DEPARTMENT OF TRANSPORTATION

Pipeline and Hazardous Materials Safety Administration

49 CFR Parts 172, 173, 174, 179, and 180

[Docket No. PHMSA–2018–0025 (HM–264)]

RIN 2137–AF40

Hazardous Materials: Liquefied Natural Gas by Rail

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

ACTION: Final rule.

SUMMARY: PHMSA, in coordination with the Federal Railroad Administration (FRA), is amending the Hazardous Materials Regulations (HMR) to allow for the bulk transport of ''Methane, refrigerated liquid,'' commonly known as liquefied natural gas (LNG), in rail tank cars. This rulemaking authorizes the transportation of LNG by rail in DOT–113C120W specification rail tank cars with enhanced outer tank requirements, subject to all applicable requirements and certain additional operational controls. The enhancements to the outer tank are indicated by the new specification suffix ''9'' (DOT–113C120W9).

DATES:

Effective date: This rule is effective August 24, 2020.

Voluntary compliance date: Voluntary compliance is authorized July 24, 2020.

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SUPPLEMENTARY INFORMATION:

Abbreviations and Terms

AAR Association of American Railroads
APA Administrative Procedure Act
ASNT American Society of Non-destructive Testing
ASTM American Society of Testing and Materials
AWS American Welding Society
BLET Brotherhood of Locomotive Engineers and Trainmen
BLEVE Boiling Liquid Expanding Vapor Explosion
BNSF Burlington Northern Santa Fe
CEQ Council on Environmental Quality
CFR Code of Federal Regulations
CPUC California Public Utilities Commission
CTMV Cargo Tank Motor Vehicle
DOT Department of Transportation
DOT–SP Department of Transportation Special Permit
DP Distributed Power
EA Environmental Assessment
ECP Electronically Controlled Pneumatic
EIS Environmental Impact Statement
E.O. Executive Order
EOT End of Train
ERG Emergency Response Guidebook
ETS Energy Transport Solutions, LLC
FEMA Federal Emergency Management Agency
FRA Federal Railroad Administration
FRSA Federal Railroad Safety Act
GHG Greenhouse Gas
GRL Gross Rail Load
HHFT High-Hazard Flammable Train
HLRW High Level Radioactive Waste
HMEP Hazardous Materials Emergency Preparedness
HMT Hazardous Materials Table
HMTA Hazardous Materials Transportation Act
HMR Hazardous Materials Regulations
IAFC International Association of Fire Chiefs
IAFF International Association of Fire Fighters
IBR Incorporation by Reference
IFR Interim Final Rule
LNG Liquefied Natural Gas
LPG Liquefied Petroleum Gas
MLI Multi-Layer Insulation
NASFM National Association of State Fire Marshals
NEPA National Environmental Policy Act
NFPA National Fire Protection Association
NGO Non-Governmental Organization
NJDEP New Jersey Department of Environmental Protection
NPRM Notice of Proposed Rulemaking
NTSB National Transportation Safety Board
NYDEC New York State Department of Environmental Conservation
NYDHSES New York State Division of Homeland Security and Emergency Services
NYDOT New York State Department of Transportation
OIRA Office of Information and Regulatory Affairs
OMB Office of Management and Budget
PHMSA Pipeline and Hazardous Materials Safety Administration
PRD Pressure Relief Device
PRV Pressure Relief Valve
PSR Physicians for Social Responsibility
RSI Railway Supply Institute
RFA Regulatory Flexibility Act
RIA Regulatory Impact Analysis
RIN Regulatory Identifier Number
RSI–CTC Railway Supply Institute Committee on Tank Cars
SNF Spent Nuclear Fuel
SI Super Insulation
TTD Transportation Trades Department, AFL–CIO
The Center The Center for Biological Diversity
TC Transport Canada
TDG Transportation of Dangerous Goods
UMRA Unfunded Mandates Reform Act
UN United Nations
U.S.C. United States Code
VCE Vapor Cloud Explosion

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I. Overview

In this final rule, PHMSA is authorizing the transportation of LNG by rail tank car, pursuant to Federal Hazardous Materials Transportation law (Federal hazmat law; 49 U.S.C. 5101 *et seq.*), because we have determined that bulk rail transport is a safe alternative for this energy product. The final rule authorizes the transportation of LNG by rail in DOT–113 tank cars, which have an established track record of safety in transporting other cryogenic flammable materials. The DOT–113 tank car authorized for LNG service will be enhanced with an outer tank that is thicker and made of steel with a greater puncture resistance to provide an added measure of safety and crashworthiness. Additionally, there will be operational controls in the form of enhanced braking requirements, remote monitoring, and route analysis, which are intended to exceed current safety requirements for other flammable cryogenic materials.

PHMSA's mission is to protect people and the environment by advancing the safe transportation of energy products and other hazardous materials that are essential to our daily lives. To do this, the agency establishes national policy, sets and enforces standards, conducts research to prevent incidents, and prepares the public and first responders to reduce consequences if an incident does occur. PHMSA and FRA share responsibility for regulating the transportation of hazardous materials by rail and take a system-wide, comprehensive approach that focuses on prevention, mitigation, and response to manage and reduce the risk posed to people and the environment. In line with PHMSA's mission and shared responsibility with FRA for oversight of the rail transport of hazardous materials, PHMSA is issuing this final rule to authorize the transportation of LNG by rail in DOT–113C120W specification rail tank cars with enhanced outer tank material and thickness (those enhancements to be indicated by the specification suffix ''9''), subject to operational controls for braking, monitoring, and route analysis.

This authorization conforms to the intent and purpose of the HMR (49 CFR parts 171–180), which are designed to ensure the safe transportation of all hazardous materials packagings (including tank cars). Collectively, the HMR combine packaging design and maintenance, operational controls, package handling, employee training, hazard communication, emergency response information, and security plan requirements to safeguard transportation. These measures help ensure that hazardous contents safely remain within a package during the course of transportation while also providing for public awareness and appropriate response mechanisms. Supplemental to the HMR, PHMSA oversees a Hazardous Materials Emergency Preparedness (HMEP) grant program that provides funding to the emergency response community for training and planning purposes, furthering appropriate response efforts.

The United States leverages domestic technology improvements to transform American life through increased natural gas production and energy independence. As a result, the United States is today the world's largest natural gas producer through economical production from shale and other unconventional formations.[1] Transportation of natural gas, however, can be constrained by the capacity of existing transportation infrastructure, which negatively affects regions with insufficient access to pipelines or ports. This constraint on capacity, coupled with increased natural gas production in the United States, has resulted in the consideration of using rail transport to help efficiently deliver natural gas to domestic U.S. and international markets.

Authorizing the use of proven DOT–113C120W-specification tank cars to transport LNG will allow the rail industry to play a role in the safe, efficient transport of this important energy product for the 21st century. LNG—referred to as ''Methane, refrigerated liquid'' [2] within the HMR—has been transported safely by trucks on highways and by marine vessels for over 40 years in the United States, and over 50 years internationally. However, the HMR did not authorize the bulk transport of LNG in rail tank cars prior to this rulemaking action, instead permitting rail transport of LNG only on an *ad hoc* basis as authorized by the conditions of a PHMSA special permit (49 CFR 107.105) or in a portable tank secured to a rail car pursuant to the conditions of an FRA approval. The recent expansion in U.S. natural gas production has increased interest in a programmatic approach to using appropriately the nation's rail infrastructure to facilitate efficient transportation of LNG. In response to that interest, PHMSA, in coordination with the FRA, issues this final rule to amend the HMR to permit the bulk transport of LNG in DOT–113C120W specification rail tank cars with enhanced outer tank requirements (those enhancements to be indicated by the specification suffix ''9''), subject to operational controls for braking, monitoring, and routing.

In addition, this final rule satisfies the directive in Executive Order (E.O.) 13868 [84 FR 15495, April 19, 2019] to propose, consistent with applicable law, regulations that ''treat LNG the same as other cryogenic liquids and permit LNG to be transported in approved rail tank cars.'' [3] E.O. 13868 recognizes the leading role that the United States plays in producing natural gas, the importance of improving the United States' capacity to supply natural gas, including LNG, to domestic and international markets, and the need to continue to transport this energy product in a safe and efficient manner. In issuing this final rule, PHMSA furthers the purposes and policies set forth in E.O. 13868 by enabling an additional safe, reliable, and efficient transportation alternative for bringing domestically produced natural gas to existing, and potentially new, markets.

The present action is based on a longstanding understanding of the properties of LNG and an evidence-based approach to the safety of the DOT–113 tank cars designed and used to transport flammable cryogenic materials. At the same time, in promulgating this final rule, and as it does with other hazardous materials, PHMSA recognizes that there is ongoing and potential future research related to the transportation of LNG by all modes. The Agency will continue to use this research to inform potential future regulatory activity, as appropriate.

In the following table, PHMSA provides an overview of: (1) The requirements for LNG transportation in tank cars pursuant to DOT Special Permit 20534 (DOT–SP 20534),[4] issued to Energy Transport Solutions, LLC (ETS) during the Notice of Proposed Rulemaking (NPRM) [5] comment period to authorize ETS's rail transportation of LNG along specific routes; (2) the requirements proposed in the October 24, 2019 NPRM; and (3) the requirements adopted in this final rule. Requirements related to the thermal performance of the DOT–113C120W tank car are unchanged from the NPRM (75 psig maximum start to discharge pressure; maximum pressure when offered; and design service temperature). But this final rule, after consideration of comments received in the docket and to provide additional operational controls and crashworthiness for LNG tank cars, adopts supplemental requirements to those initially proposed in the NPRM: Remote monitoring of pressure and location for LNG tank cars in

[1] CRS, ''An Overview of Unconventional Oil and Natural Gas: Resources and Federal Actions,'' 7–5700, Summary, (2015).

[2] Use of this description in quotes and with methane capitalized reflects the proper shipping name as listed in the § 172.101 Hazardous Materials Table.

[3] PHMSA notes that it first announced in the ''Spring 2018 Unified Agenda of Federal Regulatory and Deregulatory Actions'' [83 FR 27085] that it had initiated a ''pre-rule'' action on LNG by Rail, and subsequently announced that it would proceed with an NPRM in the ''Fall 2018 Regulatory Plan and the Unified Agenda of Federal Regulatory and Deregulatory Actions'' [83 FR 57803]. While these actions notified the public of PHMSA's intention to develop propose a regulatory framework for the safe rail transportation of LNG, PHMSA had not published a proposed rulemaking by the time the President issued E.O. 13868 on April 10, 2018.

[4] *https://www.regulations.gov/document?D=PHMSA-2019-0100-3006.*

[5] *Hazardous Materials: Liquefied Natural Gas by Rail NPRM* [84 FR 56964].

transportation; two-way end-of-train (EOT) or distributed power (DP) system for trains transporting 20 or more loaded tank cars of LNG in a continuous block, or 35 or more loaded tank cars of LNG throughout the train; and a requirement that railroads comply with § 172.820 route planning requirements. In addition, to account properly for the properties of LNG, this final rule raises the maximal filling density limit to 37.3% from the proposed 32.5%. Finally, in this final rule PHMSA is also adopting enhanced outer tank requirements compared with the requirements that apply to other DOT–113C120W-specification tank cars, including a thicker 9/16th inch outer tank made from high quality TC–128B normalized steel. Compliance with these enhanced outer tank requirements will be indicated by the new specification suffix ''9'' (DOT–113C120W9).

