA was not provided with sufficient evidence to show that 100 percent of small railroads were adhering to the voluntary or recommended speed restrictions. PHMSA has assumed that this kind of adherence is occurring, but cannot certify it. Moreover, the adopted speed restrictions are not indistinguishable to the voluntary ones. The voluntary speed restrictions apply to ''Key Crude Oil Trains,'' or similar trains, whereas PHMSA has expanded the scope of the

rule to include different Class 3 flammable liquids and different high-risk train configurations. Thus, the ''no action'' alternative is not the best course of action.

Alternative 2: 40-mph Speed Limits for HHFTs in all Areas

The 40-mph speed limits for HHFTs in all areas. This is option 1 in the NPRM. In this alternative, all HHFTs are limited to a maximum speed of 40 mph, unless all tank cars meet or exceed the performance standards for the DOT Specification 117 tank car.

Alternative 3: 40-mph Speed Limit for HHFTs in Populations of More Than 100,000 People

The 40-mph speed limits for areas with populations of more than 100,000 people alternative is option 2 in the NPRM. In this alternative, all HHFTs—unless all tank cars containing flammable liquids meet or exceed the standards for the DOT Specification 117 tank car—are limited to a maximum speed of 40 mph while operating in an area that has a population of more than 100,000 people.

Alternative 4: 40-mph Speed Limits for HHFTs in HTUAs

The 40-mph speed limits for HHFTs in HTUA. This is option 3 in the NPRM. In this alternative, all HHFTs—unless all tank cars containing flammable liquids meet or exceed the standards for the DOT Specification 117 tank car—are limited to a maximum speed of 40 mph while the train travels within the geographical limits of HTUAs. This was the most cost effective option proposed in the rulemaking.

In the NPRM, PHMSA proposed three 40-mph speed limits, including the adopted 40-mph speed limit in HTUAs, as well as two other 40-mph speed limits applicable to all areas and to areas with ''a population of more than 100,000 people.'' Thus, PHMSA's consideration of alternatives was publicly stated at the NPRM stage, and PHMSA afforded the public an opportunity to comment on the validity and expected impacts of these proposed speed limits. In the NPRM, the 40-mph speed limit in HTUAs was cited as Option 3, and the 40-mph speed limit in all areas and the 40-mph speed limit in any area with a population of more than 100,000 people were cited as Option 1 and Option 2, respectively.

Option 1 and Option 2 were not adopted for a variety of reasons that affect small and large entities alike. Option 1 and Option 2 are not as cost-effective and would be burdensome and overly restrictive relative to the 40-mph speed limit in HTUAs (Option 3). This sentiment was echoed by many commenters, including ASLRRA. According to PHMSA's cost/benefit analysis and commenter input, PHMSA has reason to believe that the implementation of Option 1 and Option 2 would create an unjustifiable burden on small entities, as well as on large railroads and offerors, and thus are not practical alternatives for small entities. Please refer to the Final RIA, as well as other sections of the rulemaking, for further summary and discussion of the NPRM's proposed 40-mph speed limits.

PHMSA is confident that the adopted speed restrictions—a 40-mph speed limit in HTUAs and a 50-mph speed limit for all HHFTs—constitute the best course of action and small carriers will be able to comply without undue burden. In fact, PHMSA expects that the adopted speed restrictions will impose only limited costs on small entities and will yield more safety benefits per unit of cost than other alternatives over time. ASLRRA's recommendation of a 25-mph speed limit to member railroads lends concrete support to this outlook.

Alternative 5—Speed Restrictions Based on Other Geographical Criteria

In addition to the alternatives proposed in the NPRM, various commenters offered alternatives that could be applied to small entities, such as small rail carriers. Various commenters suggested that PHMSA align the speed restrictions with different geographical criteria. Nevertheless, ASLRRA and AAR did not suggest that different geographical criteria be applied specifically to small rail carriers. On the contrary, ASLRRA's recommended 25-mph speed restriction specifically applied to short lines and regional rail lines carrying crude oil as a ''unit'' *on all routes.* Thus, PHMSA does not believe that different geographical criteria would be a practical alternative for small entities.

Impact on Small Entities

Most small railroads affected by this rule do not operate at speeds higher than the speed restrictions required or travel long distances over which the reduced speed would cause a significant impact. Additionally, in a February 12, 2014, letter to the Secretary, ASLRRA announced that they recommend to their members to voluntarily operate unit trains of crude oil at a top speed of no more than 25 mph on all routes.

The only small railroads that are likely to be affected by the speed restrictions are those that have relatively short mileage connecting two or more larger railroads, and that may operate at speeds higher than 30 mph. Those railroads do not originate HHFT, but let the larger railroads operate HHFTs over their track. Therefore there will be no speed restrictions imposed on these small railroads, only larger railroads operating over the small railroads' track.

The only Class III railroad which both has Class 4 or higher track (speeds above 40 mph) and also hauls crude oil or ethanol is also a commuter railroad serving a large city, and therefore not a small entity. Thus, the speed restrictions will not result in any net impact on small entities.

4. Requirement Area 4—Braking

Adopted Action

PHMSA and FRA are requiring that rail carriers transporting certain quantities of flammable liquids to equip trains with advanced braking systems. Specifically, this final rule requires all HHFTs operating in excess of 30 mph to have enhanced braking systems. At a baseline level, any train that contains a continuous block of 20 or more loaded tank cars or a total of at least 35 loaded tank cars throughout the train consist containing Class 3 flammable liquids (an HHFT) must have in place, at a minimum, a functioning two-way EOT device or a DP system to assist in braking.

With longer, heavier trains it is necessary to factor in train control issues. Therefore, PHMSA and FRA have specific braking requirements for trains that are transporting 70 or more loaded tank cars of Class 3 flammable liquids (referred to as high-hazard flammable trains or ''HHFUTs'') at speeds in excess of 30 mph. By January 1, 2021, any HHFUT transporting one or more tank car loaded with a Packing Group I flammable liquid will be required operate using an ECP brake system that complies with the requirements of 49 CFR part 232, subpart G. All other HHFUTs must be equipped with operative ECP brake systems by May 1, 2023, when traveling in excess of 30 mph.

Determination of Need

Braking systems reduce kinetic energy and therefore help prevent and mitigate the effects of train accidents. Since the First Safety Appliance Act of March 2, 1893, freight train operations in the U.S. have traditionally relied on air brakes to slow and stop a train. This conventional air brake system has proven to be reliable, but it has drawbacks. When a train is long and heavy, as is typically the case in the context of an HHFT, a conventional air brake system can easily take over one-half mile to bring a train

to a stop, even with the emergency brakes applied. Moreover, the length of a train will significantly affect the time it takes for the conventional air brakes to apply to the entire consist. It can take a number of seconds for the air brake system to function as air is removed from the system to engage the brakes, beginning with the cars nearest to the locomotive and working towards the rear of the train. For example, in a 100-car train it could take up to 16 seconds as the brakes fully apply sequentially from front-to-back. This lag in air brake application time from the front to the back of the train also can result in significant in-train buff and draft forces. These in-train forces can lead to wheel damage (*e.g.* slid flat spots) and can negatively impact rail integrity as these flat spots create a vertical impact force (''pounding'') on the rails. These are major contributing factors to derailments. In-train forces resulting from the application of conventional air brakes also can directly contribute to derailments, particularly in emergency situations, as freight cars can be forcefully bunched together when the train is brought to a stop quickly. These forces may also be amplified by the longitudinal slosh effect of a liquid lading, such as crude oil or ethanol. Such factors have led PHMSA and FRA to consider advanced brake signal propagation systems as a way to improve safety in the transportation of Class 3 flammable liquids by rail, particularly with respect to longer trains transporting 70 or more tank cars loaded with Class 3 flammable liquids. These more advanced systems have the capability to stop trains more quickly and reduce the number of braking-induced derailments.

Alternatives Considered

Alternative 1: No Action Alternative—Status Quo

If the braking requirements were not adopted, the damages estimated in the absence of this rulemaking would not be reduced, where possible, by advanced braking options. This alternative would also impose no costs. This alternative would also not codify voluntary agreements between the Class I railroads and the Department for Key Crude Oil trains. While those voluntary agreements would remain in place, it would not expand the requirements for advanced braking to other trains transporting flammable liquids that have been identified as high risk, nor would it include a requirement for ECP braking systems. PHMSA and FRA have not chosen this alternative.

Alternative 2: Two-Way End of Train Devices or Distributed Power

Alternative 2 would require each HHFT to be equipped and operated with either a two-way EOT device, as defined in 49 CFR 232.5 of this title, or DP, as defined in 49 CFR 229.5 of this title. This alternative would not mandate a requirement for ECP braking systems. Additionally, this alternative is closest to the voluntary agreements differing in that it applies to HHFTs and not a Key Crude Oil train. PHMSA and FRA believe this alternative would result in decrease in the number of tank cars punctured in a derailment by 13–16% compared to conventional braking systems. This alternative was considered but was not chosen.

Alternative 3 (*Applicable to Tank Car Option 1 Only*): Alternative 2, Plus ECP on All Newly Constructed and Retrofitted DOT Specification 117 Cars

This is the alternative proposed in the NPRM. Alternative 3 would require an HHFT to be equipped and operated with either a two-way EOT device, as defined in 49 CFR 232.5 of this title, or DP, as defined in 49 CFR 229.5 of this title. Additionally, a tank car manufactured in accordance with proposed § 179.202 or § 179.202–11 for use in a HHFT would be equipped with ECP brakes. HHFTs comprised entirely of tank cars manufactured in accordance with proposed § 179.202 and § 179.202–11 (for Tank Car Option 1 the PHMSA and FRA Designed Car, only), except for required buffer cars, would be operated in ECP brake mode as defined by 49 CFR 232.5. To reduce the burden on small carriers that may not have the capital available to install new braking systems, we proposed an exception. If a rail carrier does not comply with the proposed braking requirements above, we proposed that the carrier may continue to operate HHFTs at speeds not to exceed 30 mph.

Alternative 4: Tiered Braking Requirements Based on HHFTs and HHFUTs (Selected Alternative)

This alternative would require that rail carriers transporting certain quantities of flammable liquids to equip trains with advanced braking systems. Specifically, this alternative would require all HHFTs operating in excess of 30 mph to have enhanced braking systems. At a baseline level, any train that contains a continuous block of 20 or more loaded tank cars or a total of at least 35 loaded tank cars throughout the train consist containing Class 3 flammable liquids (an HHFT) must have in place, at a minimum, a functioning two-way EOT device or a DP system to assist in braking.

With longer, heavier trains it is necessary to factor in train control issues. Therefore, this alternative would require specific braking requirements for trains that are transporting 70 or more loaded tank cars of Class 3 flammable liquids at speeds in excess of 30 mph. Under this alternative, by January 1, 2021, any high-hazard flammable unit train (HHFUT) containing one or more tank cars loaded with a Packing Group I flammable liquid, operating in excess of 30 mph must have a functioning ECP brake system that complies with the requirements of 49 CFR part 232, subpart G. Whereas all other HHFUTs must be equipped with operative ECP brake systems by May 1, 2023, when traveling in excess of 30 mph. This was the selected option.

Impacts on Small Entities

Most small railroads affected by this rule do not operate at speeds higher than the speed restrictions required or travel long distances over which the reduced speed would cause a significant impact. Any small railroad that operates at speeds 30 mph or less would also not be impacted by the braking requirement. Additionally, in a February 12, 2014, letter to the Secretary, ASLRRA announced that they recommend to their members to voluntarily operate unit trains of crude oil at a top speed of no more than 25 mph on all routes.

ASLRRA commented to the docket that small railroads often operate older locomotives, and that retrofitting those locomotives to work with ECP brakes would be cost-prohibitive. PHMSA believes that the railroads that have the older locomotives hauling HHFTs are the same railroads that would not be adversely impacted by operating trains at speeds of 30 mph or less.

The only small railroads that are likely to be affected by the braking requirements are those that have relatively short mileage connecting two or more larger railroads, and that may operate at speeds higher than 30 mph. Those railroads do not originate HHFT, but let the larger railroads operate HHFTs over their track. PHMSA believes that all HHFTs from larger railroads will be assembled so that locomotives and cars with ECP brakes are kept together, so there will be no speed restrictions imposed. Thus, the speed restrictions will not result in any net impact on small entities.