TABLE 1—SUMMARY OF DOT–SP 20534, NPRM PROPOSALS, AND FINAL RULE COMPONENTS

LNG requirements			
Topics	DOT special permit 20534	NPRM	Final rule
Approval of LNG	Permitted between Wyalusing, PA and Gibbstown, NJ, with no intermediate stops.	Permitted Nationwide	Permitted Nationwide.
Remote Monitoring	Required as a condition of the DOT–SP.	Not Required	Required as a Special Provision for LNG.
Maximum Start to Discharge Pressure.	Not Specified	75 psig	75 psig.
Maximum Pressure when Offered for Transportation.	15 psig	15 psig	15 psig.
Design Service Temperature	Not Specified	Minus 260 °F	Minus 260 °F.
Maximum Permitted Filling Density (percent by weight).	32.5%	32.5%	37.3%.
When is a two-way end-of-train (EOT) or a distributed power (DP) system required.	Required when a train is transporting 20 or more tank cars authorized under this special permit.	Not Proposed	Required when a train is transporting 20 or more loaded tank cars of LNG in a continuous block or 35 or more loaded tank cars of LNG throughout the train.
Route Controls	Authorized only on one route	Not Proposed	Must comply with 172.820.
Minimum Wall Thickness of the Outer Tank Shell and the Outer Tank Heads.	Shell: 7⁄16″ Tank Head: 1⁄2″	Shell: 7⁄16″ Tank Head: 1⁄2″	Shell and Tank Head: Enhanced 9⁄16″.
Required Outer Tank Steel Type(s)	As specified in AAR Specifications for Tank Cars, Appendix M.	As specified in AAR Specifications for Tank Cars, Appendix M.	AAR TC 128, Grade B normalized steel plate.

II. NPRM and Background

PHMSA on October 24, 2019, in consultation with the FRA, published the NPRM proposing to authorize the transport of LNG by rail. PHMSA issued the NPRM in response to a petition for rulemaking (P–1697) [6] from the Association of American Railroads (AAR) and a review of existing regulations.

The NPRM proposed a framework for transporting LNG by rail safely by designating an authorized packaging, and by determining how the packaging would be filled safely. PHMSA chose the DOT–113C120W specification tank car packaging designed for flammable cryogenic material. This packaging has been transporting similar flammable cryogenic materials for decades with no fatalities or serious injuries. As for the filling/loading controls, PHMSA proposed a maximum start-to-discharge pressure of 75 psig, a maximum permitted filling density of 32.5 percent by weight, a maximum pressure when offered for transportation of 15 psig, and a design service temperature of minus 260 degrees Fahrenheit. The maximum offering pressure of 15 psig proposed in the NPRM is consistent with the 20-day transportation requirement for cryogenic materials and the allowable average daily pressure rise of 3 psig per day during transportation.

In the NPRM, PHMSA also proposed operational controls consistent with the existing requirements of the HMR, and invited comment on whether existing regulations and the operational controls in AAR's Circular OT–55 entitled ''*Recommended Railroad Operating Practices For Transportation of Hazardous Materials*'' [7] are sufficient. The NPRM also sought comment on the potential need for additional operating controls. Beyond the operational controls already included for other flammable cryogenic materials transported by rail, PHMSA specifically referenced train length and composition, speed restrictions, braking requirements, and routing requirements as potential areas of interest to provide for enhanced operational control requirements. PHMSA also encouraged commenters to provide data on the safety or economic impacts associated with any additional operational controls, including analysis of the safety justification or cost impact of their implementation.

PHMSA also received a request from the Offices of the Attorneys General of New York and Maryland to extend the 60-day comment period for the NPRM an additional 30 days. PHMSA issued a notice [8] on December 23, 2019, extending the comment period until January 13, 2020.

[6] PHMSA–2017–0020–0002.

[7] The freight rail industry developed the first edition of OT–55, which details railroad operating practices for hazardous materials, in the late 1980s, as part of an inter-industry hazardous materials rail safety task force that also included the Chemical Manufacturers Association (now the American Chemistry Council) and the Railway Progress Institute (now the Railway Supply Institute).

[8] *Hazardous Materials: Liquefied Natural Gas by Rail; Extension of Comment Period* [84 FR 70491], *https://www.federalregister.gov/documents/2019/12/23/2019-27656/hazardous-materials-liquefied-natural-gas-by-rail-extension-of-comment-period.*

A. Petition for Rulemaking (P–1697)

1. AAR's Petition for Rulemaking and the NPRM

On January 17, 2017, AAR submitted a petition for rulemaking to PHMSA, entitled ''Petition for Rulemaking to Allow Methane, Refrigerated Liquid to be Transported in Rail Tank Cars'' (P–1697), requesting revisions to the Hazardous Materials Table (HMT; § 172.101) and § 173.319 of the HMR that would permit the transportation of LNG by rail in DOT–113 tank cars. The Administrative Procedure Act (APA), 5 U.S.C. 551, *et seq.* requires Federal agencies to give interested persons the right to petition an agency to issue, amend, or repeal a rule. 5 U.S.C. 553(e). PHMSA's rulemaking procedures at § 106.95 allow interested persons to ask PHMSA to add, amend, or repeal a regulation by filing a petition for rulemaking along with information and arguments supporting the requested action. In May 2018, PHMSA accepted P–1697 in accordance with § 106.105 by notifying AAR that the request merited consideration in a future rulemaking.[9]

In its petition, AAR proposed that PHMSA amend the entry for ''United Nations (UN) 1972, Methane, refrigerated liquid'' in the HMT to add a reference to § 173.319 in Column (8C) authorizing transport in rail tank cars. Additionally, AAR proposed that PHMSA amend § 173.319 to include specific requirements for DOT–113 tank cars used for the transportation of LNG, and suggest that the authorized tank car specifications be DOT–113C120W and DOT–113C140W.[10] AAR further proposed amending § 173.319(d)(2) to include maximum filling densities comparable to those specified for cargo tanks containing LNG in § 173.318(f)(3). AAR argued that ''LNG should be authorized for rail transportation because it is a safe method of transporting this commodity, LNG shippers have indicated a desire to use rail to transport it, and because railroads potentially will need to transport LNG for their own use as a locomotive fuel.'' With respect to shipper demand, AAR contended the following:

The only way to transport LNG is by obtaining special approval from PHMSA for rail transport, or by transporting it via highway; and that notwithstanding the requirement for a special approval, customers have expressed interest in shipping LNG by rail from Pennsylvania to New England, and between the U.S. and Mexico. Authorizing transportation of LNG by rail likely would stimulate more interest. In addition, several railroads are actively exploring LNG as a locomotive fuel. If railroads are to use LNG-powered locomotives, they would need to supply LNG along their networks. Transporting LNG in tank cars would be an optimal, if not essential, way to transport LNG to those locations.

Furthermore, with respect to rail as a safe method of transportation, AAR noted:

Rail is undeniably safer than over-the-road transportation of LNG, and transport via that mode should be facilitated. The reason the hazardous materials regulations do not currently authorize the transportation of LNG by rail is simply that there was a lack of demand for rail transport of LNG when PHMSA authorized DOT–113 tank cars for the transportation of cryogenic liquids and listed the cryogenic liquids that could be transported in those cars. There was no determination that rail was an unsuitable mode of transporting LNG.

In the NPRM, PHMSA noted that AAR's requested action fits generally into the existing structure of the HMR, which combines packaging design and maintenance, operational controls, package handling, employee training, hazard communication, emergency response information, and security plan requirements to ensure safe transportation of hazardous materials. In the NPRM, PHMSA also requested public comment on the proposals present in AAR's petition, including their potential to reduce regulatory burdens, enhance domestic energy production, and impact safety.

2. The Center for Biological Diversity's Response to P–1697

On May 15, 2017, the Center for Biological Diversity (the Center) submitted a comment to P–1697, recommending that PHMSA deny AAR's petition for rulemaking because of potential environmental impacts of transporting LNG. The Center commented that PHMSA should not proceed in evaluating the petition request until the Agency has conducted a National Environmental Policy Act (NEPA) evaluation, prepared an Environmental Impact Statement (EIS) or Environmental Assessment (EA), and provided opportunity for public review and comment in accordance with Federal hazmat law, as applicable. PHMSA regulations do not require PHMSA to conduct a NEPA evaluation at the time it responds to a petition, and PHMSA has not taken such actions historically as part of its decision whether to accept or deny a petition for rulemaking. As result, PHMSA did not prepare an EA or EIS prior to responding to P–1697. This decision was made with the knowledge that PHMSA would be required to conduct a NEPA analysis as part of a potential rulemaking.

When PHMSA published the NPRM, it prepared a draft EA, *see Section V. J.* ''*Environmental Assessment*'' of the NPRM. A final EA for the rulemaking is included in the rulemaking docket as part of the analysis for the final rule.

B. Regulatory Review

On October 2, 2017, DOT published a notice[11] in the **Federal Register** expressing Department-wide plans to review existing regulations and other agency actions to evaluate their continued necessity, determine whether they are crafted effectively to solve current problems, and evaluate whether they potentially burden the development or use of domestically produced energy resources. As part of this review process, DOT invited the public to provide input on existing rules and other agency actions that have potential for repeal, replacement, suspension, or modification.

The Interested Parties for Hazardous Materials Transportation (Interested Parties) submitted a comment[12] supporting the authorization of LNG for rail tank car transport. Specifically, the Interested Parties noted in its comment that LNG shares similar properties to other flammable cryogenic materials currently authorized by rail tank car and

[9] PHMSA–2017–0020–0005.

[10] The HMR do not authorize the DOT–113C140W specification tank car for hazardous materials transportation. *See* section ''III. A. *Tank Car Specification*'' of the NPRM for further discussion.

[11] *Notification of Regulatory Review,* Docket No. DOT–OST–2017–0069 [82 FR 45750].

[12] Comment from Interested Parties for Hazardous Materials Transportation, Document No. DOT–OST–2017–0069–2591, at: *https://www.regulations.gov/document?D=DOT-OST-2017-0069-2591.* The Interested Parties is a volunteer-run coalition of organizations that share an interest in legislative and regulatory issues related to the safe and secure domestic and international transportation of hazardous materials. Interested Parties members include associations representing hazardous materials shippers, carriers, packaging manufacturers and other related groups, including the Agricultural Retailers Association; American Chemistry Council; American Fuel & Petrochemical Manufacturers; American Trucking Associations; American Pyrotechnics Association; Association of HazMat Shippers; The Chlorine Institute; Compressed Gas Association; Council on the Safe Transportation of Hazardous Articles; Dangerous Goods Advisory Council; The Fertilizer Institute; Gases and Welding Distributors Association; Institute of Makers of Explosives; International Liquid Terminals Association; International Vessel Operators Dangerous Goods Association; Medical Device Battery Transport Council; National Association of Chemical Distributors; National Private Truck Council; National Tank Truck Carriers; Plastics Industry Association; Petroleum Marketers Association of America; Radiopharmaceutical Shippers & Carriers Conference; Railway Supply Institute, Inc.; Reusable Industrial Packaging Association; Sporting Arms Ammunition Manufacturers Institute; The Sulphur Institute; and the Utility Solid Waste Activities Group.

has already been moved in the United States under a special permit. Additionally, they noted that Transport Canada authorizes LNG for transportation by rail in DOT–113-equivalent rail cars and that there is increased commercial demand for rail transport of LNG within the United States and between the United States and Mexico.

After consideration of the issues, PHMSA is acting on the comment from the Interested Parties by amending the HMR to allow for bulk transport of LNG by rail in a DOT–113 specification tank car. Additionally, this action supports the objectives of the Notification of Regulatory Review because it is expected to ''promote [the] clean and safe development of our Nation's vast energy resources, while avoiding regulatory burdens that unnecessarily encumber energy production, constrain economic growth, and prevent job creation.''

C. DOT Special Permit 20534

On August 21, 2017, PHMSA received an application for a special permit from ETS to authorize the transportation in commerce of ''Methane, refrigerated liquid'' in DOT–113C120W tank cars.

Upon completion of its preliminary evaluation of the application, PHMSA published for public comment a Notice of Draft Environmental Assessment for a Special Permit Request for Liquefied Natural Gas by Rail in the **Federal Register** on June 6, 2019.[13] The notice requested comment on potential safety, environmental, and any additional impacts that should be considered as part of the special permit evaluation process. The docket for the draft Environmental Assessment enclosed a draft special permit. The notice was initially published with a 30-day comment period and was extended an additional 30 days after requests from numerous stakeholders, including non-governmental organizations (NGOs) and private individuals. The extended comment period closed on August 7, 2019 and PHMSA received 2,994 comments.

On December 5, 2019, PHMSA granted DOT–SP 20534 to ETS authorizing the transportation of LNG in DOT–113C120W tank cars between Wyalusing, Pennsylvania, and Gibbstown, New Jersey, with no intermediate stops, and subject to certain operational controls. Some of the operational controls required by the special permit had not been proposed in the draft special permit; PHMSA introduced those additional operational controls in response to comments received and additional documentation provided by the applicant, as well as to further reduce risk by supplementing the robust safety regime established by the HMR. Those information requests also were intended to increase PHMSA and FRA's knowledge of ETS's operations to inform later decisions on DOT–SP 20534 and the HMR. Specifically, PHMSA added the following requirements to the special permit:

(1) Each tank car must be operated in accordance with § 173.319 except for the identified maximum permitting filling density, maximum operating pressure, and remote sensing equipment as specified in the special permit;

(2) Shipments are authorized between Wyalusing, Pennsylvania, and Gibbstown, New Jersey, with no intermediate stops.

(3) Within 90 days after issuance, the grantee shall prepare and submit a plan providing per shipment quantities, timelines, and other actions to be taken for moving from single car shipments to multi-car shipments, and subsequently to unit trains (20 or more tank cars).

(4) Trains transporting 20 or more tank cars authorized under this special permit must be equipped and operated with a two-way end of train device as defined in 49 CFR 232.5 or distributed power as defined in 49 CFR 229.5.

(5) Prior to the initial shipment of a tank car under this special permit, the grantee must provide training to emergency response agencies that could be affected between the authorized origin and destination. The training shall conform to NFPA–472, a voluntary consensus standard developed by the National Fire Protection Association (NFPA) establishing minimum competencies for responding to hazardous materials emergencies, including known hazards in emergencies involving the release of LNG, and emergency response methods to address an incident involving a train transporting LNG.

(6) While in transportation, the grantee must remotely monitor each tank car for pressure, location, and leaks.

Following issuance of DOT–SP 20534, PHMSA published a notice[14] in the **Federal Register** that PHMSA had added DOT–SP 20534 and documents supporting the special permit decision—the Special Permit Evaluation Form and Final Environmental Assessment—to the docket for the HM–264 NPRM (Docket No. PHMSA–2018–0025) for consideration by the public because of the overlapping subject matter. PHMSA invited comments on DOT–SP 20534 operational controls to be submitted to the HM–264 rulemaking docket by December 23, 2019.[15] PHMSA noted it would consider any additional comments on the operational controls included in DOT–SP 20534, which was posted to the HM–264 rulemaking docket to aid in determining appropriate operational controls for this final rule. PHMSA encouraged commenters to provide data on the safety or economic impacts associated with operational controls in the special permit, including analysis of the safety benefits and the potential cost-benefit impact of implementing those or other operational controls.

III. Amendments to the HMR Adopted in This Final Rule

In this final rule, PHMSA is authorizing LNG, a well characterized and understood material, for transportation in a specific rail car packaging that has a long, safe record carrying similar cryogenic materials, including flammable materials. Additionally, to provide an additional level of safety and in response to comments, PHMSA is adopting certain supplemental packaging integrity enhancements and operational controls.

A. Existing HMR Requirements for Rail Transport of Flammable Cryogenic Material

Federal hazmat law, 49 U.S.C. 5103, requires PHMSA[16] to designate material or a group or class of material as hazardous when it determines that transporting the material in commerce in a particular amount and form may pose an unreasonable risk to health and safety or property, and to prescribe regulations for the safe transportation of hazardous material in commerce. Transportation includes the movement of that hazardous material and any loading, unloading, or storage incidental to the movement.[17] These statutory provisions are implemented within PHMSA regulations at 49 CFR parts 171 to 180 (*i.e.,* the HMR).

The HMR prescribe a comprehensive suite of requirements for hazardous material classification, hazard communication, emergency response

[13] *Hazardous Materials Safety: Notice of Availability of the Draft Environmental Assessment for a Special Permit Request for Liquefied Natural Gas by Rail* [84 FR 26507].

[14] *Hazardous Materials: Notice of Issuance of Special Permit Regarding Liquefied Natural Gas* [84 FR 67768].

[15] On December 23, 2019, PHMSA extended the comment period to January 13, 2020 [84 FR 70491].

[16] The authority was delegated by the Secretary of Transportation in 49 CFR 1.97.

[17] 49 U.S.C. 5102(13).

information, training, packaging, and material handling. These requirements are designed to prevent the release of hazardous materials in transportation, and in the event of a release, to provide emergency responders and the public with necessary information to protect themselves and mitigate the consequences of the release to the greatest extent possible. The HMR are a proven hazardous material regulatory system well suited to manage the risks of LNG transportation in rail tank cars. The robust requirements already in place in the HMR for packaging, rail car handling, hazard communication and training address many of the safety concerns related to the transportation of LNG by rail. Moreover, PHMSA works closely with other Federal and State partners to enforce the requirements of the HMR.

1. Packaging

Selecting proper packaging for a hazardous material is a critical step in the HMR safety system. Hazardous materials packaging must be chemically and physically compatible with the material contained in the package, also known as the lading. The packaging must be able to withstand all conditions normally encountered during transportation, which include humidity and pressure changes, shocks, and vibrations. The HMR authorize many types of packagings for hazardous materials, ranging in size from 1 milliliter glass sample tubes, to 30,000-gallon railroad tank cars. Different modes of transportation (highway, air, rail, and vessel) and varying volumes of hazardous materials present different challenges, and require a variety of packaging designs to account for different conditions encountered in transportation. Tank cars used for rail transportation must be designed to withstand exposure to weather, in-train forces and switching, vibrations, dynamic forces, and exposure to the lading they transport.

Cryogenic materials pose unique challenges for selecting appropriate transportation packaging. The lading's extreme cold properties render most types of packaging material too brittle to maintain containment during transportation. Therefore, all cryogenic packagings in the HMR are required to be constructed from specific steel alloys with physical properties that enable them to retain their strength and ductility at the lading's extreme low temperatures.

Another challenge that must be considered is ensuring that the lading remains at these cold temperatures during transportation. Temperature maintenance of the lading prevents expansion and overpressure conditions, or possible activation of the transportation vessel's pressure relief device. To help ensure that neither scenario occurs during transportation, all bulk packagings authorized in the HMR for transportation of flammable cryogenic materials (*e.g.,* DOT–113 tank cars, MC–338 cargo tanks, and UN T75 portable tanks) are built as a ''tank-within-a-tank'' design. The inner tank contains the cryogenic material. The space between the inner and outer tanks is evacuated to a high degree of vacuum (absolute pressure less than 75 microns of mercury or 0.0001 atmospheres). The outer surface of the inner tank is wrapped with a high-grade insulation consisting of multiple layers of a thin reflecting material such as an aluminum foil sandwiched between a thin non-conducting paper type material. Alternately, the physical insulation may also be made of fine grained perlite particles filling the void space between the inner and outer tanks. The combined effect of vacuum in the annular space between the inner and outer tanks together with the physical insulation substantially reduces the heat transfer from the atmosphere to the lading, thus effectively maintaining the lading temperature within safe limits during transportation. Furthermore, the outer tank shields the inner tank from physical damage, exposure to the elements, and in-train forces, while providing structural support to the packaging.

Tank car design is a mature field, and the requirements for designing and building a tank car able to withstand the conditions encountered during transportation are codified in part 179 of the HMR. An industry publication, AAR Manual of Standards and Recommended Practices, Section C—III, Specifications for Tank Cars, Specification M–1002 (AAR Specifications for Tank Cars), is incorporated by reference into the HMR. HMR tank specifications and standards are aligned with authoritative design and construction standards found in the ASME Boiler & Pressure Vessel Code (BPVC), Section VIII, Division 1 *Rules for Construction of Pressure Vessels,* and welding requirements found in ASME BPVC Section IX, *Welding and Brazing Qualifications.* The inner and outer tanks are designed to ASME BPVC Section VIII Division 1 using the design margins and loading conditions for pressure vessels. The ASME BPVC Section VIII Division 1 design margin and loading conditions determine the design thickness of both the inner and outer tanks. However, the HMR prescribe minimum thicknesses requirements for both tanks. American Welding Society (AWS) standards are used during manufacturing to ensure that the welding performed has quality control systems and is performed by qualified personnel. The DOT–113 tank car requirements in the HMR incorporate elements of rigorous engineering standards, including the ASME BPVC as well as the AAR Specifications for Tank Cars, M–1002. M–1002 in turn draws on well-established industry standards of the AWS, ASTM, American Society of Non-destructive Testing (ASNT) as well as ASME, for design, materials, fabrication, testing and inspection requirements. The ASME BPVC, Section VIII, Division 1, has become the international benchmark standard for pressure vessel design for a multitude of industries, including transportation. These standards impose criteria for forming, fabricating, inspecting, and testing pressure vessels and their components and for qualifying welders, welding operators, and welding procedures to ensure the soundness of pressure vessels. Starting from these rigorous design principles, the specification requirements in part 179 of the HMR add design requirements to address conditions encountered in transportation and not necessarily applicable to stationary storage. For example, the HMR require the use of specific steels that balance toughness, strength, and weldability with being able to withstand extremely low temperatures.

Like other bulk packagings, cryogenic packagings authorized in the HMR, including DOT–113 tank cars, have requirements for safety relief devices, also referred to as pressure relief devices (PRDs). PRDs are designed to vent the contents of the tank in a controlled manner to prevent the inner tank from suffering a catastrophic failure or explosion due to pressure-increasing events, such as exposure to fire. DOT–113 tank cars have two different PRDs: (1) A pair of reclosing pressure relief valves (PRVs), which operate on a temporary basis to relieve inner tank pressure and bring it back to safe levels; and (2) a pair of non-reclosing safety vents (rupture disk) that open at a pressure higher than the start to discharge pressure of the PRVs and remain open once the disk ruptures. The latter devices are a failsafe in the event the primary PRVs fail to perform as intended.

The HMR explicitly authorize LNG for transportation in UN T75 insulated portable tanks that are loaded onto railroad flat cars and MC–338 cargo tanks, which are both tank-within-a-tank designs. Both bulk packagings have an established safety record for LNG and other flammable cryogenic materials over many years of transportation, demonstrating the high level of safety provided by the tank-within-a-tank design. On May 4, 1963, the Interstate Commerce Commission Safety and Service Board published final rule Order 57 [28 FR 4495], which authorized the transportation of liquefied hydrogen in a DOT–113 tank car. The DOT–113 specification itself was adopted into the HMR on December 1, 1962 in final rule Order 56 [27 FR 11849]. Prior to adoption, the DOT–113 design had been authorized to transport liquefied hydrogen by special permits, documents issued by PHMSA and its predecessor agencies that permit a variance from the requirements of the HMR provided an equivalent level of safety is maintained. PHMSA and its predecessor agencies have used special permits to evaluate new transportation technologies and practices prior to authorizing them for broader use. Liquefied ethylene, a flammable cryogenic material with physical properties (including flammability range and cryogenic state) similar to LNG, has been authorized for transportation in DOT–113C120W tank cars since the publication of final rule HM–115, *Cryogenic Liquids* [48 FR 27674, June 16, 1983]. The DOT–113C120W tank car was authorized by special permit prior to adoption in the HMR.

It is essential to ensure that cryogenic lading remains below a maximum temperature during transportation. The HMR address this currently by requiring tank car owners to ensure the thermal integrity of DOT–113 packages through measurement of thermal performance throughout the life of the tank. Specifically, the HMR prohibit the transportation of a DOT–113 if the average daily pressure rise in the tank exceeded 3 psig during the prior shipment. The insulation located in the annular space between the outer and inner tanks can lose its effectiveness over time due to conditions encountered during transportation, through settling of the insulation or through the development of micro vacuum leaks. New multi-layer insulation systems do not suffer settling problems, but are still susceptible to the degradation of vacuum and therefore must be monitored in the same way as older insulation systems. As the effectiveness of the insulation system lessens, more thermal energy can be transmitted to the inner tank and the lading. The rate of thermal energy transfer can be determined by measuring the pressure the lading exerts on the inner tank at the time the material is offered, and after the material arrives at its destination. If the average daily pressure rise during transportation exceeds 3 psig, the thermal integrity of the tank must be tested. This testing involves measuring either pressure rise or calculated heat transfer over a 24-hour period. When the pressure rise test is performed, the absolute pressure in the annular space of the loaded tank car may not exceed 75 microns of mercury at the beginning of the test and may not increase more than 25 microns during the 24-hour period. If the tank fails the thermal integrity test, it must be removed from hazardous material transportation service until it has been repaired and passes the required thermal integrity tests. This system of thermal integrity management has proven to be an effective way of preventing unsafe pressure increases during transportation for the existing DOT–113 fleet, and PHMSA expects that it will continue to be effective for DOT–113s used in LNG service.