5. Requirement Area 5—Classification of Unrefined Petroleum-Based Products

Adopted Action

The final rule requires any offeror of unrefined petroleum-based products for transportation to develop, implement, and update a sampling and testing program related to the classification and identification of properties for packaging selection of these materials (see ''Summary and Discussion of Public Comments'' for plan details). PHMSA believes that there would be an initial cost for each offeror of approximately $3,002 for the first year, and additional costs of $810 annually thereafter, for a total value, discounted at 7 percent over 20 years, of $10,514. PHMSA believes that this adopted section will not significantly burden any of these small entities.

Determination of Need

The offeror's responsibility to classify and describe a hazardous material is a key requirement under the HMR. Improper classification and failure to identify applicable material properties can have significant negative impacts on transportation safety. Proper classification is necessary ensure proper packaging, operational controls, and hazard communication requirements are met, all of which are important to mitigate the negative effects of a train derailment or other hazardous materials incident.

While the classification of manufactured products is generally well understood and consistent, unrefined petroleum-based products potentially have significant variability in their properties as a function of history, location, method of extraction, temperature at time of extraction, and the type and extent of conditioning or processing of the material. Manufactured goods and refined products, by definition, are at the other end of the spectrum from unrefined or raw materials. This means that the physical and chemical properties are more predictable as they are pure substances or well-studied mixtures. PHMSA and FRA audits of crude oil loading facilities, prior to the issuance of the February 26, 2014. Emergency Restriction/Prohibition Order, indicated that the classification of crude oil being transported by rail was often based solely on a Safety Data Sheet (SDS). The information is generic, providing basic data and ranges of values for a limited number of material properties. In these instances, it is likely no validation of the information is performed at an interval that would allow for detection of variability in material properties.

Alternatives Considered

Alternative 1: No Action Alternative—Status Quo

The industry would continue the status quo and sample the material based on the existing classification and characterization methods. Rail derailment and other accidents involving shipments of crude oil or other unrefined petroleum-based products that have been improperly classified may create potential risks for emergency responders. If PHMSA had adopted alternative 1, then there would be no added costs or benefits to the rule.

Alternative 2: Require Sampling and Testing Program for Mined Liquids and Gases as Proposed in NPRM

Under this alternative, PHMSA would require a documented sampling and testing plan for shippers of these mined gases and liquids in transportation. This plan would enable PHMSA and shippers of this commodity to more easily ascertain the specific classification and characteristics of the commodity and help to minimize potential risks when responding to a derailment and accident. Offerors would also certify that program is in place, document the testing and sampling program, and make program information available to DOT personnel, upon request.

This option was proposed in rulemaking, but only offerors petroleum-based products (*i.e.* petroleum crude oil, liquefied petroleum gas, and natural gas) were analyzed for the IRFA and in the draft RIA. Commenters did not provide sufficient data to justify expanding the definition beyond petroleum-based products. A detailed analysis of this option is provided in the final RIA,, but it is not adopted in this final rule.

Alternative 3: Require Sampling and Testing Program for Unrefined Petroleum Based Products.

This is the alternative adopted in this rulemaking. Under this alternative, PHMSA requires a documented sampling and testing plan for offerors of unrefined petroleum-based products in transportation. This plan will enable PHMSA and shippers of this commodity to more easily ascertain the specific classification and properties of the commodity and help to minimize potential risks when responding to a derailment or other accident. Offerors must also certify that program is in place, document the testing and sampling program, and make program information available to DOT personnel, upon request.

This revised definition narrows the scope of affected offerors from those offering all ''mined liquids and gases'' to only ''unrefined petroleum-based products.'' While the savings from the proposed definitions are not quantified, the clarification ensures that additional offerors will not be inadvertently impacted.

Impact on Small Entities

PHMSA believes that there would be an initial cost for each offeror of approximately $3,002 for the first year, and additional costs of $810 annually thereafter, for a total value, discounted at 7 percent over 20 years, of $10,514. PHMSA believes that this adopted section will not significantly burden any of these small entities.

6. Requirement Area 6—Notification

Adopted Action

On May 7, 2014, DOT issued an Emergency Order [116] (''the Order'') requiring each railroad transporting one million gallons or more of Bakken crude oil in a single train in commerce within the U.S. to provide certain information in writing to the SERCs for each state in which it operates such a train. The notification made under the Order included estimated frequencies of affected trains transporting Bakken crude oil through each county in the state, the routes over which it is transported, a description of the petroleum crude oil and applicable emergency response information, and contact information for at least one responsible party at the host railroads. In addition, the Order required that railroads provide copies of notifications made to each SERC to FRA upon request and to update the notifications when Bakken crude oil traffic materially changes within a particular county or state (a material change consists of 25 percent or greater difference from the estimate conveyed to a state in the current notification). In the August 1, 2014 NPRM, PHMSA proposed to codify and clarify the requirements of the Order and requested public comment on the various parts of the proposal.

After careful consideration of the comments and after discussions within PHMSA and FRA, we believe that for the final rule using the definition of the HHFT for notification applicability is a more conservative approach for affecting safer rail transportation of flammable liquid material; and is a more consistent approach because it aligns with the changes to other operational requirements, including routing.

[116] Docket No. DOT–OST–2014–0067 (Order).

The primary intent of the Order was to eliminate unsafe conditions and practices that create an imminent hazard to public health and safety and the environment. Specifically, the Order was designed to inform communities of large volumes of crude oil transported by rail through their areas and to provide information to better prepare emergency responders for accidents involving large volumes of crude oil. DOT issued the Order under the Secretary's authority to stop imminent hazards at 49 U.S.C. 5121(d). The Order was issued in response to the crude oil railroad accidents previously described, and it is in effect until DOT rescinds the Order or a final rule codifies requirements and supplants the requirements in the Order.

The adopted action is that DOT is removing the notification requirement language proposed in the NPRM and is instead using as a substitute the contact information language requirement that is already part of the additional planning requirements for transportation by rail found in § 172.820 of the HMR that now applies to HHFTs. As provided in § 172.820(g), each HHFT must identify a point of contact (including the name, title, phone number and email address) related to routing of materials identified in § 172.820 in its security plan and provide this information to: (1) State and/or regional Fusion Centers (established to coordinate with state, local and tribal officials on security issues and which are located within the area encompassed by the rail carrier's system); and (2) State, local, and tribal officials in jurisdictions that may be affected by a rail carrier's routing decisions and who directly contact the railroad to discuss routing decisions.

Determination of Need

Recent accidents have demonstrated the need for action in the form of additional communication between railroads and emergency responders to ensure that the emergency responders are aware of train movements carrying large quantities of flammable liquid through their communities in order to better prepare emergency responders for accident response.

Alternatives Considered

Alternative 1: No Action Alternative—Status Quo

This alternative would maintain implementation of the Order issued on May 7, 2014. PHMSA estimated there are essentially no new costs associated with this alternative, and thus no burdens on small entities, because rail carriers are already subject to the Order.

Alternative 2: Utilizing Rail Routing POC for HHFTs

This alternative utilizes the contact information language requirement that is already part of the additional planning requirements for transportation by rail found in § 172.820 of the HMR. As provided in § 172.820(g), each HHFT must identify a point of contact (including the name, title, phone number and email address) related to routing of materials identified in § 172.820 in its security plan and provide this information to: (1) State and/or regional Fusion Centers (established to coordinate with state, local and tribal officials on security issues and which are located within the area encompassed by the rail carrier's system); and (2) State, local, and tribal officials in jurisdictions that may be affected by a rail carrier's routing decisions and who directly contact the railroad to discuss routing decisions.

This is the favored alternative since it adds no additional cost and provides for consistency of notification requirements for rail carriers transporting material subject to routing requirements, *i.e.* trains carrying: (1) More than 2,268 kg (5,000 lbs.) in a single carload of a Division 1.1, 1.2 or 1.3 explosive; (2) a quantity of a material poisonous by inhalation in a single bulk packaging; (3) a highway route-controlled quantity of a Class 7 (radioactive) material; and now (4) Class 3 flammable liquid as part of a high-hazard flammable train (as defined in § 171.8). This option also addresses security sensitive and business related confidentiality issues that many comments addressed.

Alternative 3: Rescinding Emergency Order With No Corresponding Regulatory Change

This alternative effectively would return to the status quo prior to the publication of the emergency order. This EO was designed to inform communities of large volumes of crude oil transported by rail through their areas and to provide information to better prepare emergency responders for accidents involving large volumes of crude oil. As the primary intent of this EO was to eliminate unsafe conditions and practices that created an imminent hazard to public health and safety and the environment removal of this order without a corresponding action to reduce the risk is not acceptable and thus not selected.

Impacted on Small Entities

Small entities affected by this provision have been providing notification for crude oil shipments under the Emergency Order. As the notification utilizes the contact information language requirement that is already part of the additional planning requirements for transportation by rail found in § 172.820 of the HMR the impact on the small entities is included in the routing impacts. For a discussion of those impacts see the routing section of the FRFA.

7. Total Burden on Small Entities

Small Offerors Other Than Shippers

There will be no burden on small offerors that are not shippers, except those who must classify mined liquids and gases. Those small entities will face a total cost, discounted at 7 percent over 20 years, of $10,514 per small entity.

Small Shippers

The total impact per small shipper, before considering market forces, discounted at 7 percent over twenty years, will be $1.134 million discounted at 7 percent, and $1.672 million discounted at 3 percent, the costs of upgrading tank cars. However, PHMSA believes that small shippers can pass on those costs to other parties in the supply chain, because all shippers face the same cost constraints.

Small Railroads

The total impact per small railroad, discounted at 7 percent over twenty years, will be $45,230, the cost of routing analysis.

PHMSA has identified no additional significant alternative to this final rule that meets the agency's objective in promulgating this rule, and that would further reduce the economic impact of the rulemaking on small entities.

F. Paperwork Reduction Act

Under the Paperwork Reduction Act of 1995, no person is required to respond to an information collection unless it has been approved by OMB and displays a valid OMB control number. Section 1320.8(d) of Title 5 of the CFR requires that PHMSA provide interested members of the public and affected agencies an opportunity to comment on information and recordkeeping requests. In the August 1, 2014 NPRM, PHMSA requested a new information collection from the Office of Management and Budget (OMB) under OMB Control No. 2137–0628 entitled ''Flammable Hazardous Materials by Rail Transportation.'' PHMSA stated

that the NPRM may result in an increase in annual burden and costs under OMB Control No. 2137–0628 due to proposed requirements pertaining to the creation of a sampling and testing program for mined gas or liquid and rail routing for HHFTs, routing requirements for rail operators, and the reporting of incidents that may occur from HFFTs.

In the NPRM, we requested comment on whether PHMSA should require reporting of data on the total damages that occur as a result of train accidents involving releases of hazardous material, including damages related to fatalities, injuries, property damage, environmental damage and clean-up costs, loss of business and other economic activity, and evacuation-related costs. Currently, PHMSA only collects some of this information, and data verification is inconsistent. Further, we requested comments on whether PHMSA should require reporting on every car carrying hazardous material that derails, whether that car loses product or not. Such reporting would assist PHMSA in assessing the effectiveness of different kinds of cars in containing the hazardous materials that they carry. In response to the NPRM, PHMSA received general comments from the following individuals related to information collection:

American Fuel & Petrochemical Manufacturers (AFPM)

The AFPM commented that the criteria for modifying the sampling and testing program and what it seeks to address is vague. It adds that this will be another unnecessary paperwork requirement with no corresponding benefit. The AFPM survey and other studies confirm that Bakken Crude oils are correctly classified. They maintain that identification of flammable liquids by geographic, regional, or even a particular country of origin serves no known purpose except to impose unnecessary paperwork requirements.

We disagree that expanding existing classification requirements will not impact transportation safety. PHMSA and FRA audits of crude oil facilities indicated the classification of crude oil transported by rail was often based solely on a SDS. While the classification of manufactured products is generally well-understood and consistent, unrefined petroleum-based products potentially have significant variability in their 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. As such, we feel it is necessary to require development and adherence to a consistent and comprehensive sampling and testing program, and to provide oversight for such a program.

Waterkeeper Alliance

The Waterkeeper Alliance noted that according to the proposed regulations, the new sampling and testing program must be ''documented in writing and retained while it remains in effect.'' Specifically, PHMSA is requiring that offerors keep on hand the most recent versions of the program documentation, provide that version to employees responsible for conducting the testing, and provide documentation to the DOT upon request. Waterkeeper recommended that PHMSA should, at a minimum, require that this information be submitted to FRA (and the public, upon request) and be kept on hand with the railroad or offeror so that responsible packaging decisions can be made based on that data.