The flammability and low-temperature hazards presented by LNG in transportation are well understood. The DOT–113C120W tank car has a well-established safety record transporting similar cryogenic flammable materials. The construction specifications for the steel used for fabricating the inner tank of the DOT–113C120W tank car requires it to withstand a (design) service temperature of −260 °F, which is also the temperature of LNG at atmospheric pressure (*i.e.,* LNG is not cooled below this temperature). The austenitic steel required for the inner tank retains all necessary strength and ductility at −260 °F, and is suitable for use to −423 °F the shipping temperature of liquefied hydrogen, a far lower temperature than it would be exposed to in LNG service.

2. Hazard Communication

Once the lading has been properly packaged, the HMR prescribe an extensive system of multi-layered hazard communication tools designed to provide information on the type and location of hazardous materials present to transportation employees, emergency responders, and the public. The discussion below will focus on hazard communication requirements specific to rail transportation, but similar requirements exist for highway, vessel, and air transport, with variations to account for specific challenges applicable to each mode of transportation.

The HMR require that a tank car containing a hazardous material conspicuously display placards on each side and each end of the car. The diamond-shaped placards are designed to be instantly recognizable to any trained emergency responder or transportation employee. Placards allow for quick identification of the DOT hazard class or division of the material being transported by their color, symbol, and the numeral entered in the bottom corner of the placard. Specifically, for DOT–113 tank cars transporting flammable gases such as LNG, the placard must also be placed on a white square background to increase the contrast and visibility of the placard in accordance with § 172.510(a)(3), and as a visual signal of the special handling procedures for DOT–113 tank cars transporting flammable gases. Tank cars must additionally be marked on each side and each end with the UN ID number of the hazardous material being carried. This marking is typically displayed on a white rectangle in the center of the placard. Moreover, tank cars loaded with flammable gases, like LNG, are required to be marked on two sides with the key words of the proper shipping name, or the common name of the material being transported. Therefore, a tank car transporting LNG will be marked with the words ''Methane, refrigerated liquid'' or ''Natural gas, refrigerated liquid'' on two sides of the tank car.

The train crew is required to maintain a document which identifies the position in the train of each rail car containing a hazardous material. The crew is also required to maintain emergency response information for each hazardous material carried in the train. This emergency response information must include specific information related to the material being transported, including:

- Immediate hazards to health;
- Risks of fire or explosion;
- Immediate precautions to be taken in the event of an accident or incident;
- Immediate methods for handling fires;
- Initial methods for handling spills or leaks in the absence of fire; and
- Preliminary first aid measures.

As one method of compliance with these requirements, train crews often carry the DOT Emergency Response Guidebook (ERG),[18] a joint publication of PHMSA, Transport Canada, the Secretariat of Communication and Transport of Mexico, and interested parties from government and industry,

[18] *https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/ERG2016.pdf.*

to supplement emergency response information provided by the person shipping the hazardous material. The ERG is intended for use by emergency services personnel to provide guidance for initial response to hazardous materials transportation incidents. The ERG cross-references specific materials with incident response information, including firefighting instructions and evacuation distances. The ERG is made widely available, as PHMSA provides millions of free copies of the ERG to emergency responders in every State, and several commercial publishers have copies available for purchase. Smartphone applications of the ERG are also available. The ERG includes instruction to handle incidents involving flammable cryogenic materials such as LNG.

Finally, the document carried by the train crew is required to display clearly the emergency response telephone number for each hazardous material transported in the train. The phone number must be easily recognizable to the train crew, or any other person using the train document in an emergency. The telephone number must be of a person who either: (1) Is knowledgeable of the hazardous material being shipped, and has comprehensive emergency response and incident mitigation information for that material; or (2) has immediate access to a person who possesses such knowledge and information. The emergency response telephone number must be monitored at all times the material is in transportation. A telephone number that requires a call back (such as an answering service, answering machine, or beeper device) does not meet this requirement. The emergency response telephone number may be monitored by the person offering the hazardous material, or an agency or organization capable of, and accepting responsibility for, providing the comprehensive emergency response and incident mitigation information.

The railroad industry has also developed its own electronic hazard communication aids, beyond the requirements of the HMR. Specifically, the AAR, in conjunction with its members and Railinc (an AAR technology subsidiary), has developed and deployed an application called AskRail.[19] The AskRail app links to the freight railroad industry's train and railcar information database maintained by Railinc. AskRail provides an emergency responder who has registered to use the service with detailed information about the type and location of all cars carrying hazardous materials in a train including emergency response guidance.

This existing system of hazard communication under the HMR, supplemented by industry efforts such as AskRail, accurately communicates the hazards presented by hazardous materials to emergency responders, transportation employees, and the public and contributes to proper emergency response when accidents occur in transportation.

3. Training

The HMR requirements for safe transportation of hazardous materials also encompass training for all hazmat employees involved in the transportation of hazardous material. *See* part 172 subpart H. Training is the cornerstone of compliance with the HMR, because only properly trained employees can ensure the applicable HMR requirements are followed appropriately. All hazmat employees must be trained and tested by their employer to perform their HMR-related functions correctly and safely. This includes employees who prepare a hazardous material package for transportation, transport hazardous materials (*e.g.,* the train crew), or unload hazardous material. *See* § 171.8. In accordance with § 172.704, training must cover:

◦ General awareness of HMR requirements;
◦ Function-specific training applicable to the particular functions performed by the employee (*e.g.,* proper loading procedures for flammable cryogenic material);
◦ Safety;
◦ Security awareness; and
◦ In-depth security training, when applicable.

Training must be documented in accordance with § 172.704(d), and repeated at least every 3 years.

4. Security Plans

The HMR also address security requirements for certain high-risk hazardous materials. Offerors and carriers of materials listed in § 172.800 must develop and adhere to a transportation security plan for hazardous materials. Security plans are required of any offeror or carrier of flammable gas in a quantity over 792 gallons, which is far below the volume of a single tank car of LNG or similar flammable cryogenic material. Security plans must include an assessment of transportation security risks for shipments of the hazardous materials, including site-specific or location-specific risks associated with facilities at which the hazardous materials listed in § 172.800 are prepared for transportation, stored, or unloaded incidental to movement, and appropriate measures to address the assessed risks. Specifically, security plans must address three elements:

◦ *Personnel security.* Measures to confirm information provided by job applicants hired for positions that involve access to and handling of the hazardous materials covered by the security plan.
◦ *Unauthorized access.* Measures to address the assessed risk that unauthorized persons may gain access to the hazardous materials covered by the security plan or transport conveyances being prepared for transportation of the hazardous materials covered by the security plan.
◦ *En route security.* Measures to address the assessed security risks of shipments of hazardous materials covered by the security plan en route from origin to destination, including shipments stored incidental to movement.

Properly implemented security plans decrease the risk that a shipment of hazardous material, including LNG, can be used in an attack against persons or critical infrastructure within the United States.

5. Preparing a Packaging for Transportation

Hazardous materials packages must be prepared and filled in such a way to ensure that there can be no detectable release of hazardous materials to the environment during conditions normally incident to transportation. Specifically, for LNG, there are several existing requirements in the HMR that address the proper filling of a DOT–113 tank car to ensure safe transportation of the commodity. These package preparation requirements include:

- As provided in § 173.31, when the car is offered into transportation, the offeror must inspect the tank car and all closures prior to movement (*i.e.,* the pre-trip inspection); and
- Filling density restrictions and loading pressure restrictions in § 173.319 for cryogenic material.

The filling and loading restrictions in § 173.319 are based on the physical properties of each flammable cryogenic material and are designed to ensure that during transportation, the inner tank will not experience a pressure rise that triggers the PRVs to activate.

6. Route Planning

The HMR address requirements for rail route planning in § 172.820. Trains

[19] *https://public.railinc.com/products-services/askrail.*

meeting the following criteria are required to assess the safety and security risks along transportation routes (§ 172.820(c)) and perform an alternative route analysis (§ 172.820(d)):

(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, as defined in § 173.403 of this subchapter; or

(4) A high-hazard flammable train (HHFT) as defined in § 171.8 of this subchapter.

Historically, 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 [20] 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 under Docket HM–232E (71 FR 76834), which proposed to revise the current requirements in the HMR applicable to the safe and secure transportation of hazardous materials by rail. Specifically, the HM–232E NPRM proposed 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.

In the HM–232E NPRM, PHMSA solicited comments 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; PIH materials; and highway-route controlled quantities of radioactive materials pose significant rail safety and security risks warranting the enhanced security measures proposed. Commenters generally did not support enhanced security measures for a broader list of materials than were proposed in the NPRM.

PHMSA adopted the NPRM's proposed security measures in an April 16, 2008 Interim Final Rule (IFR) (73 FR 20752) which was subsequently amended by a November 26, 2008 final rule (73 FR 72182). The 2008 IFR and final rule imposed a series of rail routing requirements in § 172.820. Carriers must 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.

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,[21] and are in widespread use across the rail industry for security-sensitive hazardous materials. An overwhelming majority of commenters expressed support for additional routing requirements for HHFTs and thus, PHMSA finalized the proposed requirements.[22]

In this final rule, PHMSA makes any railroad that transports a quantity of LNG in a tank car subject to the route planning requirements in § 172.820.

7. Operational Controls

In addition to requirements for packaging, hazard communication, training, and security plans that must be met before the hazardous material is offered for transportation, the HMR contain operational controls requirements for the safe transportation of hazardous materials in tank cars. These requirements include specific provisions for handling flammable cryogenic materials similar to LNG, including loading and unloading requirements for tank cars in §§ 173.31 and 174.67, which help prevent movement of tank cars during loading/unloading operations, help prevent other rail equipment from approaching tank cars during loading/unloading through use of derails, bumpers, or lining switches to prevent entry, and include specific instructions that tank car unloading personnel are required to follow, such as attendance of the unloading operation and care of tools used for unloading.

Other operational controls include an unloading requirement in § 174.204 that requires that tank cars containing a flammable cryogenic material must be unloaded directly from the car to permanent storage tanks of sufficient capacity to receive the entire contents of the car. Finally, switching restrictions in § 174.83(b) prohibit a DOT–113 specification tank car displaying a Division 2.1 (flammable gas) placard, including a DOT–113 specification tank car containing a residue of a Division 2.1 material (*e.g.,* LNG), from being cut off while in motion, coupled into with more force than is necessary to complete the coupling, or struck by any car moving under its own momentum. These special handling requirements protect DOT–113 tank cars from experiencing unnecessary impact forces during switching. Compliance with these switching restrictions is highlighted by the special white background for the flammable gas placard required by § 172.510 for DOT–113, and a marking requirement for the tank car which indicates that the cars may not be humped or cut off while in motion (*see* § 179.400–25).

Additionally, three operational controls currently address the expedited movement of a tank car transporting hazardous materials, delivery of tank cars containing gases and cryogenic material, and notification of delays in transit. First, § 174.14 requires that a carrier must forward each shipment of hazardous materials promptly and within 48 hours (Saturdays, Sundays, and holidays excluded), after acceptance at the originating point or receipt at any yard, transfer station, or interchange point, except that where biweekly or weekly service only is performed, a shipment of hazardous materials must be forwarded on the first available train. Furthermore, § 174.14(b) states that a tank car loaded with any Division 2.1 material (which would include LNG), may not be received and held at any point, subject to forwarding orders, to defeat the purpose of this requirement for the expedited movement of a hazardous material, or to

[20] *https://www.congress.gov/110/plaws/publ53/PLAW-110publ53.pdf.*

[21] *https://www.ntsb.gov/publications/_layouts/ntsb.recsearch/Recommendation.aspx?Rec=R-14-004.*

[22] 80 FR 26644.

defeat the requirements of § 174.204 for tank car delivery of gases such as cryogenic liquids. Section 174.204 prohibits tank cars containing Class 2 materials from being unloaded unless the shipment is consigned for delivery to an unloading facility on private tracks, and prohibits the storage of Division 2.1 (flammable) cryogenic material. If a tank car containing Class 2 material cannot be delivered to a private track for unloading, the regulation does allow the car to be unloaded on a rail carriers tracks provided the lading is piped directly from the tank car to permanent storage tanks. Finally, in accordance with § 173.319, the shipper must notify FRA whenever a tank car containing any flammable cryogenic material is not received by the consignee within 20 days from the date of shipment.

8. Risk Based Framework

The HMR address the risks inherent in the transportation of hazardous materials through comprehensive packaging, hazard communication, training, security planning, and material- and mode-specific operational controls.

The HMR regulate 435 million shipments of hazardous materials every year and by all modes of transportation, with an average of 20 hazardous material incidents resulting in death and serious injury each year, most of which occur in the highway mode. The existing HMR requirements are robust and will adequately address the risks posed by transportation of LNG in DOT–113C120W tank cars. However, in this final rule, PHMSA is adopting certain additional safety measures designed to further reduce those risks. These safety measures are discussed in detail in the following section.

B. The DOT–113C120W Specification Tank Car

PHMSA considers the existing DOT–113C120W tank car a suitable packaging for transportation of LNG by rail. The inner tank is capable of withstanding the cryogenic temperatures and chemical properties of LNG, and the thermal protection system is capable of maintaining LNG at a safe pressure and temperature throughout transportation. However, in this final rule, to improve crashworthiness and in response to comments received, PHMSA requires that DOT–113C120W tank cars used for LNG transportation must be constructed with a thicker outer tank, and that the outer tank be constructed of a higher quality steel currently required for construction of DOT–117A and PIH/TIH tank car tanks. PHMSA has determined that the thicker outer tank in DOT–117A and PIH/TIH tank cars improved crashworthiness. The DOT–117A crashworthiness improvement results are discussed below. Additionally, PHMSA is adopting the proposals for maximum offering pressure as proposed in the NPRM, but is amending the maximum filling density to 37.3%.

1. Suitability of the DOT–113C120W Tank Car for LNG

The DOT–113C120W tank car has a long history of safe transportation of flammable cryogenic material similar to LNG. The safe history of DOT–113C120W tank cars used for the transportation of other cryogenic materials such as ethylene since 1983 (and earlier under special permits) is a key factor in determining that this tank car design is appropriate for the transportation of LNG. Please see our discussion of the history of the DOT–113 specification in ''*Section III.A. Existing HMR Requirements for Rail Transport of Flammable Cryogenic Gas*'' for further details.

DOT–113C120W rail tank cars are vacuum-insulated tank-within-a-tank designs (similar to a thermos bottle) consisting of an inner alloy stainless steel tank enclosed within a carbon steel outer tank specifically designed for the transportation of cryogenic material, such as liquid hydrogen, oxygen, ethylene, nitrogen, and argon. Additionally, the design and use of the DOT–113 specification tank car includes added safety features—such as protection systems for piping between the inner and outer tanks, multiple PRDs (pressure relief valves and vents), and insulation—that contribute to an excellent safety record throughout its 50 years of service. The HMR currently authorize the DOT–113C120W specification tank car, the same specification being authorized for LNG in this rule, for another flammable cryogenic material, ethylene, which has chemical properties similar to those of LNG.

The DOT–113 tank car requirements in the HMR incorporate elements of rigorous engineering standards, including the ASME BPVC as well as the AAR Specifications for Tank Cars, M–1002. M–1002 in turn draws on well-established industry standards of the American Society for Testing and Materials (ASTM), American Society of Non-destructive Testing (ASNT), as well as ASME, for design, materials, fabrication, testing and inspection requirements. The ASME BPVC, Section VIII, Division 1, is the international benchmark standard for pressure vessel design for a multitude of industries, including transportation. Starting from these rigorous design principles, the specification requirements in part 179 of the HMR add design requirements to address conditions encountered in transportation and not necessarily applicable to stationary storage. For example, the HMR require the use of specific steels that balance toughness, strength, and weldability with being able to withstand extremely low temperatures.

When cryogenic ethylene is transported in DOT–113C120W specification tank cars, it is offered at cryogenic service temperature (defined in § 173.115(g) as colder than −90 °C), as LNG would be in this final rule. The delimiter letter ''C''—as used in ''DOT–113C120W''—indicates the car is designed for a loading and shipping temperature as low as −260 °F (−162 °C) (*see* the specification requirements in § 179.401–1 for DOT–113C120W tank cars). Negative 260 °F corresponds to the temperature at which LNG converts from a gas to a liquid. The HMR do not permit the filling of a tank car below its service temperature (*see* § 173.319(a)(4)(ii)). However, should the inner tank experience colder temperatures, the 300-grade austenitic stainless steels, 304/304L, permitted for the inner tank, are authorized to withstand the much lower service temperature of cryogenic hydrogen, 423 °F.

Similarly, the standard heat transfer rate assigned to the DOT–113C120W tank car in § 179.401–1, a maximum of 0.4121 Btu per day per pound of water capacity, is consistent with the requirements for the other bulk packages authorized for LNG in the HMR (MC 338 cargo tanks and UN T75 portable tanks), and packages authorized by DOT Special Permits. The specific design properties of the DOT–113C120W, including service temperature and thermal performance, make it an appropriate packaging for safe transportation of LNG, in the same way that the packaging is currently used to transport cryogenic ethylene.

2. Materials of Construction for DOT–113 Tank Cars

In the United States, storage vessels for LNG are designed and constructed in accordance with ASME BPVC Section VIII *Rules for Construction of Pressure Vessels,* Division 1. To maintain the low temperature, LNG storage tanks are usually made with an inner and outer tank with insulating material between and a vacuum applied to the annular space.

a. Inner Tank

ASTM A240/240M 300-grade austenitic stainless steels, 304/304L, are the only steels authorized in the HMR for constructing the inner tank of a DOT–113 tank car. The major elements in these steels are: Carbon—0.08% (0.03%); manganese—2.00% (both); chromium—18.0–20.00% (both); nickel—8.00–11.00% (8.00–12.00%); and the remainder iron. The role of chromium and nickel in the 304/304L grade steels is to: (1) Retain the Face Centered Cubic (FCC) atomic structure which gives 304/304L its strength, ductility and toughness down to cryogenic temperatures and (2) provide a corrosion resistant passive layer. The tensile strength of 304/304L steel is 70,000–75,000 psi with Charpy V-notch toughness (resistance to brittle failure) values in the range of 80–130 ft. lbs. at −320 °F (minimum Charpy V-notch failure value is 60 ft. lbs.), below the temperature range encountered during LNG transportation. The service environment of a railroad tank car is dynamic and severe and can result in the accumulation of impact and fatigue damage. Austenitic stainless steels, which are readily weldable using qualified welders and welding procedures, are therefore well-suited for use in the construction and repair of tank cars.

For storage tanks, ASME design criteria allow for the use of 300-grade stainless steels or ASTM A553 *Standard Specification for Pressure Vessel Plates, Alloy Steel, Quenched and Tempered 7, 8, and 9% Nickel.* Both the 304/304L and A553 steels have similar nickel content limits, but utilize the nickel to achieve strength and toughness in different ways. The A553 steel is a heat treatable, ''quench and tempered'' type of steel with the nickel helping to form martensite, a strong but brittle metallurgical product. The quench and tempering treatment makes welding A553 difficult, requiring expertise in welding procedure development and operator skill which adds risk to its use for tank cars. By contrast, the nickel content in 304/304L stainless steels facilitates the formation of austenite, a strong, tough and ductile form of steel, which maintains its physical properties at cryogenic temperatures. This, coupled with its excellent weldability, make it the clear choice for cryogenic tank cars.

The inner tank has a minimum thickness requirement of 3/16th inch (after forming) unless increased through a calculated formula in 179.400–8, which increases thickness based on inner diameter of the tank. The calculations used to determine the thickness of the inner tank are aligned with the ASME BPVC Section VIII Division 1 and align with all other tanks used for cryogenic materials. Typically, DOT–113 inner tanks exceed the minimum value of 3/16th inch thickness to conform to ASME calculations and to avoid localized thinning arising from manufacturing processes and the variation in the thickness of steel sourced from steel mills. Therefore, in this final rule, PHMSA maintains the current requirements for inner tanks.

b. Outer Tank

For DOT–113 tank cars, plate materials listed in M–1002 Appendix M must be used for the outer tank. Industry practice has been to fabricate the external tank from ASTM A516–70 steel. A516–70 steel has provided reliable performance in the service history of DOT–113 tank cars. However, PHMSA in this final rule is authorizing rail transport of LNG in DOT–113C120W-specification tank cars with enhanced outer tank thickness and materials (with a specification suffix ''9'' added to denote those enhancements). Specifically, this final rule requires DOT–113C120W9-specification tank cars carrying LNG to have a minimum outer tank thickness of 9/16'' (compared to 7/16'' for other DOT–113C120W-specification tank cars). Further, those thicker outer tanks must be made of TC–128 Grade B (TC–128B) normalized steel. TC–128B normalized steel is currently used for TIH and flammable liquid tank car designs and its manufacturing process produces a more puncture resistant steel as compared to A516–70 steel. AAR TC–128 Grade B normalized steel is a high-strength, fine-grained carbon-manganese-silicon steel intended for fusion-welded tank car tanks in service at moderate and lower temperatures. By normalizing (heating the steel to 1600 °F and air cooling) TC–128 steel and controlling its chemistry, the outer tank of an LNG tank car made from TC–128 Grade B steel has a reduced probability of tank failure due to cracking and an increased resistance to puncture compared to ASTM A516–70 steel.

The TC–128 Grade B normalized carbon steel used to construct the outer tank for DOT–113C120W9 tank cars does not maintain the same strength and ductility at the cryogenic temperatures of the lading. However, this is not a safety concern for DOT–113 tank cars. Existing DOT–113C120W tank cars used in cryogenic ethylene service have outer tanks constructed of ASTM A516–70 carbon steel. ASTM A516–70 is also not resistant to cryogenic temperatures, and has been used safely in the outer tank of DOT–113C120W tank cars for decades. Similarly, the steel used to construct the outer tanks of other ''tank-within-a-tank'' cryogenic packagings, including MC–338 cargo tanks, UN T75 portable tanks, and ocean-going LNG tanker ships, is not resistant to cryogenic temperature.

LNG in these packagings is contained during transportation in an inner stainless-steel tank or tank lined with cryogenic compatible liners, which maintains strength and ductility at cryogenic temperatures, while the outer tank provides accident protection and structural support to the packaging. The only way LNG can be released from the inner tank of a rail tank car to the void space between the inner and outer tanks is if the inner tank is compromised. In a rail accident, a puncture of the inner tank can occur only after the outer tank is breached. In such a scenario, any LNG released from the breach of the inner tank will also be released into the environment and not be contained in the space between the two tanks even if the outer tank is made of stainless steel that maintains strength and ductility at cryogenic temperatures. Therefore, there is no safety advantage in making the outer tank of stainless steel. On other hand, making the outer tank of stainless steel able to withstand cryogenic temperatures in addition to withstanding the in-train forces during transportation, providing puncture resistance, and ensuring structural support for the tank car would be prohibitively expensive (especially if the thickness is the same as or thicker than the adopted 9/16th inch TC–128 Grade B normalized carbon steel design).