PHMSA did not propose requiring third-party involvement with testing or submitting test results to a third party in the NPRM and, as such, is not adopting any such requirements. PHMSA did not propose regulatory changes to classification test procedures, and as such, is not adopting any such requirements. Furthermore, in the NPRM, PHMSA stated that we are not proposing a requirement for the retention of test results.

Bridger LLC

In the August 1, 2014 NPRM, PHMSA posed the question, ''PHMSA assumes no unjacketed tank cars would be in PG I service in 2015 and 2016, in the absence of this rule. Does this assumption match the expected service of unjacketed tank cars?'' Bridger firmly answered no, and in its comments asserted, ''Bridger note[d] that PHMSA assumes no non-jacketed tank cars would be in PG I service in 2015 and 2016, in the absence of this rule. Bridger adds that, ''PHMSA is under a mistaken belief that railcar manufacturers have stopped marketing railcars that are not Enhanced CPC–1232 railcars.'' Further, Bridger LLC stated that ''before PHMSA makes this key assumption regarding the rule, it should require the railcar manufacturers to provide accurate data and information regarding its marketing and manufacturing activities, issuing an information collection notice if necessary.'' Based on the substantive public comment received in response to the NPRM, in this final rule, PHMSA is confident its revised assumptions regarding fleet composition and new and existing outstanding tank car order configurations precludes the need to prepare an information collection notice.

George Washington University

The George Washington University urged PHMSA to be consistent with the requirements of the Paperwork Reduction Act, and with the text of its proposal. The George Washington University added PHMSA should commit to collecting the information needed to measure the rule's success.

Sampling and Testing Plans

In the NPRM PHMSA used data from the Hazmat Intelligence Portal from June 2014. For the Final Rule PHMSA pulled updated data from November 2014 and now estimates that there will be approximately 1,804 respondents up from 1,538, based on a review of relevant active registrations on the PHMSA Hazmat Intelligence Portal, each developing an average of one sampling and testing plan each year. First year hourly burden is estimated at 40 hours per response, or 72,160 burden hours; hourly burden for each subsequent year is estimated at 10 hours per response, or 18,040 burden hours. PHMSA assumes a Chemical Engineer is the labor category most appropriate to describe sampling methodologies, testing protocols, and present test results. The mean hourly wage for a Chemical Engineer was $45.56 in 2014, according to the Bureau of Labor Statistics. We inflate this wage by 60 percent to account for fringe benefits and overhead of $27.94 per hour, for a total weighted hourly wage of $75.05. At an average hourly cost of $75.05 per hour, first year burden cost for this proposed requirement is estimated at $5,415,605.00; burden cost for each subsequent year is estimated at $1,353,902.00.

Routing—Collection by Line Segment

PHMSA estimates that there will be approximately 170 respondents (10 for Class II Railroads; 160 for Class III Railroads) each submitting an average of one routing collection response each year, and each subsequent year. Hourly burden is assumed to be 40 hours per response, or 6,800 burden hours each year. PHMSA used a labor rate that combines two employee groups listed in the Bureau of Labor Statistics May 2012 Industry-Specific Occupational Employment and Wage Estimates: NAICS 482000—Rail Transportation occupational code 11–0000 ''Management Occupations'' and occupation code 43–6011 ''Executive Secretaries and Executive Administrative Assistants.'' A combination of these two groups will

probably be utilized to perform the requirements in this proposed rule. The average annual wages for these groups are $100,820 and $54,520 respectively. The resulting average hourly wage rate, including a 60 percent increase to account for overhead and fringe benefits, is $62.25. At an average hourly cost of $62.25 per hour, burden cost for the first year and each subsequent year is estimated at $423,300.00.

Routing Security Analysis

For the first year, PHMSA estimates that there will be approximately 170 respondents (10 for Class II Railroads; 160 for Class III Railroads). Class II Railroads are expected to submit 170 routing security analysis responses per year, based on the number of feasible alternate routes to consider after future possible network changes, with each response taking approximately 80 hours each, or 4,000 hours. At an average hourly cost of $62.25 per hour, first year burden cost for Class II Railroads is estimated at $249,000.00. Class III Railroads are expected to submit 320 routing security analysis responses per year, with each response taking approximately 40 hours, or 12,800 hours. At an average hourly cost of $62.25 per hour, first year burden cost for Class III Railroads is estimated at $796,800.00. Railroads will also be required to provide an alternate routing security analysis. Class II Railroads are expected to submit 40 routing security analysis responses per year, based on the number of feasible alternate routes to consider after future possible network changes, with each response taking approximately 120 hours each, or 4,800 hours. At an average hourly cost of $62.25 per hour, first year burden cost for Class II Railroads is estimated at $298,800.00. Class III Railroads are expected to submit 160 alternate routing security analysis responses per year, with each response taking approximately 20 hours, or 3,200 hours. At an average hourly cost of $62.25 per hour, first year burden cost for Class III Railroads is estimated at $199,200.00.

PHMSA assumes that new route analyses are necessary each year based on changes in commodity flow, but that after the first year's route analyses are completed, analyses performed on the same routes in subsequent years will take less time. For each subsequent year, PHMSA estimates that there will be approximately 170 respondents (10 for Class II Railroads; 160 for Class III Railroads). Class II Railroads are expected to submit 50 routing security analysis responses per year, with each response taking approximately 16 hours each, or 800 hours. At an average hourly cost of $62.95 per hour, subsequent year burden cost for Class II Railroads is estimated at $49,800.00. Class III Railroads are expected to submit 320 routing security analysis responses per year, with each response taking approximately 8 hours, or 2,560 hours. At an average hourly cost of $62.95 per hour, first year burden cost for Class III Railroads is estimated at $159,360.00. Railroads will also be required to provide an alternate routing security analysis. For each subsequent year, PHMSA estimates that there will be approximately 170 respondents (10 for Class II Railroads; 160 for Class III Railroads). Class II Railroads are expected to submit 40 routing alternate security analysis responses per year, with each response taking approximately 12 hours each, or 480 hours. At an average hourly cost of $62.95 per hour, subsequent year burden cost for Class II Railroads is estimated at $29,800.00. Class III Railroads are expected to submit 160 alternate routing security analysis responses per year, with each response taking approximately 2 hours, or 320 hours. At an average hourly cost of $62.95 per hour, first year burden cost for Class III Railroads is estimated at $19,920.00.

Incident Reporting

PHMSA estimates there will be 289 incidents over 20 years, for an average of 15 incidents per year, involving the derailment and release of crude oil/ethanol. Each report would be submitted by a single respondent and would take approximately 2 additional hours to submit per response, compared to the current requirements. At an average hourly cost of $62.95 per hour, burden cost is estimated at $1,825.55. We do not currently have sufficient data to estimate the number of respondents and responses that would be required if PHMSA extended incident reporting requirements to derailments not involving a product release.

Total

We estimate that the total information collection and recordkeeping burden for the requirements as specified in this final rule will be as follows:

OMB No. 2137–0628, ''Flammable Hazardous Materials by Rail Transportation'' First Year Annual Burden:

Total Annual Number of Respondents: 1,989.

Total Annual Responses: 2,559.

Total Annual Burden Hours: 103,789.

Total Annual Burden Cost: $7,384,533.55.

Subsequent Year Burden:

Total Annual Number of Respondents: 1,989.

Total Annual Responses: 2,559.

Total Annual Burden Hours: 29,029.

Total Annual Burden Cost: $2,037,988.

Requests for a copy of this information collection should be directed to Steven Andrews or T. Glenn Foster, Office of Hazardous Materials Standards (PHH–12), Pipeline and Hazardous Materials Safety Administration, 1200 New Jersey Avenue SE., Washington, DC 20590–0001, Telephone (202) 366–8553.

G. Environmental Assessment

The National Environmental Policy Act of 1969 (NEPA) (42 U.S.C. 4321–4375), requires that Federal agencies analyze the environmental impacts of proposed actions. If an agency does not anticipate that a proposed action will have a significant impact on the environment, the Council on Environmental Quality (CEQ) regulations provide for the preparation of an environmental assessment (EA) to determine whether a proposed action has significant effects and therefore requires an environmental impact statement or finding of no significant impact (FONSI). The EA must include discussions of (1) the need for the proposed action, (2) alternatives to the proposed action as required by NEPA section 102(2)(E), (3) the environmental impacts of the proposed action and alternatives, and (4) the agencies and persons consulted (40 CFR 1508.9(b)).

This Final EA includes responses to public comments received on the EA in the NPRM. One change in the Final EA is the addition of an alternative in response to various comments for expedited DOT Specification 111 (DOT–111) tank car usage discontinuance, ''Alternative of 2018 Removal of DOT–111 Tank Cars from Service.'' PHMSA has likewise not carried the ''ANPRM Alternative,'' found in the NPRM draft EA, forward in this Final EA. This is because the ANPRM included several actions that are not within the scope of this rulemaking. As discussed below, PHMSA considered, but eliminated from detailed consideration, an immediate removal of DOT–111 tank cars. Lastly, this Final EA now also includes additional data and calculations to support discussions.

1. Need for the Proposal

The purpose of this rulemaking is to address serious safety and environmental concerns revealed by recent train accidents involving high-hazard flammable trains (HHFTs). This final rule is designed to lessen the

frequency and consequences of train accidents involving the unintentional release flammable liquids from HHFTs. The purpose of the regulations for enhanced tank car standards and operational controls for high-hazard flammable trains is to prevent spills by keeping flammable liquids, including crude oil and ethanol, in rail tank cars and mitigating the severity of incidents should they occur.

U.S. crude oil production has risen sharply in recent years, with much of the increased output moving by rail. In 2008, U.S. Class I railroads originated 9,500 carloads of crude oil. In 2013, the number of rail carloads of crude oil surpassed 400,000. The Association of American Railroads (AAR) reported 229,798 carloads in the first half of 2014. In 2013, there were over 290,000 carloads of ethanol originated in the United States. This data suggests an increasing need to transport flammable liquids by rail.

The growing reliance on trains to transport large volumes of flammable liquids, particularly crude oil and ethanol, under the current regulatory framework, poses a risk to life, property, and the environment. These risks of HHFTs have been highlighted by the recent derailments of trains carrying crude oil in Casselton, North Dakota; Aliceville, Alabama; Lac-Mégantic, Quebec, Canada and Mount Carbon, West Virginia and recent derailments of trains carrying ethanol in Arcadia, Ohio and Cherry Valley, Illinois. This rule also addresses the National Transportation Safety Board (NTSB) recommendations regarding accurate classification, enhanced tank car integrity, rail routing, and oversight.

2. Alternatives

In developing this rule, PHMSA considered the following alternatives:

No Action Alternative

In the no action alternative, PHMSA would not issue a final rule, and the current regulatory standards would remain in effect. This would allow for the indefinite continued use of the DOT–111 tank cars to transport crude oil and ethanol.

In addition, the no action alternative would result in no new operational controls. Specifically, a classification and sampling plan would not be adopted. Selection of the no action alternative would not include mandates to sample and test materials, and carriers/offerors might engage or continue to engage in the practice of using inaccurate safety data sheets (SDSs) to classify their products. HHFT carriers also would not be required to consider the 27 safety and security factors to determine routing. Moreover, if PHMSA selected the no action alternative, the requirement to communicate with state and/or regional fusion centers about routing decisions would not take effect, and information would not be as easily available to authorized personnel.[117] If PHMSA selected the no action alternative, no new speed restrictions would take effect.

Finally, no action would continue the status quo with regard to braking systems. The final rule proposes a two-tiered, cost-effective and risk-based solution to reduce the number of cars and energy associated with train accidents. Without action, the current braking systems would continue to be used and the highest-risk train sets (larger HHFTs) would continue using the same braking systems.

Selected Alternative

The selected alternative, which was originally discussed in the draft EA, and is more fully discussed in the preamble has a phase-out schedule depicted in Table EA1 below. The amendments included in this alternative are more fully addressed in the preamble and regulatory text sections of this final rule. However, they generally include:

- New defined term of ''High-hazard flammable train;''
- Rail routing requirements as specified in Part 172, Subpart I of the HMR;
- Sampling and testing program designed to ensure proper classification and characterization of unrefined petroleum-based products;
- Phase in requirements for updated braking devices and braking systems;
- Speed restrictions for rail cars that do not meet the safer DOT–117 standard; and
- Phase-out DOT–111 cars in HHFTs and require DOT–117 for such HHFTs, as follows.[118]

TABLE EA1—TIMELINE FOR CONTINUED USE OF DOT SPECIFICATION 111 (DOT–111) TANKS FOR USE IN HHFTS

Tank car type/service	Retrofit deadline
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 date would trigger a retrofit reporting requirement, and tank car owners of affected cars would have to report to DOT the number of tank cars that they own that have been retrofitted, and the number that have not yet been retrofitted.