As explained further below, PHMSA expects that each of the enhancements provided for in the final rule will improve tank car crashworthiness.

c. Determination of Inner and Outer Tank Requirements

PHMSA is maintaining the requirements for the inner tank. ASTM A 240/A 240M, Type 304 or 304L steel has the correct balance of strength, durability, and weldability for use in transportation applications for cryogenic materials, as demonstrated over many years of use. However, due to the possibility of LNG being transported in blocks of tank cars within each train that are larger than the blocks of tank cars that are typically used for rail transportation of other flammable cryogenic liquids, and in response to comments, PHMSA is authorizing in this final rule rail transportation of LNG in DOT–113C120W-specification tank cars with enhanced outer tank thickness and materials (those enhancements to be indicated by the specification suffix ''9'') to obtain improved crashworthiness.

The inner tank design of DOT–113C120W9 tank cars will be identical to other DOT–113C120W-specification tank cars, and will have the same safety features to vent the contents in the event of an unsafe pressure increase. In essence, the lading retention capabilities of the DOT–113C120W9 and other DOT–113C120W-specification tank cars are identical, with specific enhancements to the outer tank of the tank car design being employed to increase crashworthiness.

The outer tank enhancements for the DOT–113C120W9 incorporate the best available technology for the outer tank of a tank car with little additional manufacturing costs. Increasing wall thickness and the use of normalized steel (which increases the ductility of the steel) of the outer tank wall together provide enhanced crashworthiness for the tank car. Previously, there was limited economic rationale to amend the outer tank characteristics for the DOT–113C120W tank car to incorporate those elements because of the small size of the fleet and the small number of tank cars within each train. The existing level of safety provided by the DOT–113C120W tank car and existing operational controls is sufficient for the current use scenarios, as shown by the safety history of that tank car with over 100,000 shipments.

Currently, because of market demand and usage patterns for ethylene, DOT–113 tank cars are transported as part of mixed commodity freight trains at one to three cars per train. However, as the number of tank cars within a train increases—in blocks of cars larger than three or in unit trains—there is a higher probability that a car containing a flammable cryogenic material such as LNG will be involved should a derailment or other accident occur.

PHMSA cannot predict the number of DOT–113C120W9 tank cars per train the LNG market will support, but we know that from ETS's application for DOT–SP 20534, that it has plans to operate unit trains of at least 80 cars per train at some point in the future. With the possibility of larger numbers of cars in LNG transportation, PHMSA and FRA have determined that applying improved outer tank requirements is feasible from a manufacturing and economic perspective. Given the feasibility of securing a more robust tank car design within prevailing manufacturing processes across North America, PHMSA determined that the authorization for transporting LNG by rail can achieve an additional safety margin by employing the more robust car design described herein.

If a tank car containing LNG is breached during a derailment, the LNG will behave largely the same way as crude oil or ethanol. The LNG lading will be released as a very cold liquid, creating an LNG pool that could catch on fire. Employing a thicker outer shell will reduce the puncture probability of the inner tank, and thus mitigate the consequences of the derailment. Moreover, a tank car is estimated to have a service life of approximately 50 years. DOT–113 tank cars compliant with the enhanced outer shell requirements are projected to cost 3% more to manufacture. When divided by the large number of carloads that would be carried during a DOT–113's 50-year service life, the 9/16th inch TC–128B normalized steel outer tank is highly cost-effective in that it will mitigate the consequences of derailment involving LNG by reducing the number of tanks punctured in the unlikely event of an accident. See our discussion of modeling crashworthiness in *Section III. B. 6.* ''*Finite Element Modeling and Validation*'' for additional information.

3. Safety History

DOT–113 tank cars have a demonstrated safety record of over 50 years. More than 100,000 rail shipments of cryogenic material in DOT–113 tank cars have taken place with no reported fatalities or serious injuries occurring due to a train-accident caused release of product. Only twice—during the 2011 incident in Moran, KS and the 2014 incident in Mer Rouge, LA—did the inner tank of a DOT–113 tank car release product due to damage sustained during an accident. LNG transportation by rail in currently authorized packaging also has a demonstrated, albeit brief, safety history. Since LNG was authorized to be shipped by rail in T–75 UN containers, PHMSA and FRA have no record of any rail incidents involving these packagings.

4. Crashworthiness Assessment/Field Tests

PHMSA and FRA are confident, based on rigorous modeling, testing, and experience (described in detail in below), that the DOT specification tank cars, enhanced with a 9/16th inch outer tank made of TC–128 Grade B normalized steel, will provide sufficient crashworthiness in accident scenarios compared to tank cars manufactured from 7/16th inch A516–70 steel outer tanks. As part of the analysis conducted for the *Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains,* (HM–251; 80 FR 26643, May 8, 2015) along with the final rule RIA, PHMSA determined that there was a reduction in the number of tank cars punctured when increasing the outer tank thickness from 7/16th inch to 9/16th inch of TC–128 Grade B normalized steel with a train traveling at 40 mph.

This final rule will require the same increase in thickness of the same type of steel as was required in the HM–251 final rule for DOT–117 tank cars. PHMSA, therefore, expects a similar increase in safety benefits from the use of enhanced outer tank thickness and improved materials.

5. Comparison of Derailments

In the following table, FRA compared three derailment accidents that occurred in relatively similar conditions. All accidents involved trains travelling at similar speeds, in similar weather conditions, and with a similar number of cars derailed. The tank cars that derailed in Guernsey, Saskatchewan, had a tank thickness of 9/16th inch and had 62 percent fewer shell punctures than the tank cars that derailed in Casselton, North Dakota, and 69 percent fewer tank punctures than the tank cars that derailed in Arcadia, Ohio. The tank cars involved in the Casselton and Arcadia derailments had a tank thickness of 7/16th inch. These scenarios validate the extensive modeling and simulations done and provide evidence of the substantial safety benefit of requiring an outer tank thickness of 9/16th inch in the construction of the DOT–113C120W tank car that is being authorized for the transportation of LNG by rail in this rule.

TABLE 3—COMPARISON OF DERAILMENTS

	Derailment location		
	Guernsey, SK	Casselton, ND	Arcadia, OH
Derailment date	2/6/2020	12/30/2013	2/6/2011.
Temp at Time of Derailment	−18 °C (0 °F)	−18 °C (−1 °F)	−4 °C (25 °F).
Train speed (MPH)	42	48	42.
Type of cars (Specification)	DOT 117J (286K)	DOT 111 Legacy (263K)	DOT 111 Legacy (263K).
Shell Thickness	9/16th inch	7/16th inch	7/16th inch.
Total cars derailed	32	20	32.
Total cars breached	8	19	30.
Head Punctures	*0*	*3*	*10.*
Shell Punctures	*5*	*13*	*16.*
Fittings Compromised	*3*	*10*	*13.*
Product(s) released	UN 1267 Crude Oil	UN 1267 Crude Oil	UN 1987 Ethanol.
Fire Occurred	Yes	Yes	Yes.
Thermal Ruptures	No	Yes	Yes.
Approximate size of derailment area.	900′L × 250′W (est)	600′L × 600′W	1200′L × 450′W.
General topography of derailment area.	Flat field, raised RR bed	Flat/straight tangent track	Flat field, raised RR bed.

6. Finite Element Modeling and Validation

FRA's Research program, in coordination with PHMSA, funded the development and continued refinement of Finite Element (FE) Models for a variety of tank car specifications as well as computer simulation of impacts and derailments. FE modeling is a widely-used method for evaluating the effects of stresses on components or structures and is used in the fields of structural analysis, heat transfer, and fluid flow. Within the FRA research program, component and full scale tests results are used to validate the computer simulations and their assumptions and boundary conditions. Full scale test results are compared to simulation results, including the overall force-time or force-indentation histories, the puncture/non-puncture outcomes, the rigid body motions of the tank car, the internal pressures within the lading, and the energy absorbed by the tank during the impact.

The Volpe National Transportation Systems Center (Volpe Center) supports the FRA in this research effort, and has performed pre- and post-test FE analyses corresponding to several component and full-scale shell impact tests. Validated models and computer simulations are a necessary alternative to full-scale impact testing which are time consuming, expensive, and challenging to perform.

A primary purpose for a pre-test simulation is to estimate the threshold puncture speed of the test ram car. The puncture speed of the tank car is the speed at which, under the test conditions, the initial kinetic energy of the ram car is equal to the energy necessary to puncture the inner and outer tank. The threshold puncture speed is the maximum speed at which the tank car can be impacted under the prescribed conditions without resulting in a tear to the inner and outer tanks that would allow its lading to escape.

Results of recent tests and simulations demonstrate the potential improvement in crashworthiness from the outer tank enhancements set forth in this final rule. In November 2019 FRA conducted a full-scale impact test of a DOT–113C120W tank car at TTC in Pueblo, CO.[23] According to the test report, the initial kinetic energy imparted to the inner and outer tanks was about 2.8 Million ft.-lbs. Further, it is estimated that the residual energy (after puncture of the inner and outer tanks) was about 25% of the initial energy. Accordingly, the puncture energy of the DOT–113 tank is about 75% of 2.8 Million ft.-lbs., or 2.1 Million ft.-lbs. A separate full-scale impact test was performed on a DOT–117J100W specification tank car equipped with a jacket and thermal protection material. A review of the test report suggests that the tank (made of TC–128B normalized steel) absorbed an energy of about 1.9 Million ft.-lbs., without puncture. The report also notes that under those conditions, the tank was near puncture. PHMSA estimates the puncture capacity of the DOT–117 car to be about 2 Million ft.-lbs. Comparing the puncture capacities of the two tank specifications (DOT–113 @ 2.1 Million ft.-lbs., and the DOT–117 @ 2 Million ft.-lbs.), their performances are very similar, and that the DOT–113 might even have a slightly higher puncture resistance. The two tank cars have about the same cumulative thickness. Therefore, based on the puncture tests and modeling, PHMSA and FRA anticipate that increasing the outer tank thickness of the DOT–113 from 7/16 to 9/16 (a 28.5% increase), and requiring the use of the more puncture-resistant TC–128B normalized steel, will add about 20–30% to the puncture resistance (*i.e.,* reduction in number of punctures) of the DOT–113C120W9.

The above comparison of testing and simulation results was used to determine the suitability of the DOT–113 tank car for LNG service, as well as to determine the increased safety gained by using a 9/16th inch thick outer tank shell of TC–128 Grade B, normalized steel. Further, a similar model was created in the *Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains* [HM–251, 80 FR 26643] rulemaking to help evaluate how effectively the increased thickness improved on the DOT–111 tank car (predecessor to the DOT–117). The results of that modeling were factored into design of the current DOT–117 specification tank car which improved on the DOT–111 tank car design.

7. Loading and Preparation for Offering

In this final rule, PHMSA is adopting a 37.3 percent maximum filling density for LNG, which will allow for approximately 2 percent outage below the inlet of the pressure control valve to prevent the venting of liquid material at start-to-discharge pressure, thus ensuring the safe transportation of LNG. In the NPRM, PHMSA proposed a 32.5 percent filling density. However, PHMSA has determined a 37.3 percent maximum filling density is appropriate

[23] Full-Scale Shell Impact Test of a DOT–113 Tank Car, RR 20–03, February 2020.

because it is consistent with outages determined to be safe for LNG in other packagings such as MC–338 cargo tanks and UN T75 portable tanks. This maximum filling density is also more conservative than maximum filling densities set in the HMR for other flammable cryogenic materials, which allows for 0.5 percent outage at the start-to-discharge pressure. *See* § 173.319(b)(1). Additionally, a 37.3 percent maximum filling density harmonizes with Canada's Transportation of Dangerous Goods (TDG) regulations which have been in place since 2015.

PHMSA expects that any tank car containing a cryogenic material will be delivered to its destination within 20 days of offering, and requires notification of any car that has not reached its destination within this timeframe. *See* § 173.319(a)(3). Therefore, PHMSA is adopting a 15 psig maximum offering pressure, as proposed, which is appropriate for the transportation of LNG and is consistent with the level of safety provided to other flammable cryogenic materials. The HMR do not prohibit shippers from offering a tank car of LNG at a lower pressure.