** We anticipate these will be spread out throughout the 120 months and the retrofits will take place during normal requalification and maintenance schedule, which will likely result in fleet being retrofit sooner.

Alternative of 2018 Removal of DOT–111 Tank Cars From Service

This alternative includes the same amendments as the selected alternative above, but would discontinue the use DOT–111 cars in HHFTs on a more accelerated schedule than the selected alternative. Specifically, for the purposes of analyzing this alternative in the environmental assessment, the retrofit deadlines for Non Jacketed DOT–111 tank cars in PG I service, Non Jacketed DOT–111 tank cars in PG II service, and Jacketed DOT–111 tank cars in PG I and PG II service would all be expedited to meet a deadline of October 1, 2018 (41 months). In this environmental assessment and its

[117] Fusion centers serve as first responder emergency communication networks.

[118] The preferred alternative in the NPRM included a compliance deadline of October 1, 2017, for PG I service, October 1, 2018, for PG I service, and October 1, 2020, for PG III service.

analysis, all references to an expedited phase-out of DOT–111 tank cars by 2018 refer to this specific population of DOT–111 tank cars in PG I and PG II service only.

Alternatives Considered but Not Carried Forward

PHMSA received a range of comments asking that it consider an immediate ban or other expedited discontinuance of all DOT–111 tank cars for crude and ethanol transport. PHMSA considered the impacts of immediately banning the use of the DOT–111 tank car in HHFTs. However, PHMSA concluded in the regulatory impact analysis (RIA) included in this rulemaking that an immediate ban of the DOT–111 tank car is not a reasonable alternative because the rail industry could not replace rail cars immediately and would not be able to immediately switch to other transportation modes. This would cause supply chain disruptions, increased shipping costs, and increased reliance on trucks to make up for lost transport capacity. This increased reliance on trucks could have detrimental environmental and safety implications. As such, PHMSA concluded that a ban by 2016 would be impractical. Therefore, PHMSA more fully examined the impacts of a schedule that would phase out the use of all DOT–111 tank cars in PG I and PG II service by 2018, which is more aggressive than the selected alternative.

3. Environmental Impacts of the Selected Action and Alternatives No-Action Alternative:

If PHMSA were to select the no-action alternative, current regulations would remain in place, and no new provisions would be added. However, the safety and environmental threats that result from the increasing use of HHFTs would not be addressed. The existing threat of derailment and resulting fire, as exhibited in serious accidents like Lac-Mégantic, Quebec, which resulted in 47 fatalities, and Aliceville, Alabama, where we estimate that 630,000 gallons of crude oil entered navigable waters, destroying a several acres of wetlands and forest, would continue. Clean-up is ongoing for both of these accidents. For more information on safety and environmental risks, please see the RIA.

As noted in the Final Rule, NTSB has identified these tank cars as vulnerable to puncture. No action would allow for the long term continuation of transportation of flammable liquids by rail in large volumes in the DOT–111 tank car. In addition, if no action were taken PHMSA would not adopt the DOT–117 tank car standard for new construction. This would lead to market uncertainty and leave important safety benefits unrealized.

If PHMSA selected the no action alternative, the safety benefits of the sampling program would not be realized. These requirements are intended to ensure the proper safety precautions are applied to each carload. Without these protections, first responders could face greater challenges in responding to incidents, and their efforts could be less effective at mitigating the impacts of a release.

Selection of the no action alternative would also not include requirements to share routing selection information with state authorities and/or fusion centers. This requirement is intended to aid first responders to best respond to incidents to mitigate the effects of a release.

If PHMSA selected the no action alternative, speed restrictions would not take effect. Speed restrictions decrease the kinetic energy involved in accidents and are intended to decrease the amount of hazardous materials released when a derailment or incident occurs. Similarly, the no action alternative would not include the safety benefits of more advanced braking systems to reduce the likelihood or severity of derailments.

Selected Alternative

In considering the various alternatives, PHMSA analyzed the following potential environmental impacts of each amendment in the selected alternative.

The extension of the existing rail routing requirements in 49 CFR 172.820 to include HHFTs will require that rail carriers consider safety and security risk factors such as population density along the route; environmentally-sensitive or significant areas; venues along the route (stations, events, places of congregation); emergency response capability along the route; etc., when analyzing and selecting routes for those trains. Use of routes that are less sensitive could mitigate the safety and environmental consequences of a train accident and release, were one to occur. It is possible that this requirement and consideration of the listed risk factors could cause rail carriers to choose routes that are less direct, potentially increasing the emission of greenhouse gases and other air pollutants. PHMSA, however, concluded that the reduction in risk to sensitive areas outweighs a slight increase in greenhouse gases. Furthermore, consideration of emergency response capabilities along the route could result in better environmental mitigation in the event of a release. The purpose of environmental mitigation is to decrease impacts to environmental media such as air and water.

Next, the requirement for offerors to develop sampling and testing plans is intended to ensure that unrefined petroleum products are properly characterized to ensure that: (1) The proper regulatory requirements are applied to each shipment to minimize the risk of incident, (2) first responders have accurate information in the event of a train accident, and (3) the characteristics of the material are known and fully considered so that offerers and carriers are aware of and can mitigate potential threats to the integrity of rail tank cars. PHMSA believes that this provision will reduce the risk of release of these materials.

PHMSA has calculated in the RIA that braking and speed restrictions, especially for older DOT–111 tank cars, will reduce the likelihood of train accidents that result in the release of flammable liquids. PHMSA has also shown that the braking requirements could improve fuel efficiency, thereby reducing greenhouse gas emissions. The effective use of braking on a freight train can result in some accident avoidance. In addition, the effective use of braking on a freight train can potentially lessen the consequences of an accident by diminishing in-train forces, kinetic energy, etc., which can reduce the likelihood of a tank car being punctured and decrease the likelihood of a derailment. Lessening the likelihood of derailments translates into a reduction in the probability of releases into the environment.

These benefits are amplified when a train operates in ECP brake mode, particularly as train length increases to 70 or more cars. The system-wide implementation of ECP brakes on high-hazard flammable unit trains also will potentially improve the efficiency of the rail system by permitting trains to run closer together because of the improved performance of the brake system. The final rule cites business benefits related to operating in ECP brake mode (*e.g.,* reduced fuel consumption, longer inspection intervals, real time diagnostics, greater control stopping and starting etc.) Additionally, system-wide implementation of ECP brakes will improve the efficiency of the rail system by permitting trains to run closer together because of the improved performance of the brake system.

PHMSA concluded that the phasing-out of DOT–111 tank cars in HHFTs will reduce risk of release because of the improved integrity and safety features of the DOT–117. The DOT–117 will provide bottom outlet protection and a

high capacity pressure relief valve. To improve integrity and puncture resistance of the tank, DOT–117 has a full-height ½ inch minimum thickness head shield, an 11-gauge jacket, and a 9⁄16 inch shell. This is a significant improvement compared to the existing DOT–111, which has no head shield, or jacket requirement and is constructed with a 7⁄16 inch thick shell.

The DOT–117 tank car must have a thermal protection system, capable of surviving a 100-minute pool fire after a train accident. The 100-minute survivability period is intended to provide emergency responders time to assess an accident, establish perimeters, and evacuate the public as needed. This thermal protection is critical in limiting human health risks to the public and first responders and limiting environmental damage in the event of a train accident. The introduction of the new DOT–117, along with the phase-out of the DOT–111 used in HHFTs will result in the manufacturing of some new tank cars to replace retirements and to accommodate new investment. PHMSA recognizes that performed a quantitative analysis the newer tank cars are heavier such that their transport will result in somewhat greater use of fuel and in turn greater release of air pollutants, including carbon dioxide. However, PHMSA has discussed in the RIA that the increased integrity of the tank cars, designed to reduce the risk of release of high-hazard flammable materials to the environment, causing air and likely water pollution, positively outweighs a relatively small increase in air pollution.

While the nature of the phase-out is intended to minimize the unintended impacts of an accelerated phase-out, increased manufacture of replacement rail tank cars could nevertheless result in greater short-term release of greenhouse gases and use of resources needed to make the new tank cars, such as steel. PHMSA, however, concluded that these possible temporary increases are far outweighed by the increased safety and integrity of each railcar and each train and the decreased risk of release of crude oil and ethanol to the environment. The phase out of older tank cars will not create a solid waste burden on the environment because they will be recycled. Any environmental burdens will be limited to energy inputs and pollutants from the recycling and manufacture processes, which we do not expect to be significant since in the absence of this rule, the same number of tank cars would eventually be built. The only difference under this rule is that the same number of tank cars will be built to the new standard.

Alternative of 2018 Removal of DOT–111 Tank Cars From Crude Oil and Ethanol Service

If PHMSA were to select the provisions of this additional Final EA alternative, we recognize that some safety and environmental risks could be reduced in the short-term. For example, due to improved integrity of new tank cars, such as puncture resistance and thermal protection, rail incidents would be less likely to result in release of crude oil or ethanol to the environment. Also, the releases that still occurred would likely be smaller in volume. These avoided or decreased release amounts would avoid increased water, soil, and air pollution. PHMSA recognizes that derailment of HHFTs has resulted in water, soil, and air pollution. Such releases also pose risk to human health and public safety.

PHMSA examined and performed a quantitative analysis of a 2018 phase-out alternative in this Final EA, which includes an expedited phase out of all DOT–111s in PG I and PG II service. PHMSA used this alternative, which requires removal from service of all DOT–111 tank cars for transport of crude oil and ethanol by the end of 2018, as a quantitative baseline. In its analysis of the full impacts of removal of DOT–111 tank cars by the end of 2018, PHMSA found disadvantages to this alternative. As explained more specifically in Appendix A, the transportation capacity lost to the retirement of the DOT–111 tank cars would likely cause crude and ethanol transportation to be shifted to truck/highway transportation (*i.e.* ''modal shift''). Trucks already figure prominently into the supply chains for both crude [119] and ethanol,[120] although so far there has been limited evidence of large scale long-haul shipments of crude oil from wells to refineries.[121] A shortage of rail tank cars would make highway transportation a more viable option for long-haul transportation. Highway transportation is more polluting both in terms of air pollutants and hazardous materials released due to incidents. Furthermore, highway transportation has higher fatality and injury rates. PHMSA's analysis concluded that a 2018 removal of the DOT–111s would cause increased air pollutant emissions in 2019, for both rail and truck modes of transportation.

Furthermore, PHMSA had to consider the costs of such a drastic regulatory change to industry, energy production, and the public. Comments submitted by industry indicated that costs imposed by a 2018 complete removal of the entire DOT 111 fleet would be prohibitive and that such an action would potentially disrupt supply, which could affect the public in the form of higher energy prices. Further, such a sudden removal would greatly constrain the capacity of manufacture and repair required for other tank cars, potentially resulting in shortages for transport of other commodities.

PHMSA weighed the benefit of reductions in releases from rail accidents that would result from the 2018 removal of DOT–111 tank cars against increased air pollution and highway accidents, often resulting in releases, that would result from a temporary modal shift, along with extremely high cost to industry and the public, and the other regulatory provisions in this rulemaking that are also aimed at reducing derailments and releases. Upon consideration of all these factors, PHMSA recognizes the need to upgrade the rail car fleet, but found that a targeted phase-out of the DOT–111 tank cars was the most prudent and protective approach.

4. Discussion of Environmental Impacts in Response to Comments

PHMSA received various comments on this rulemaking. Some commented directly on the NPRM EA, while others commented more generally on the rule while focusing their comments on environmental matters. We have tried to address both types of comments here.

Rail Capacity/Modal Shift/Rail Tank Car Phase-Out

The RSI's comments suggested that PHMSA's proposed retrofit schedule could result in modal shift. RSI suggested that from 2015–2025, over-the-road trucks needed to replace railcar capacity would emit 6.41 million more tons of carbon dioxide (CO_2) than the railcars would have had they been permitted to remain in service. PHMSA received similar comments from Archer Daniels Midland (ADM).

[119] See: Davies, Phil (2013). ''Busting bottlenecks in the Bakken.'' Federal Reserve Bank of Minneapolis. *https://www.minneapolisfed.org/publications/fedgazette/busting-bottlenecks-in-the-bakken*. Over 70 percent of crude oil in North Dakota is shipped to a pipeline or rail terminal by truck.

[120] See: Bevil, Kris (2011). ''By Train, By Truck, or By Boat: How Ethanol Moves and Where it's Going.'' Ethanol Producer Magazine. The percentage of ethanol moved by long-haul truck is believed to be 20 percent.

[121] See: Sheppard, David, and Nichols, Bruce (2011). ''Insight: Oil Convoy Blues: Trucking Game Foils Crude Traders.'' New York: Reuters. *http://www.reuters.com/article/2011/10/14/us-cushing-trucks-idUSTRE79D0OP20111014*.

The selected alternative considers comments submitted by the RSI with regard to the retrofit capacity of rail yards and the build capacity of tank car manufacturers. PHMSA has carefully considered retrofit and build capacity, and concluded that its selected alternative will not result in any shift to highway transportation due to shortages of compliant tank cars. PHMSA agrees that shifting transportation to highway would increase emissions and the risk of incidents due to higher rates of highway traffic incidents than rail incidents. However, under this final rule, as explained in more detail below, PHMSA concluded that there will not be any losses of capacity from retrofits or excessive retirements of tank cars that will lead to a backlog of new tank car orders (such a backlog would represent lost rail car capacity that would require more shipments by truck), and thus no modal shift will occur under the final rule; the final rule was carefully drafted to avoid modal shift.

Nonetheless, in order to better address comments received in response to the NPRM (relating to environmental matters) and NPRM EA, PHMSA simulated the impact of a schedule in which DOT–111 tank cars in PG I and PG II service would be phased out by 2018, which was proposed in the NPRM and supported by some environmental organizations. The full details of this analysis are provided in Appendix A. Such a scenario would lead to increased retirements and unplanned new orders of tank cars. Initially, these new orders plus existing planned orders would exceed the build capacity of rail car manufacturers. Because crude oil and ethanol producers would still need to move their products, the lack of suitable tank cars would likely result in modal shift from rail transportation to highway transportation, which would result in greater air pollution. The backlog of orders would be eliminated after 2019, which would result in a shift back to rail, eliminating related increased emissions. Under the selected alternative, a mode shift does not occur. Table EA2 provides PHMSA's analysis of increased emissions resulting from a 2018 phase-out of DOT–111 tank cars. As stated previously, due to increased modal shifts that would be necessitated, we expect magnified pollution and negative safety effects for phase-outs prior to 2018.

TABLE EA2—EXCESS EMISSIONS OF CRITERIA AIR POLLUTANTS AND CARBON DIOXIDE UNDER 2018 PHASE-OUT SCHEDULE OF DOT–111 TANK CARS

Year/tons	Hydrocarbons (HC, including volatile for truck)	Carbon monoxide (CO)	Oxides of nitrogen (NO_X)	Particulate matter (PM)	Carbon dioxide (CO_2)
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	2,584	9,931	34,633	1,571	4,759,930

RSI cites analyses prepared for them by the Brattle Group (a consulting firm specializing in economic analysis) estimating that replacing lost rail capacity in 2017 with truck transportation for crude oil and ethanol shipments in North America would require approximately 20,000 trucks carrying over 370,000 truckloads on North American highways. In 2018, the year in which the loss of capacity would be fully felt, RSI further cites the Brattle Group, indicating that replacement transportation would require approximately 70,000 trucks carrying almost 1.6 million loads and that over the road (OTR) truckers spilled 58 percent more total liquid hazardous material from 2002–2009 than railroads per year and per billion ton-miles. AAR has also expressed concern that, ''[t]he result would be the diversion of traffic off the rail network and onto less safe and less environmentally friendly modes of transportation.'' AAR also commented that rail is an environmentally superior form of transportation.

PHMSA's calculations for increased emissions were lower than those provided by RSI. In particular, PHMSA's selected alternative would result in no shift to highway transportation. PHMSA's analysis also does not concur with RSI that the less stringent phase-out schedule in the selected alternative would lead to 6.41 million additional tons of CO_2 emissions. PHMSA disagrees with RSI's projections for the number of additional trucks needed to account for lost DOT–111 capacity. PHMSA's analysis indicates that 20,000 additional trucks (*i.e.,* the amount cited by RSI as required to replace lost rail capacity in 2017) would be capable of handling about half of all the crude and ethanol shipped in DOT–111 tank cars in a given year.[122] Moreover 70,000 trucks (*i.e.,* the amount cited by RSI as required to replace lost rail capacity in 2018) could handle 123,375 ton miles of crude and ethanol, or almost all of the total crude and ethanol ton miles Brattle provided for 2014.[123] Given these facts, PHMSA calculates that RSI overestimates the number of additional trucks needed.

The Center for Biological Diversity (CBD), Clean Water Action, Delaware River Keeper, Earthjustice, Environment New Jersey, and Powder River Basin Resource Council have all expressed concern about the integrity of the DOT–111 tank cars and propose that these cars be removed from service immediately, as opposed to PHMSA's planned phase-out.[124] As discussed above, PHMSA recognizes commenters' concerns regarding DOT–111 phase-out schedule, but PHMSA deemed this option to be impractical because of negative impacts from modal shift, including increased incidents resulting in release of hazardous materials and increased fatalities, as illustrated in Tables EA3 and EA4.

[122] If one assumes that a semi-truck/tank-trailer and semi-truck/trailer combinations are both able to haul about 47,000 pounds of cargo 150,000 miles per year, divided by 2 to account for empty return trips, or 1.76 million ton-miles per year. Currently, about 96.5 percent (just over 40,000 million ton miles) of ethanol transported by rail is in DOT–111 tank cars, and 29 percent of crude oil (or about 30,000 million ton miles) by rail is in DOT–111 tanks cars. An additional 20,000 trucks could handle 35,250 million ton miles (1.76 million × 20,000) of hazardous material, and 70,000 trucks could handle 123,375 million ton miles (1.76 million × 70,000) of hazardous material.

[123] Brattle concludes 85,062 million ton miles of crude oil in 2014 and 46,243 million ton miles of ethanol. PHMSA concludes that 70,000 trucks would be able to transport 94 percent of that volume.

[124] The Friends of the Gorge and the Adirondack Mountain Club were co-commenters with CBD.

TABLE EA3—ADDITIONAL HAZARDOUS MATERIAL INCIDENTS AND RELEASES FROM MODAL SHIFT

[2018 DOT–111 Tank Car Phase-Out Scenario]

Year	Year	Year
2015	2015	2015
2016	2016	2016
2017	2017	2017
2018	2018	2018
2019	2019	2019

TABLE EA4—ADDITIONAL FATALITIES AND INJURIES FROM MODE SHIFT

[2018 DOT–111 Tank Car Phase-Out Scenario]

Year	Fatalities	Injuries
2015	0.00	0.00
2016	0.00	0.00
2017	0.00	0.00
2018	0.00	0.00
2019	94.68	2,359.83

PHMSA expects additional air emissions, spills and fatalities in 2019 as a result of the shift to highway transportation. Our analyses indicate that the amendments in this final rule will actually realize much greater savings in these areas over the long-term. The RIA prepared for this final rule examines a period from 2015 to 2034, but benefits would continue to accrue beyond this analysis period. We have therefore decided that it is not prudent to modify the regulation in response to these comments.

NEPA Requirements

The CBD and ADM commented that an Environmental Impact Statement (EIS), as opposed to an EA, is required under NEPA. PHMSA determined that an EA was appropriate to determine whether to prepare an EIS or a FONSI. An EIS is necessary when a proposed action will have significant environmental impacts. At the outset, PHMSA performed a NEPA best practice environmental checklist analysis for this rulemaking, examining all facets of the environment that could potentially be impacted. This rulemaking does not authorize and will not result in new construction of rail infrastructure or new transportation of hazardous materials. These factors, which impact the environment, are already in existence and are ongoing. Since the primary purpose and function of the rulemaking is to decrease the already existing risk of releases of crude oil and ethanol, the rulemaking does not result in any significant new environmental impacts. Based on the analysis completed for this EA, PHMSA does not agree that this rulemaking could result in significant environmental impacts that would require the preparation of an EIS, and therefore PHMSA intends to issue a FONSI.

The CBD noted in its comments that PHMSA should initiate an Endangered Species Act consultation with FWS/NMFS in order to fully assess areas where HHFTs have the potential to impact listed species and critical habitat. As stated above, the intent of this rule is to prevent releases of hazardous chemicals to the environment. This rulemaking is not authorizing any new impacts to protected species or habitats, as rail transportation of hazardous materials and high-hazard flammable material is ongoing and rail infrastructure already exists. Increased regulation of ongoing transportation of hazardous materials will not jeopardize continued existence of any species and will not result in the destruction of habitat. Therefore, no consultation is required. While the routing provisions included in this rulemaking could alter the routes HHFTs take, the ''Rail Risk Analysis Factors'' that rail operators must consider in selecting routes include the consideration of ''environmentally sensitive and significant areas.'' See Appendix D to Part 172. Therefore, PHMSA concluded that improved routing selection and the eventual universal use of safer tank cars will result in a reduction in risk to endangered species.

Riverkeeper 2266 stated its concerns regarding potential oil spills entering the Hudson River. Riverkeeper asserted that the characteristics of the River would make cleanup especially difficult and complicated. Riverkeeper 2266 also commented that spills could hurt the tourist-based economy, wildlife, and riverfront communities. Lastly, Riverkeeper 2266 and others expressed concerns that PHMSA's new safety standards only apply to trains of 20 cars or more with Class 3 flammable liquids, even though devastating effects to the environment could also occur for trains with 19 or fewer cars.

In the NPRM, PHMSA proposed to define HHFT to mean a single train carrying 20 or more carloads of a Class 3 flammable liquid. This definition aligns with the definition of ''Key Train'' in OT–55N. Many commenters raised concerns regarding the ambiguity of this definition as it would be applied to crude oil and ethanol trains and suggested that this definition would inadvertently include manifest trains that did not pose as high a risk as unit trains. PHMSA subsequently revised the definition of HHFT to ''20 or more loaded tank cars of a Class 3 flammable liquid in a continuous block or a single train carrying 35 or more loaded tank cars of a Class 3 flammable liquid throughout the train.'' While the point regarding the potential environmental impacts associated the transport 19 or less tank cars of flammable liquid cars is valid, the focus of the final rule is on trains in which the flammable liquid cars are concentrated in large blocks.

Environmental Justice and Other Environmental Factors

Commenters, such as ADM, Clean Water Action Pennsylvania, and Earthjustice commented that an Environmental Justice (EJ) assessment should be included in the EA. Earthjustice's [125] comments alleged that low income and minority communities would face double the impact of other communities because many occur within one-mile blast zones of train tracks subject to this rulemaking. Both Earthjustice and Clean Water Action (Pennsylvania) also commented that PHMSA should have performed a complete EJ assessment for this rulemaking.

This rulemaking has no role in the siting of already existing railroad lines. This rulemaking also does not authorize new hazardous materials transportation; these activities are ongoing. The purpose of the rulemaking is to decrease the risk of release of crude oil and ethanol. PHMSA has calculated in the RIA that consideration of the Rail Risk Analysis Factors will reduce risk of release in general, especially in densely populated areas, as railroad operators will now be required to consider population density, places of congregation, and presence of passenger traffic, among other factors to encourage selection of the most prudent routes. PHMSA, therefore, does not agree that there is potential for this rulemaking to have a disparate impact on low income or minority populations. Consideration of the Rail Risk Analysis Factors will reduce risk of release in densely populated areas where low income and minority populations are likely to be located.

This rulemaking also has no impact on historic preservation or wetlands and floodplains because it does not authorize any new construction. It is also not reasonable that this rulemaking would indirectly or cumulatively result in new construction. It simply attempts to make existing hazardous materials

[125] Forest Ethics, Sierra Club, NRDC and Oil Change International were co-commenters with Earthjustice.

transportation safer for the environment and public safety.

5. Agencies Consulted

PHMSA worked closely with the FRA, EPA, and DHS/TSA in the development of this final rulemaking for technical and policy guidance. PHMSA also considered the views expressed in comments to the ANPRM and NPRM submitted by members of the public, state and local governments, and industry.

6. Conclusion

The provisions of this rule build on current regulatory requirements to enhance the transportation safety and security of shipments of hazardous materials transported by rail, thereby reducing the risks of release of crude oil and ethanol and consequent environmental damage. PHMSA has calculated that this rulemaking will decrease current risk of release of crude oil and ethanol to the environment. Therefore, PHMSA finds that there are no significant environmental impacts associated with this final rule.