8. Review Approval Provision to Exceed Weight

On May 14, 2010, PHMSA published a final rule amending the HMR to incorporate provisions contained in several widely used or longstanding special permits that have an established safety record. The final rule, *Hazardous Materials: Incorporation of Special Permits into Regulations* (75 FR 27205, May 14, 2010), in part, amended the HMR to allow certain rail tank cars transporting hazardous materials to exceed the gross weight on rail limitation of 263,000 pounds upon approval of the FRA. On January 25, 2011, the FRA published a notice (76 FR 4250) of FRA's approval pursuant to the Final Rule of the operation of certain tank cars in hazardous materials service that exceed 263,000 pounds and weigh up to 286,000 pounds gross rail load (GRL). In 2002, AAR adopted a revised industry standard related to railroad freight cars weighing over 263,000 pounds GRL and weighing up to 286,000 pounds. This revised industry standard, AAR Standard S–286 (adopted 2002, revised 2003, 2005, 2006), Free/Unrestricted Interchange for 286,000 pound GRL Cars (S–286), is applicable to rail freight cars manufactured, rebuilt or modified on or after January 1, 2003, and is the existing industry standard for designing, building, and operating rail cars at gross weights over 263,000 pounds and up to 286,000 pounds. S–286 sets forth industry-tested practices for designing, building, and operating rail cars at gross weights over 263,000 pounds and up to 286,000 pounds. S–286 provides for the free interchange among carriers of cars built to meet its requirements.

In this rulemaking, DOT–113 tank cars in LNG service will be required to have an outer tank that is 9/16th inch thick (after forming) and made from TC–128 Grade B, normalized steel plate. Depending on the specific design characteristics of a tank car manufactures approved car design, PHMSA and FRA determined that simply the use of 9/16th inch TC–128, Grade B normalized steel for the outer tank would not increase the GRL above 263,000 pounds; however, PHMSA and FRA understand that operators may select certain specification designs that may place the rail car at a GRL over 263,000 pounds.

In an effort to maintain consistency with FRA's current approval (*see* 76 FR 4250, January 25, 2011) of newly manufactured railroad tank cars with a GRL exceeding 263,000 pounds, this final rule will amend the HMR to state that tank cars manufactured for LNG service after (the effective date of this final rule) may be loaded to a maximum GRL of 286,000 provided the tank car meets the following criteria:

1. Tank car is constructed in accordance with S–286.
2. The outer shell and heads are constructed with TC–128 Grade B, normalized steel.

This aligns with the action PHMSA and FRA took when creating the DOT–117 specification and does not place a new burden on tank car manufacturers. A tank car manufacturer may therefore consider their design ''approved'' provided it meets the two conditions above, with no application to FRA or PHMSA required.

C. Additional Operational Controls for LNG Transportation

In the NPRM, PHMSA proposed to rely on the operational controls already required in the HMR for the transportation by rail of other flammable cryogenic materials, and invited comment on whether additional operational controls may be warranted. PHMSA encouraged commenters to provide data on the safety or economic impacts associated with any proposed operational controls, including analysis of the safety justification or cost impact of implementing operational controls.

In this final rule, PHMSA is amending the HMR to adopt operational controls beyond the current extensive requirements of the HMR. These additional operational controls consist of requirements for:

- A two-way end-of-train (EOT) device or distributed power (DP) for trains with 20 continuous tank cars of LNG, or 35 tank cars of LNG throughout the entire train;
- Location and inner tank pressure monitoring for each tank car containing LNG; and
- Compliance with § 172.820 route planning requirements (*i.e.,* rail routing).

PHMSA and FRA believe that the current requirements of the HMR ensure a robust level of safety for the transport of LNG by rail that is further reinforced by widely-adopted voluntary industry standards in AAR Circular OT–55. Additionally, the new operational controls in this final rule will add a still greater margin of safety to address the risks posed by LNG transportation in DOT–113C120W tank cars.

1. AAR Circular OT–55

AAR Circular OT–55 (OT–55) outlines operational controls for trains meeting the industry definition of a ''Key Train,'' including speed restrictions, track requirements, storage requirements, and the designation of ''Key Routes,'' which are subject to additional inspection and equipment requirements. OT–55 defines a ''Key Train'' as any train with:

- One tank car load of Poison or Toxic Inhalation Hazard (PIH or TIH) (Hazard Zone A, B, C, or D), anhydrous ammonia (UN1005), or ammonia solutions (UN3318);
- 20 car loads or intermodal portable tank loads of any combination of hazardous material, or;
- One or more car loads of Spent Nuclear Fuel (SNF), High Level Radioactive Waste (HLRW).

Key Trains have a maximum speed of 50 mph. If a defect to a rail car (*e.g.,* hanging equipment) is reported by a wayside detector but not confirmed by visual inspection, the maximum speed is reduced to 30 mph. Circular OT–55 defines a ''Key Route'' as ''any track with a combination of 10,000 car loads or intermodal portable tank loads of hazardous materials, or a combination of 4,000 car loadings of PIH or TIH (Hazard zone A, B, C, or D), anhydrous ammonia, flammable gas, Class 1.1 or 1.2 explosives, environmentally sensitive chemicals, Spent Nuclear Fuel (SNF), and High Level Radioactive Waste (HLRW) over a period of one year.'' OT–55 states that ''main tracks on 'Key Routes' must be inspected by rail defect detection and track geometry inspection cars or any equivalent level of inspection no less than two times each year; sidings are similarly inspected no less than one time each year; and main track and sidings will have periodic track inspections that will identify cracks or breaks in joint bars.'' Finally, OT–55 states that ''wayside defective bearing detectors shall be placed at a maximum of 40 miles apart on ''Key Routes,'' or equivalent level of protection may be installed based on improvements in technology.'' These recommended practices were originally implemented by all major Class I rail carriers operating in the United States, with smaller short-line railroads following on as signatories.

While PHMSA did not propose to incorporate by reference OT–55 or to adopt the requirements for ''Key Trains'' in the HMR, the railroad industry's widespread, voluntary adoption of the circular is an important consideration for PHMSA in assessing the need for prescribing additional operational controls by regulation. AAR first published Circular No. OT–55 in January 1990 to document recommended railroad operating practices for the transportation of hazardous materials. The first issue of the circular included recommended mainline and yard operating practices, designation of key routes, proposed separations from hazmat storage areas, training of transportation employees, and implementation of TRANSCAER®. TRANSCAER® is a national community outreach program that works to improve community awareness, emergency planning and incident response for the transportation of hazardous materials, criteria for shipper notification, and procedures for handling time sensitive materials. Over the past 30 years, OT–55 has been routinely revised as needed to incorporate technological developments and other changes in industry practice concerning the safe transportation of hazardous materials. For instance, OT–55 has adopted revisions to AAR's interchange standards, and technology advancements such as the use of electronic emergency response information to provide timely and reliable information to emergency responders.

To further promote compliance with the recommended practices outlined in OT–55, and compliance with Federal transportation laws, the rail industry developed and published the *United States Hazardous Materials Instructions for Rail,* commonly referred to as ''HM–1.'' The purpose of the HM–1 is to provide the rail industry with uniform hazardous materials operating rules that railroads can implement and consistently apply to support compliance with Federal regulations, and to enhance significantly employee safety and the safety of the communities through which the railroads operate. The HM–1 may be implemented as published, or it may be modified by an individual railroad to be consistent with its unique operating rules and practices.

Through its enforcement activities, FRA verifies that each railroad has established operating rules governing the safe transportation of hazardous materials, and utilizes those instructions to enforce that railroad's compliance with the Federal operating and hazardous materials transportation regulations.

In accordance with the ''Key Train'' definition and the changes being adopted, OT–55's operational controls would apply to the bulk transport of LNG by rail in a train that is composed of 20 car loads or intermodal portable tank loads in which LNG is present along with any combination of other hazardous materials. Due to the operational controls required for ''Key Trains,'' Circular OT–55 provides an additional level of safety regardless of what combination of hazardous materials the train is transporting. PHMSA and FRA believe this industry standard reduces the risk of derailments and collisions and therefore decreases the risk involved in the transportation of all hazardous materials, including LNG.

PHMSA and FRA note that the hazardous materials operating instructions from Circular OT–55–Q, the most recent edition, have been incorporated into railroads' (carriers') operating rules. Furthermore, FRA regularly performs reviews of railroads and their operating rules and are not aware of any instances in which a railroad is failing to adhere to Circular OT–55 when operating ''Key Trains.''

2. Additional Operational Controls in the Final Rule

In this final rule, PHMSA is adopting several additional operational controls:

(1) Trains with a block of 20 loaded tank cars of LNG, or 35 loaded tank cars of LNG throughout the entire train, are required to be equipped with an EOT device or DP.[24]

(2) Each loaded tank car containing LNG must be monitored for location and tank pressure by the offeror and notify the carrier if the tank pressure rises by more than 3 psig in any 24-hour period.

(3) Each carrier operating trains carrying a loaded tank car of LNG must perform additional planning requirements in accordance with § 172.820 (*i.e.,* rail routing). While the general operational controls in the HMR, as supplemented by the widespread, voluntary practices governing Key Trains in Circular OT–55, provide robust protections against derailment and other accidents (and by extension, a loss of package integrity resulting from the same) involving train configurations with only a handful of tank cars, PHMSA believes that the additional operational controls established by this final rule will ensure safe transportation of LNG regardless of train configuration. As explained earlier, trains currently transport to three DOT–113 tank cars of flammable cryogenic materials (such as ethylene) in mixed commodity freight trains. However, if the market for rail transportation of LNG evolves to include movement of LNG in larger quantities (in blocks of cars or unit configurations) within each train, there is a higher probability that, should a derailment occur, one or more cars containing LNG would be involved and would be breached.

The additional operational controls will decrease the likelihood and severity of derailments (DP/EOT device); decrease the likelihood that an LNG tank car is lost in transport (location monitoring); increase the likelihood that the railroad is notified immediately in the unlikely event that a tank car experiences unsafe conditions during transportation (pressure monitoring); and reduce the severity of the consequences in a derailment scenario by requiring that railroads transport LNG on the safest route available to them (rail routing and risk assessment). Over a DOT–113 tank car's expected 50-year service life, the use of DP/EOT devices for block carriage and unit trains, remote monitoring, and risk-based routing of trains transporting LNG will help ensure the transportation safety of LNG on the rail transportation network.

Enhanced braking requirements can result in accident avoidance and can lessen the consequences of an accident by more quickly slowing the train and decreasing the energy of impacts by reducing the number of tank cars affected by a potential derailment. PHMSA decided on the HHFT threshold (*i.e.,* a continuous block of 20 loaded LNG tank cars or 35 loaded LNG tank cars throughout the train) based on the effectiveness of this existing requirement for flammable liquids in rail transportation. PHMSA reviewed the possibility of requiring electronically controlled pneumatic (ECP) braking on cars meeting the above threshold, but determined that ECP

[24] *See* Section IV, B. *Operational Controls, 1. Braking and Routing* for further discussion.

brakes are not a practical alternative given that ECP brakes are not cost justified when applied to unit train configurations in the HHFT environment. *See* HM–251F; 83 FR 48393 (Sept. 25, 2019).[25]

Given the availability of existing braking technologies, PHMSA is requiring advanced braking in the form of a two-way EOT device or, alternatively, a linked and operational DP system located at the rear of the train. A two-way EOT device or DP system is more effective than conventional brakes because a locomotive engineer can initiate an emergency brake application from the front and rear of the train, which can reduce stopping distances and lessen in-train forces that can cause or contribute to the severity of certain derailments. These advanced braking requirements are consistent with the current requirements for HHFTs, which apply to Class 3 flammable liquids that are transported in a single block of twenty cars or 35 cars dispersed throughout a single train.[26]

The requirement to remotely monitor a tank car containing LNG will allow shippers and carriers to better identify adverse conditions and prevent a non-accidental release of LNG while in transportation. Moreover, the requirements in this final rule allow for flexibility for shippers and carriers in determining how to best monitor the location of the tank cars and pressure within the inner tank. PHMSA and FRA expect that the industry will develop standard practices and implement technologies to meet the HMR performance standard for monitoring.

PHMSA is also adopting routing requirements in § 172.820 to further reduce the risk of a train accident. This amendment requires railroads to evaluate safety and security risk factors when assessing the potential routes to be used to transport LNG. The 27 safety and security risk factors set forth in Appendix D of Part 172 against which carriers evaluate their routes provide a robust framework for identifying and managing route-based risks associated with LNG transportation by rail. FRA regularly conducts evaluations of a railroad's route risk assessment requirements to ensure adherence to the requirement.