Appendix A

Environmental Assessment Supporting Calculations

PHMSA performed calculations to analyze the additional air emissions, hazardous materials incidents, quantity of hazardous material spilled, fatalities, and injuries from two options to phase-out DOT–111 rail tanks cars. As discussed, PHMSA calculated these impacts to be minimal for the selected alternative because no shift to highway transportation is anticipated.

Selected Alternative

The schedule for retrofitting DOT–111 and CPC–1232 tank cars and mandating use of tank cars that comply with the new standards is not expected to reduce tank car capacity for shipping crude and ethanol. Consequently, the deleterious effects of shipments being shifted to highway transportation on trucks will be avoided. The new tank car standards and other provisions of the rule are expected to reduce the risk of hazardous materials incidents, and the severity of those incidents that do occur. As discussed under ''Selected alternative'' in Section 3 of the Final EA, this alternative is anticipated to provide positive benefits for the environment and safety.

2018 Phase-Out of DOT–111 Tank Cars Alternative

The alternative of prohibiting use of all DOT–111 tank cars in 2018 is the scenario that PHMSA staff could envision as physically possible that would both (a) negatively impact railroads and shippers' ability to continue transport of crude oil and ethanol by rail and (b) have the greatest chance of resulting in modal shift. PHMSA calculates that a modal shift resulting from a decrease in the number of tank cars authorized to transport flammable liquids, notably crude oil and ethanol, would have significant deleterious effects on safety and the environment. The evaluation of this scenario assumes that there will be a sufficient number of trucks and drivers to handle the additional volume of crude oil and ethanol. Because it is unclear whether this additional trucking capacity would actually be available, these results can be considered an upper limit on potential environmental impacts.

Per ton-mile of transportation, cargo tank motor vehicles (CTMVs) emit significantly higher levels of volatile organic compounds, non-volatile hydrocarbons, carbon monoxide, oxides of nitrogen, carbon dioxide, and particulate matter than freight rail. In addition, the fatality and injury rate per ton-mile from accidents is significantly higher than from freight rail. In estimating the size of this modal shift, PHMSA employs several key assumptions.

1. There are approximately 33,000 DOT–111 tank cars in service that transport high-hazard flammable material.

2. Rail tank car manufacturers have an annual build capacity of roughly 24,000 cars.[126] Manufacturers will not permanently increase capacity to deal with short-run spikes in demand.

3. Under this alternative, a total phase-out of DOT–111s would occur by the end of 2018. Shippers would find alternative methods to transport their products to account for any of the 33,000 DOT–111s not replaced by this time.

4. Shippers or carriers will spread out replacing/removing from service DOT–111 tank cars over time.

Please see the RIA prepared for this rule for additional information on these assumptions.

Based on these assumptions, PHMSA estimated that at the end of 2018, there would be a backlog of 12,239 DOT–111 tank cars that would not meet the retrofit deadline, but that these would be replaced by new, compliant tank cars by the end of 2019. In the meantime, their carrying capacity would shift to CTMVs. The capacity and backlog of tank cars is presented in the table below.

TABLE EA5—DOT–111 REPLACEMENT SCHEDULE, 2018 PHASE-OUT OF DOT–111 TANK CARS

Year	Initial DOT–111s	Actual DOT–111s replaced	Backlog of DOT–111s replaced
2015	32,831	0	32,831
2016	0	4,413	28,418
2017	0	7,941	20,477
2018	0	8,238	12,239

Table EA 6 below shows the relative amounts of emissions in grams per ton-mile for freight rail and CTMV.

TABLE EA6—EMISSION RATES BY MODE, GRAMS PER MILLION TON MILES,[127] 2018 PHASE-OUT OF DOT–111 TANK CARS

Mode/Pollutant	HC (VOC for truck)	CO	NO_X	PM	CO_2
Railroad*	0.018201	0.055600	0.353600	0.010251	21.140000
Truck*	0.100000	0.370000	1.450000	0.060000	171.830000

[126] RSI concluded that over 21,000 new deliveries of CPC–1232 tank cars will occur in 2014. In addition, over 600 new jacketed DOT–111s were delivered in the first quarter of 2014. Based on these two figures, PHMSA has concluded that build capacity is at least 24,000 cars per year.

[127] Kruse, C. J., Protopapas, A., and Olson, L. (2012). *A Modal Comparison of Domestic Freight Transportation Effects on the General Public: 2001–2009.* Arlington, VA: National Waterways Foundation. Retrieved from *http://nationalwaterwaysfoundation.org/study/FinalReportTTI.pdf.*

PHMSA concluded that 47,000 million ton miles of ethanol would be transported per year by rail between 2015 and 2018, and that about 108,000 million ton miles of crude oil will be transported on average per year. PHMSA concluded that about 96 percent of ethanol transported by rail is currently shipped in DOT–111 tank cars, and that about 29 percent of crude oil transported by rail is shipped in these tank cars. Assuming these proportions in the hypothetical scenario, DOT–111s would be used to transport about 45,300 million ton miles of ethanol (96% × 47,000) and 31,500 million ton miles of crude oil (29% × 108,000). All told, about 76,869 million ton miles of crude and ethanol would be shipped in DOT–111 tank cars on average per year, and each of the 32,831 DOT–111 tank cars in crude and ethanol service would handle on average 1.7 million ton miles per year. That is, the loss of each individual DOT–111 tank car would require a shift of 1.7 million ton miles of crude or ethanol per rail tank car to another mode.

Rail car manufacturers have excess capacity for replacing some, but not all, of older DOT–111s. The backlog presented by a complete DOT–111 phase out by 2018 translates into lost DOT–111 rail-car capacity that would have to be handled by CTMVs. Table EA7 equates the lost capacity to ton-miles shifted to CTMV. It is important to note that these are the maximum amounts of ton-miles that could be shifted to truck. These amounts will be constrained by the availability of trucks and drivers to handle these additional loads.[128]

TABLE EA7—TON-MILES OF CRUDE AND ETHANOL SHIFTED TO CTMV, 2018 PHASE-OUT OF DOT–111 TANK CARS

Year	Percent DOT–111 ton miles shifted to CTMV	Total DOT–111 ton miles	DOT–111 ton-miles shifted to CTMV
2016	0.0	76,869	0
2017	0.0	76,869	0
2018	0.0	76,869	0
2019	37.28	76,869	28,655.75

PHMSA applied the ton-miles shifted to CTMV presented in Table EA7 to the emissions per ton-mile presented in Table EA6 to calculate the additional emissions that result from constraining rail car capacity by an expedited 2018 retirement schedule for DOT–111s.

TABLE EA8—ADDITIONAL TONS OF EMISSIONS FROM MODE SHIFT, 2018 PHASE-OUT OF DOT–111 TANK CARS

Year/Tons	HC (VOC for truck)	CO	NO_X	PM	CO_2
2015	0	0	0	0	0
2016	0	0	0	0	0
2017	0	0	0	0	0
2018	0	0	0	0	0
2019	2,584	9,931	34,633	1,571	4,759,930

PHMSA examined the additional hazardous material incidents and quantities of hazardous material released that could occur from a mode shift to CTMVs. *Table EA9* below presents the spill rates and gallons of hazardous material released per million ton miles by rail and highway modes.

TABLE EA9—HAZARDOUS MATERIALS INCIDENT AND SPILL RATES PER MILLION TON-MILES, 2018 PHASE-OUT OF DOT–111 TANK CARS

Mode	Number spills/million ton-miles	Number gallons spilled/million ton-miles
Railroad	0.000339	4.889386
Truck	0.001371	10.411803
Difference	0.001032	5.522417

Multiplying the annual the ton-miles (the ''Percent DOT–111 Ton-Miles Shifted to CTMV'' column) presented in Table EA7 by the ''difference'' row for hazardous material incident and release rates in Table EA9 yields the additional number of hazardous material incidents and quantity of hazardous material incident released, which are presented in Table EA10. PHMSA concluded that a shift to truck for transporting crude oil and ethanol that would have been transported in DOT–111 tank cars would lead to nearly 30 additional hazardous material incidents and over 158,000 additional gallons of hazardous material per incident released in 2019.

[128] An estimate of the number of trucks needed can be calculated using the following assumptions and parameters:

1. A standard semi-truck weighs 20,000 pounds, a tank trailer weighs about 13,000 pounds, and the maximum gross vehicle weight rating for a tractor-trailer is 80,000 pounds. Each truck can transport up to 47,000 pounds of ethanol or crude oil.

2. A fully utilized tractor trailer travels up to 500 miles per day for up to 300 days per year, or a total of 150,000 miles per year.

3. Trucks will make return trips empty, so their maximum annual transport capacity is halved.

A typical semi-truck/tank-trailer combination can transport up to 1.7652 million ((((47,000 × 150,000) ÷ 2,000) ÷ 2) ÷ 1,000,000) ton miles of crude or ethanol per year. A mode shift of 15,200 million ton miles would require an additional 8,861 trucks. This is a relatively small addition to the current number of such vehicle combinations currently operating. PHMSA concluded that the availability of trucks is unlikely to constrain the amount of crude oil and ethanol that could be shifted to highway transportation.

TABLE EA10—ANTICIPATED ADDITIONAL HAZARDOUS MATERIAL INCIDENTS AND RELEASES FROM MODE SHIFT, 2018 PHASE-OUT OF DOT–111 TANK CARS

Year	Spills	Gallons
2015	0	0
2016	0	0
2017	0	0
2018	0	0
2019	29.57	158,249

Lastly, PHMSA examined the additional transportation fatalities, and injuries that could occur from a mode shift to CTMVs. Table EA11 presents accident, fatality, and injury rates per million ton mile for rail and CTMV.

TABLE EA11—ADDITIONAL ACCIDENT, INJURY, AND FATALITY RATES PER MILLION TON MILES BY MODE,[129] 2018 PHASE-OUT OF DOT–111 TANK CARS

Mode	Additional fatalities	Additional injuries
Railroad	0.000525	0.005183
Truck	0.003829	0.087534
Difference	0.003304	0.082351

Multiplying the ton-miles presented in Table EA7 (the ''Percent DOT–111 Ton-Miles Shifted to CTMV'' column) by the ''difference'' row for fatality and injury rates in Table EA11 yields the anticipated additional number of fatalities and injuries from truck transportation instead of rail transportation, which are presented in Table EA12. PHMSA concluded that a shift to truck for transporting crude oil and ethanol that would have been transported in DOT–111 tank cars would lead to nearly 95 additional deaths and about 2,300 additional injuries in 2019.

TABLE EA12—ADDITIONAL FATALITIES AND INJURIES FROM MODAL SHIFT, 2018 PHASE-OUT OF DOT–111 TANK CARS

Year	Fatalities	Injuries
2015	0	0
2016	0	0
2017	0	0
2018	0	0
2019	94.68	2,359.83

H. Privacy Act

In accordance with 5 U.S.C. 553(c), DOT solicits comments from the public to better inform its rulemaking process. DOT posts these comments, without edit, including any personal information the commenter provides, to *www.regulations.gov*, as described in the system of records notice (DOT/ALL–14 FDMS), which can be reviewed at *www.dot.gov/privacy.*

I. Executive Order 13609 and International Trade Analysis

Under Executive Order 13609, agencies must consider whether the impacts associated with significant variations between domestic and international regulatory approaches are unnecessary or may impair the ability of American businesses to export and compete internationally. In meeting shared challenges involving health, safety, labor, security, environmental, and other issues, regulatory approaches developed through international cooperation can provide equivalent protection to standards developed independently while also minimizing unnecessary differences.

Similarly, the Trade Agreements Act of 1979 (Public Law 96–39), as amended by the Uruguay Round Agreements Act (Public Law 103–465), prohibits Federal agencies from establishing any standards or engaging in related activities that create unnecessary obstacles to the foreign commerce of the United States. For purposes of these requirements, Federal agencies may participate in the establishment of international standards, so long as the standards have a legitimate domestic objective, such as providing for safety, and do not operate to exclude imports that meet this objective. The statute also requires consideration of international standards and, where appropriate, that they be the basis for U.S. standards.

PHMSA participates in the establishment of international standards in order to protect the safety of the American public, and we have assessed the effects of the proposed rule to ensure that it does not cause unnecessary obstacles to foreign trade. Accordingly, this rulemaking is consistent with Executive Order 13609 and PHMSA's obligations under the Trade Agreement Act, as amended.

For further discussion on the impacts of harmonization see the ''Harmonization'' portion of ''Miscellaneous Relevant Comments'' Section of this rulemaking.

J. Statutory/Legal Authority for This Rulemaking

This final rule is published under the authority of 49 U.S.C. 5103(b), which authorizes the Secretary of

[129] Kruse, C. J., Protopapas, A., and Olson, L. (2012). *A Modal Comparison of Domestic Freight Transportation Effects on the General Public: 2001–2009.* Arlington, VA: National Waterways Foundation. Retrieved from *http://nationalwaterwaysfoundation.org/study/FinalReportTTI.pdf*

Transportation to ''prescribe regulations for the safe transportation, including security, of hazardous materials in intrastate, interstate, and foreign commerce.'' The amendments in this rule address safety and security vulnerabilities regarding the transportation of hazardous materials in commerce.

K. Regulation Identifier Number (RIN)

A regulation identifier number (RIN) is assigned to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. The RIN contained in the heading of this document can be used to cross-reference this action with the Unified Agenda.

L. Executive Order 13211

Executive Order 13211 requires Federal agencies to prepare a Statement of Energy Effects for any ''significant energy action.'' 66 FR 28355, May 22, 2001. Under the Executive Order, a ''significant energy action'' is defined as any action by an agency (normally published in the **Federal Register**) that promulgates, or is expected to lead to the promulgation of, a final rule or regulation (including a notice of inquiry, advance NPRM, and NPRM) that (1)(i) is a significant regulatory action under Executive Order 12866 or any successor order and (ii) is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (2) is designated by the Administrator of the Office of Information and Regulatory Affairs as a significant energy action.

PHMSA has evaluated this action in accordance with Executive Order 13211. See the environmental assessment section for a more thorough discussion of environmental impacts and the supply, distribution, or use of energy. PHMSA has determined that this action will not have a significant adverse effect on the supply, distribution, or use of energy. Consequently, PHMSA has determined that this regulatory action is not a ''significant energy action'' within the meaning of Executive Order 13211.

XI. Regulatory Text

List of Subjects

49 CFR Part 171

Exports, Hazardous materials transportation, Hazardous waste, Imports, Incorporation by reference, Reporting and recordkeeping requirements.

49 CFR Part 172

Hazardous materials transportation, Hazardous waste, Labeling, Packaging and containers, Reporting and recordkeeping requirements, Security measures.

49 CFR Part 173

Hazardous materials transportation, Packaging and containers, Radioactive materials, Reporting and recordkeeping requirements, Uranium.

49 CFR part 174

Hazardous materials transportation, Rail carriers, Reporting and recordkeeping requirements, Security measures.

49 CFR Part 179

Hazardous materials transportation, Incorporation by reference, Railroad safety, Reporting and recordkeeping requirements.

The Final Rule

In consideration of the foregoing, we are amending title 49, chapter I, subchapter C, as follows:

PART 171—GENERAL INFORMATION, REGULATIONS, AND DEFINITIONS

■ 1. The authority citation for part 171 continues to read as follows:

Authority: 49 U.S.C. 5101–5128, 44701; Pub. L. 101–410 section 4 (28 U.S.C. 2461 note); Pub. L. 104–121, sections 212–213; Pub. L. 104–134, section 31001; 49 CFR 1.81 and 1.97.

■ 2. In 171.7, redesignate paragraphs (k)(2) through (4) as (k)(3) through (5) and add new paragraph (k)(2) to read as follows:

§ 171.7 Reference material.

* * * * *

(k) * * *

(2) AAR Manual of Standards and Recommended Practices, Section C—III, Specifications for Tank Cars, Specification M–1002 (AAR Specifications for Tank Cars), Appendix E, Design Details, implemented April 2010; into §§ 179.202–9, and 179.202–12(f).

* * * * *

■ 3. In § 171.8 definitions of ''High-hazard flammable train'' and ''High-hazard flammable unit train'' are added in alphabetical order to read as follows:

§ 171.8 Definitions.

* * * * *

High-hazard flammable train (HHFT) means a single train transporting 20 or more loaded tank cars of a Class 3 flammable liquid in a continuous block or a single train carrying 35 or more loaded tank cars of a Class 3 flammable liquid throughout the train consist.

High-hazard flammable unit train (HHFUT) means a single train transporting 70 or more loaded tank cars containing Class 3 flammable liquid.

* * * * *

PART 172—HAZARDOUS MATERIALS TABLE, SPECIAL PROVISIONS, HAZARDOUS MATERIALS COMMUNICATIONS, EMERGENCY RESPONSE INFORMATION, TRAINING REQUIREMENTS, AND SECURITY PLANS

■ 4. The authority citation for part 172 continues to read as follows:

Authority: 49 U.S.C. 5101–5128; 44701; 49 CFR 1.81 and 1.97.

■ 5. In § 172.820:

■ a. In paragraph (a)(2), remove the word ''or'' from the end;

■ b. In paragraph (a)(3), remove the period and add ''; or'' to the end; and

■ c. Add paragraphs (a)(4) and (b)(1)(i) and (ii).

The additions read as follows:

§ 172.820 Additional planning requirements for transportation by rail.

(a) * * *

(4) A high-hazard flammable train (HHFT) as defined in § 171.8 of this subchapter.

(b) * * *

(1) * * *

(i) A rail carrier subject to additional planning requirements of this section based on paragraph (a)(4) of this section, must complete the initial process by March 31, 2016, using data for the six month period from July 1, 2015 to December 31, 2015; or

(ii) A rail carrier subject to additional planning requirements of this section based on paragraph (a)(4) of this section, must complete the initial process by March 31, 2016, using data for all of 2015, provided the rail carrier indicates in their initial analysis that it has chosen this option.

* * * * *

PART 173—SHIPPERS—GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS

■ 6. The authority citation for part 173 continues to read as follows:

Authority: 49 U.S.C. 5101–5128, 44701; 49 CFR 1.81 and 1.97.

■ 7. Section 173.41 is added to subpart B to read as follows:

§ 173.41 Sampling and testing program for unrefined petroleum-based products.

(a) *General.* Unrefined petroleum-based products offered for

transportation must be properly classed and described as prescribed in § 173.22, in accordance with a sampling and testing program, which specifies at a minimum:

(1) A frequency of sampling and testing that accounts for any appreciable variability of the material (*e.g.,* history, temperature, method of extraction [including chemical use], location of extraction, time of year, length of time between shipments);

(2) Sampling prior to the initial offering of the material for transportation and when changes that may affect the properties of the material occur (*i.e.,* mixing of the material from multiple sources, or further processing and then subsequent transportation);

(3) Sampling methods that ensure a representative sample of the entire mixture, as offered, is collected;

(4) Testing methods that enable classification of the material under the HMR;

(5) Quality control measures for sample frequencies;

(6) Duplicate sampling methods or equivalent measures for quality assurance;

(7) Criteria for modifying the sampling and testing program; and

(8) Testing or other appropriate methods used to identify properties of the mixture relevant to packaging requirements (*e.g.,* compatibility with packaging, identifying specific gravity for filling packages).

(b) *Certification.* Each person who offers a hazardous material for transportation shall certify, as prescribed by § 172.204 of this subchapter, that the material is offered for transportation in accordance with this subchapter, including the requirements prescribed by paragraph (a) of this section.

(c) *Documentation, retention, review, and dissemination of program.* The sampling and testing program must be documented in writing (*i.e.* hardcopy or electronic file thereof) and must be retained for as long as the sampling and testing program remains in effect, or a minimum of one year. The sampling and testing program must be reviewed at least annually and revised and/or updated as necessary to reflect changed circumstances. The most recent version of the sampling and testing program must be available to the employees who are responsible for implementing it. When the sampling and testing program is updated or revised, all employees responsible for implementing it must be notified, and the most recent version must be made available.

(d) *Access by DOT to program documentation.* Each person required to develop and implement a sampling and testing program must maintain a copy of the sampling and testing program documentation (or an electronic file thereof) that is accessible at, or through, its principal place of business, and must make the documentation available upon request at a reasonable time and location to an authorized official of the Department of Transportation.

■ 8. In § 173.241, paragraph (a) is revised to read as follows:

§ 173.241 Bulk packagings for certain low-hazard liquid and solid materials.

* * * * *

(a) *Rail cars:* Class DOT 103, 104, 105, 109, 111, 112, 114, 115, 117, or 120 tank car tanks; Class 106 or 110 multi-unit tank car tanks; and AAR Class 203W, 206W, and 211W tank car tanks. Additional operational requirements apply to high-hazard flammable trains (see § 171.8 of this subchapter) as prescribed in § 174.310 of this subchapter. Except as otherwise provided in this section, DOT Specification 111 tank cars and DOT Specification 111 tank cars built to the CPC–1232 industry standard are no longer authorized to transport Class 3 (flammable liquids) in Packing Group III, for use in high-hazard flammable train service, unless retrofitted to the DOT Specification 117R retrofit standards or the DOT Specification 117P performance standards provided in part 179, subpart D of this subchapter.

(1) DOT Specification 111 tank cars and DOT Specification 111 tank cars built to the CPC–1232 industry standard are no longer authorized for use in high-hazard flammable train service unless retrofitted prior to the dates in the following table:

Packing group	DOT 111 not authorized on or after	DOT 111 built to the CPC–1232 not authorized on or after
III	May 1, 2025	May 1, 2025.

(2) Conforming retrofitted tank cars are to be marked ''DOT–117R.''

(3) Conforming performance standard tank cars are to be marked ''DOT–117P.''

* * * * *

■ 9. In § 173.242, paragraph (a) is revised to read as follows:

§ 173.242 Bulk packagings for certain medium hazard liquids and solids, including solids with dual hazards.

* * * * *

(a) *Rail cars:* Class DOT 103, 104, 105, 109, 111, 111, 112, 114, 115, 117, or 120 tank car tanks; Class 106 or 110 multi-unit tank car tanks and AAR Class 206W tank car tanks. Additional operational requirements apply to high-hazard flammable trains (see § 171.8 of this subchapter) as prescribed in § 174.310 of this subchapter. Except as otherwise provided in this section, DOT Specification 111 tank cars and DOT Specification 111 tank cars built to the CPC–1232 industry standard are no longer authorized to transport Class 3 (flammable liquids) in Packing Group II and III, for use in high-hazard flammable train service, unless retrofitted to the DOT Specification 117R retrofit standards, or the DOT Specification 117P performance standards provided in part 179, subpart D of this subchapter.

(1) DOT Specification 111 tank cars and DOT Specification 111 tank cars built to the CPC–1232 industry standard are no longer authorized for use in high-hazard flammable train service unless retrofitted prior to the dates in the following table:

Packing group	DOT 111 not authorized on or after	DOT 111 built to the CPC–1232 industry standard not authorized on or after
II	May 1, 2023 (jacketed and non-jacketed)	July, 1 2023 (non-jacketed). May 1, 2025 (jacketed).
III	May 1, 2025	May 1, 2025.

(2) Conforming retrofitted tank cars are to be marked ''DOT–117R.''

(3) Conforming performance standard tank cars are to be marked ''DOT–117P.''

* * * * *

■ 10. In § 173.243, paragraph (a) is revised to read as follows:

§ 173.243 Bulk packaging for certain high-hazard liquids and dual-hazard materials that pose a moderate hazard.

* * * * *

(a) *Rail cars:* Class DOT 103, 104, 105, 109, 111, 112, 114, 115, 117, or 120 fusion-welded tank car tanks; and Class 106 or 110 multi-unit tank car tanks. Additional operational requirements apply to high-hazard flammable trains (see § 171.8 of this subchapter) as prescribed in § 174.310 of this subchapter. Except as otherwise provided in this section, DOT Specification 111 tank cars and DOT Specification 111 tank cars built to the CPC–1232 industry standard are no longer authorized to transport Class 3 (flammable liquids) in Packing Group I, for use in high-hazard flammable train service, unless retrofitted to the DOT Specification 117R retrofit standards or the DOT Specification 117P performance standards provided in part 179, subpart D of this subchapter.

(1) DOT Specification 111 tank cars and DOT Specification 111 tank cars built to the CPC–1232 industry standard are no longer authorized for use in high-hazard flammable train service unless retrofitted prior to the dates in the following table:

Packing group	DOT 111 not authorized on or after	DOT 111 built to the CPC–1232 industry standard not authorized on or after
I	January 1, 2017 (non-jacketed report trigger) January 1, 2018 (non-jacketed) March 1, 2018 (jacketed).	April 1, 2020 (non-jacketed). May 1, 2025 (jacketed).

(2) Conforming retrofitted tank cars are to be marked ''DOT–117R.''

(3) Conforming performance standard tank cars are to be marked ''DOT–117P.''

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PART 174—CARRIAGE BY RAIL

■ 11. The authority citation for part 174 continues to read as follows:

Authority: 49 U.S.C. 5101–5128; 49 CFR 1.81 and 1.97.

■ 12. Section 174.310 is added to subpart G to read as follows:

§ 174.310 Requirements for the operation of high-hazard flammable trains.

(a) *Applicability.* Each rail carrier operating a high-hazard flammable train (as defined in § 171.8 of this subchapter) must comply with each of the following additional safety requirements with respect to each high-hazard flammable train that it operates:

(1) *Routing.* The additional planning requirements for transportation by rail in accordance with part 172, subpart I of this subchapter;

(2) *Speed restrictions.* All trains are limited to a maximum speed of 50 mph. The train is further limited to a maximum speed of 40 mph while that train travels within the limits of high-threat urban areas (HTUAs) as defined in § 1580.3 of this title, unless all tank cars containing a Class 3 flammable liquid meet or exceed the DOT Specification 117 standards, the DOT Specification 117P performance standards, or the DOT Specification 117R retrofit standards provided in part 179, subpart D of this subchapter.

(3) *Braking.* (i) Each rail carrier operating a high-hazard flammable train (as defined in § 171.8 of this subchapter) operating at a speed in excess of 30 mph must ensure the train is equipped and operated with either a two-way end-of-train (EOT) device, as defined in 49 CFR 232.5, or a distributed power (DP) system, as defined in 49 CFR 229.5.

(ii) By January 1, 2021, each rail carrier operating a high-hazard flammable unit train (HHFUT) comprised of at least one tank car loaded with a Packing Group I material, at a speed exceeding 30 mph must ensure the train is equipped with ECP brakes that meet the requirements of 49 CFR part 232, subpart G, except for buffer cars, and must be operated in ECP brake mode as established in 49 CFR part 232, subpart G.

(iii) By May 1, 2023, each rail carrier operating a high-hazard flammable unit train (HHFUT) not described in paragraph (a)(3)(ii) of this section, at a speed exceeding 30 mph must ensure the train is equipped with ECP brakes that meet the requirements of 49 CFR part 232, subpart G, except for buffer cars, and must be operated in ECP brake mode as established in 49 CFR part 232, subpart G.

(iv) Each buffer car in an high-hazard flammable unit train that is not equipped with ECP brakes will be counted in determining the percentage of cars with effective and operative brakes during the operation of the train, as required under 49 CFR 232.609.

(v) Alternate brake systems may be submitted for approval through the processes and procedures outlined in 49 CFR part 232, subpart F.

(4) *New tank cars.* After October 1, 2015, tank cars manufactured for use in a HHFT must meet:

(i) DOT Specification 117, or 117P performance standard in part 179, subpart D of this subchapter; or

(ii) An authorized tank specification as specified in part 173, subpart F of this subchapter.

(5) *Retrofit reporting* Owners of non-jacketed DOT–111 tank cars in PG I service in an HHFT, who are unable to meet the January 1, 2017, retrofit deadline specified in § 173.243 (a)(1) are required to submit a report by March 1, 2017, to Department of Transportation. A group representing owners may submit a consolidated report to the Department of Transportation in lieu of individual reports from each tank car owner. The report must include the following information regarding the retrofitting progress:

(i) The total number of tank cars retrofitted to meet the DOT–117R specification;

(ii) The total number of tank cars built or retrofitted to meet the DOT–117P specification;

(iii) The total number of DOT–111 tank cars (including those built to CPC–1232 industry standard) that have not been modified;

(iv) The total number of tank cars built to meet the DOT–117 specification; and

(v) The total number of tank cars built or retrofitted to a DOT–117, 117R or 117P specification that are ECP brake ready or ECP brake equipped.

(vi) Entities required to submit a report under this paragraph shall submit subsequent follow-up reports containing the information identified in this paragraph within 60 days of being notified by PHMSA and FRA.

(b) [Reserved]

PART 179—SPECIFICATIONS FOR TANK CARS

■ 13. The authority citation for part 179 continues to read as follows:

Authority: 49 U.S.C. 5101–5128; 49 CFR 1.81 and 1.97.

Subpart D–Specifications for Non-Pressure Tank Car Tanks (Classes DOT–111AW, 115AW, and 117AW)

■ 14. The heading for subpart D is revised to read as set forth above.

■ 15. The heading for § 179.200 is revised to read as follows:

§ 179.200 General specifications applicable to non-pressure tank car tanks (Class DOT–111, DOT–117).

* * * * *

■ 16. The heading for § 179.200–1 is revised to read as follows:

§ 179.200–1 Tank built under these specifications must meet the applicable requirements in this part.

* * * * *

■ 17. Sections 179.202 and 179.202–1 are added to read as follows:

§ 179.202 Individual specification requirements applicable to DOT–117 tank car tanks.

§ 179.202–1 Applicability.

Each tank built under these specifications must conform to the general requirements of § 179.200 and the prescriptive standards in §§ 179.202–1 through 179.202–11, or the performance standard requirements of § 179.202–12.

■ 18. Sections 179.202–3 through § 179.202–13 are added to read as follows:

§ 179.202–3 Approval to operate at 286,000 gross rail load (GRL).

A tank car may be loaded to a gross weight on rail of up to 286,000 pounds (129,727 kg) upon approval by the Associate Administrator for Safety, Federal Railroad Administration (FRA). See § 179.13.

§ 179.202–4 Thickness of plates.

The wall thickness after the forming of the tank shell and heads must be, at a minimum, 9/16 of an inch AAR TC–128 Grade B, normalized steel, in accordance with § 179.200–7(b).

§ 179.202–5 Tank head puncture resistance system.

The DOT–117 specification tank car must have a tank head puncture resistance system in conformance with § 179.16(c). The full height head shields must have a minimum thickness of ½ inch.

§ 179.202–6 Thermal protection system.

The DOT–117 specification tank car must have a thermal protection system. The thermal protection system must conform to § 179.18 and include a reclosing pressure relief device in accordance with § 173.31 of this subchapter.

§ 179.202–7 Jackets.

The entire thermal protection system must be covered with a metal jacket of a thickness not less than 11 gauge A1011 steel or equivalent; and flashed around all openings so as to be weather tight. A protective coating must be applied to the exterior surface of a carbon steel tank and the inside surface of a carbon steel jacket.

§ 179.202–8 Bottom outlets.

If the tank car is equipped with a bottom outlet, the handle must be removed prior to train movement or be designed with protection safety system(s) to prevent unintended actuation during train accident scenarios.

§ 179.202–9 Top fittings protection.

The tank car tank must be equipped with top fittings protection conforming to AAR Specifications for Tank Cars, appendix E paragraph 10.2.1 (IBR, see § 171.7 of this subchapter).

§ 179.102–10 ECP brakes.

(a) By January 1, 2021, each rail carrier operating a high-hazard flammable unit train as defined in § 171.8, comprised of at least one tank car loaded with a Packing Group I material must ensure the train meets the ECP braking capability requirements as prescribed in § 174.310 of this subchapter.

(b) By May 1, 2023, each rail carrier operating a high-hazard flammable unit train as defined in § 171.8, not described in paragraph (a) of this section must ensure the train meets the ECP braking capability requirements as prescribed in § 174.310 of this subchapter.

(c) Alternate brake systems may be submitted for approval through the processes and procedures outlined in 49 CFR part 232, subpart F.

§ 179.202–11 Individual specification requirements.

In addition to § 179.200, the individual specification requirements are as follows:

DOT specification	Insulation	Bursting pressure (psig)	Minimum plate thickness (Inches)	Test pressure (psig)	Bottom outlet
117A100W	Optional	500	9/16	100	Optional.

§ 179.202–12 Performance standard requirements.

(a) *Approval.* Design, testing, and modeling results must be reviewed and approved by the Associate Administrator for Railroad Safety/Chief Safety Officer, Federal Railroad Administration (FRA), 1200 New Jersey Ave. SE., Washington, DC 20590.

(b) *Approval to operate at 286,000 gross rail load (GRL).* In addition to the requirements of paragraph (a) of this section, a tank car may be loaded to a gross weight on rail of up to 286,000 pounds (129,727 kg) upon approval by the Associate Administrator for Safety, Federal Railroad Administration (FRA). See § 179.13.

(c) *Puncture resistance.* (1) Minimum side impact speed: 12 mph when impacted at the longitudinal and vertical center of the shell by a rigid 12-inch by 12-inch indenter with a weight of 286,000 pounds.

(2) Minimum head impact speed: 18 mph when impacted at the center of the head by a rigid 12-inch by 12-inch indenter with a weight of 286,000 pounds.

(d) *Thermal protection systems.* The tank car must be equipped with a thermal protection system. The thermal protection system must be equivalent to the performance standard prescribed in § 179.18 and include a reclosing pressure relief device in accordance with § 173.31 of this subchapter.

(e) *Bottom outlet.* If the tank car is equipped with a bottom outlet, the handle must be removed prior to train movement or be designed with protection safety system(s) to prevent unintended actuation during train accident scenarios.

(f) *Top fittings protection.* The tank car tank must be equipped with top fittings protection conforming to AAR Specifications for Tank Cars, appendix E paragraph 10.2.1 (IBR, see § 171.7 of this subchapter).

(g) *ECP brakes.* (1) By January 1, 2021, each rail carrier operating a high-hazard flammable unit train as defined in § 171.8, comprised of at least one tank car loaded with a Packing Group I material must ensure the train meets the ECP braking capability requirements as prescribed in § 174.310 of this subchapter.

(2) By May 1, 2023, each rail carrier operating a high-hazard flammable unit train as defined in § 171.8, not described in paragraph (g)(1) of this section must ensure the train meets the ECP braking capability requirements as prescribed in § 174.310 of this subchapter.

(3) Alternate brake systems may be submitted for approval through the processes and procedures outlined in 49 CFR part 232, subpart F.

§ 179.202–13 Retrofit standard requirements (DOT–117R).

(a) *Applicability.* Each tank retrofit under these specifications must conform to the general requirements of § 179.200 and the prescriptive standards in § 179.202–13, or the performance standard requirements of § 179.202–12.

(b) *Approval to operate at 286,000 gross rail load (GRL).* A tank car may be loaded to a gross weight on rail of up to 286,000 pounds (129,727 kg) upon approval by the Associate Administrator for Safety, Federal Railroad Administration (FRA). See § 179.13.

(c) *Thickness of plates.* The wall thickness after forming of the tank shell and heads must be, at a minimum, 7/16 of an inch, and constructed with steel authorized by the HMR at the time of construction.

(d) *Tank head puncture resistance system.* The DOT–117R specification tank car must have a tank head puncture resistance system in conformance with § 179.16(c). The full height head shields must have a minimum thickness of ½ inch.

(e) *Thermal protection system.* The DOT–117R specification tank car must have a thermal protection system. The thermal protection system must conform to § 179.18 and include a reclosing pressure relief device in accordance with § 173.31 of this subchapter.

(f) *Jackets.* The entire thermal protection system must be covered with a metal jacket of a thickness not less than 11 gauge A1011 steel or equivalent; and flashed around all openings so as to be weather tight. The exterior surface of a carbon steel tank and the inside surface of a carbon steel jacket must be given a protective coating.

(g) *Bottom outlets.* If the tank car is equipped with a bottom outlet, the handle must be removed prior to train movement or be designed with protection safety system(s) to prevent unintended actuation during train accident scenarios.

(h) *Top fittings protection.* Existing tank car tanks may continue to rely on the equipment installed at the time of manufacture.

(i) *ECP brakes.* (1) By January 1, 2021, each rail carrier operating a high-hazard flammable unit train as defined in § 171.8, comprised of at least one tank car loaded with a Packing Group I material must ensure the train meets the ECP braking capability requirements as prescribed in § 174.310 of this subchapter.

(2) By May 1, 2023, each rail carrier operating a high-hazard flammable unit train as defined in § 171.8, not described in paragraph (i)(1) of this section must ensure the train meets the ECP braking capability requirements as prescribed in § 174.310 of this subchapter.

(3) Alternate brake systems may be submitted for approval through the processes and procedures outlined in 49 CFR part 232, subpart F.

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Anthony R. Foxx,

Secretary of Transportation.

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