Requirements of the route analysis measures for a rail carrier include:

- Compilation of commodity transportation data;
- Analysis of safety and security risks for transportation route(s);
- Identification and analysis of potential alternate route(s); and
- Based on the above data, selection of the practicable route posing the least overall safety and security risk.

By expanding the existing route analysis and consultation requirements of § 172.820 to include LNG by tank car, PHMSA is incorporating additional safety elements that are available within the overall hazardous materials regulatory scheme. It is worth noting that routing requirements were not mandated in the special permit issued to ETS because the permit is issued to a shipper rather than a rail carrier who is ultimately responsible for the route risk analysis. In this final rule, there is no limitation on specific origins and destinations, thereby necessitating routing and risk analysis under § 172.820. Some of the operational controls included in special permit DOT–SP 20534 were not adopted or were revised in the final rule. The requirement to submit a plan providing per shipment quantities, timelines, etc., was included in DOT–SP 20534 in order to gather more information about the movement of the material. This requirement is not feasible for a broadly applicable regulatory authorization. In this final rule, PHMSA applied the HHFT criteria in reaching its determination to require the same braking requirements for LNG transportation. After review of the comments and the safety history of flammable liquid HHFTs, PHMSA concludes that this is best option to ensure safe movement of LNG. In the final rule, the remote monitoring requirements are different than what was included in the DOT–SP 20534 because PHMSA does not believe that direct monitoring for leaks is necessary. Monitoring for tank pressure and tank car location parameters will sufficiently inform the offeror of the tank car's location and condition and allow notification to the carrier should an undesirable condition occur. For example, registering and notification of an unexpected decrease in pressure could likely indicate a methane release and could be communicated immediately to the rail carrier and the closest emergency responders.

With respect to train length and weight limitations, PHMSA determined that there should not be a maximum for either in this rulemaking. PHMSA notes that the HMR do not limit the number of shipments a shipper can offer into transportation, nor do the HMR restrict the number or type of hazardous materials rail cars that a carrier can transport in a train. An individual railroad's appropriate train operating lengths are based on multiple factors, including, but not limited to, track profile, train make-up, train dynamics, and crew training. Due to these and other unique factors that influence a specific railroad's operation, PHMSA and FRA conclude that determination of appropriate train lengths is best left to the individual railroads.

Regarding separation distance, which is the number of non-placarded rail cars between a locomotive or occupied caboose and railcars containing hazardous materials (see § 174.85), PHMSA has concluded that it is appropriate to maintain the current requirement at this time, pending further study of the issue. Non-placarded rail cars are rail cars that do not contain an amount of hazardous material that require placarding (see 49 CFR part 172 subpart F for additional information about placarding requirements). The current requirement for a flammable gas, like LNG, requires a separation distance of five cars between the engine and placarded tank car, when train length permits. If train length does not permit a separation distance of five cars, the tank car(s) must be placed near the middle of the train, but not nearer than the second car from an engine or occupied caboose. These long-standing separation distance requirements protect train crews from the releases of hazardous materials in accident conditions. PHMSA and FRA collaborated under the scope of the Rail Safety Advisory Committee Hazardous Materials Issues Working Group Task No. 15–04 to consider the separation distance issue.

Ultimately, due to an absence of consensus of the Working Group participants, as well as a lack of established incident data, the members did not reach agreement on a change to the existing regulation governing hazardous materials in train separation distances. Moreover, PHMSA worked with the Volpe Center in its review of rail accidents occurring between 2006 and 2015 where there was a release of hazardous materials near the head end of the train (occupied locomotive). The review found no reported crew injuries

[25] PHMSA notes that while this rulemaking does not prohibit LNG rail transportation in unit trains, the likelihood is low that there will be LNG unit trains, at least initially. Development of the necessary infrastructure, especially construction of DOT–113C120W9 tank cars, to transport LNG by railroad, particularly by unit trains, demands significant financial investment, long term commitment, and considerable planning. LNG tank car fleets would need to be built, and there is a limit to the construction capacity of the industry. As a result, FRA anticipates that industry will transport LNG in smaller configurations, at least until infrastructure is in place to allow for unit train service.

[26] *See* Section IV, B. *Operational Controls, 1. Braking and Routing* for a more detailed discussion.

and therefore no injuries that were potentially preventable with additional buffer cars.

Extensive research exists on separation distance of hazardous materials from train crews and locomotives, and other hazardous materials in a train. PHMSA has initiated a research project in coordination with the John A. Volpe National Transportation Systems Center (Volpe Center) as an initial step in addressing NTSB Safety Recommendations R–17–1 and –2.[27] This effort will result in a report that identifies gaps in the existing studies, areas for further research, and what conclusions can be drawn collectively from the existing knowledge base, if any. PHMSA may consider changes to the separation distance requirements in § 174.85 of the HMR for placarded rail cars and tank cars in mixed commodity freight train and unit train configurations pending the outcome of the study.

In consideration of the foregoing, PHMSA is not amending the separation distance requirement in this final rule.

IV. Summary and Discussion of Comments to the Rulemaking Docket

The NPRM comment period closed on January 13, 2020. PHMSA received 445 comment submissions[28] to the rulemaking docket through the extended comment period. PHMSA considered all comments in the development of this final rule. The comments submitted to this docket may be accessed via *http://www.regulations.gov*. The following table categorizes the commenters by background:

TABLE 4—NPRM COMMENTERS

Commenter background	Count	Description and examples of category
Non-Government Organizations	27	Environmental Groups (17); Emergency Response Organizations (6); Other (4).
Governments	15	Local (6); State (6); Federal (2); Tribal (1).
Private Individuals	391	
Industry Stakeholders	12	Tank Car Manufacturers (1); Trade Associations (10); Shippers (1).

PHMSA received comments relating to tank car design, operational controls, emergency response, and potential environmental and economic impacts. These comments are summarized and discussed in greater detail below.

A. Tank Car Design

In the NPRM, PHMSA proposed to authorize DOT–113C120W tank cars for use in the transportation of LNG by rail and to amend the ''Pressure Control Valve Setting or Relief Valve Setting'' Table in § 173.319(d)(2) by adding a column for methane as follows:

TABLE 5—PROPOSED PRESSURE CONTROL VALVE SETTING OR RELIEF VALVE SETTING

Maximum start-to-discharge pressure (psig)	Maximum permitted filling density (percent by weight)				
	Ethylene	Ethylene	Ethylene	Hydrogen	Methane
17				6.60.	
45	52.8.				
75		51.1	51.1		32.5.
Maximum pressure when offered for transportation.	10 psig	20 psig	20 psig		15 psig.
Design service temperature	Minus 260 °F	Minus 260 °F	Minus 155 °F	Minus 423 °F	Minus 260 °F.
Specification (§ 180.507(b)(3) of this subchapter).	113D60W, 113C60W	113C120W	113D120W	113A175W, 113A60W	113C120W.

As discussed in the summary of amendments in this final rule in Section III, the start-to-discharge pressure setting, filling density, maximum offering pressure, and the thermal characteristics of the DOT–113 tank car in § 173.319 were selected to allow enough holding time (including loading, transit, storage incidental to movement, and unloading) such that the inner tank would not experience a pressure rise sufficient to activate the reclosing PRV during conditions normally incident to transportation. Additionally, if the pressure in the inner tank were to reach the start-to-discharge pressure of the reclosing PRV, the inlet to the valve would successfully vent vapor to relieve further pressure buildup. That is, the combination of these conditions (the start-to-discharge pressure setting, filling density, maximum offering pressure, and the thermal characteristics of the DOT–113C120W) acts as a safety measure to prevent activation of the PRV under normal conditions of transport. At the maximum offering pressure of 15 psig and the start-to-discharge pressure setting of 75 psig for the reclosing PRV adopted in this final rule, the tank car has a 60 psig pressure range before venting occurs. Using an average daily pressure rise of 0.75 to 1.5 psig as indicated by industry, even if the FRA notification requirement for tank cars in transportation for over 20 days is reached, the tank would see only a 15 to 30 psig pressure increase—meaning there would still be a 30 to 45 psig buffer remaining before venting occurs (or an aggregate 20 to 60 days of holding time). Please see *Section III. B.* ''*The DOT–113C120W Specification Tank Car*'' for additional details on the offering pressure, set-to-discharge pressure, and the revised filling density requirements for LNG in this final rule.

[27] *https://www.ntsb.gov/safety/safety-recs/recletters/R-17-001-002.pdf*

[28] Some comment submissions noted additional signatories. Those were considered in the development of the final rule.

PHMSA received numerous comments about the tank car design for the transportation of LNG by rail, which it sorted into the following subtopics:

1. General Suitability of the DOT–113C120W Specification Tank Car;
2. Crashworthiness Assessment/Field Tests;
3. High Nickel Steels;
4. Maximum Permitted Filling Density;
5. Maximum Pressure When Offered;
6. Insulation;
7. Maximum Gross Rail Weight; and
8. The DOT–113C140W Tank Car Specification.

In this section, PHMSA responds to 15 sets of substantive comments related to tank car design for LNG transportation.

1. General Suitability of the DOT–113C120W Specification Tank Car

PHMSA received various comments regarding the general safety of the tank car design as proposed in the NPRM. Notably, the Railway Supply Institute Committee on Tank Cars (RSI–CTC) cited the regulatory history of the DOT–113C120W as an indication that DOT previously considered it for the transport of LNG and that the specification itself was originally designed to accommodate cryogenic materials, like LNG. RSI–CTC noted that the Hazardous Materials Regulations Board, a predecessor agency to PHMSA, published a notice in the **Federal Register** in 1971 as part of the HM–91 [29] rulemaking docket indicating that the agency was ''considering amendment of the Department's Hazardous Materials Regulations to provide for the shipment of ethylene, hydrogen, methane, [and] natural gas . . . in a cold liquefied gas state in certain tank cars.'' RSI–CTC further commented that the delimiter letter ''C'' indicates that DOT–113C120W tank cars were specifically designed for the safe transportation of cryogenic materials like LNG. They also pointed out that these cars are subject to additional operating requirements, namely thermal integrity and in-transit reporting requirements, which have led to a strong safety record of over 50 years. Similarly, the International Association of Fire Chiefs (IAFC) agreed with the NPRM's proposal to use DOT–113 tank cars, noting that other refrigerated liquids are transported safely using this specification.

Other commenters expressed concern over the tank car design, stating that there is a lack of testing on the suitability of the tank car for the transportation of LNG. The Governor of Washington State, on behalf of Washington State, claimed that PHMSA's assertion of a demonstrated safety record for DOT–113 tank cars is baseless without a completed risk assessment, because LNG is not currently authorized for transportation in DOT–113 tank cars and PHMSA and FRA may not be aware of every incident involving these cars. The Surfrider Foundation noted its belief that the proposed tank cars were never designed or intended to be used for the transport of LNG. Likewise, the California Public Utilities Commission (CPUC) expressed concern that PHMSA is moving forward with a deregulatory action without proper evaluation. CPUC also stated that transporting LNG in DOT–113 tank cars poses an unacceptable risk, further noting that an increase in pressure could trigger venting and that exposure of the newly vented gas to a heat source could result in an expanded fire or secondary explosion. Finally, CPUC also stated that the proposed modification to the HMR to authorize a DOT–113 tank car would be untested and that this is inconsistent with PHMSA's mission for safety.

Furthermore, various commenters—including the New York State Department of Transportation (NYDOT), the New York State Department of Environmental Conservation (NYDEC), the New York State Division of Homeland Security and Emergency Services (NYDHSES), and the NTSB—stated their belief that the limited number of incidents involving DOT–113 tank cars does not provide adequate evidence to ensure that they are safe for the transportation of LNG. These commenters expressed that the sample size of crashes is too small given the low number of DOT–113 tank cars in existence, and therefore, they requested additional research on the suitability of these tank cars for LNG service. Similarly, a group of environmental protection NGOs expressed their belief that PHMSA failed to provide analysis to justify its claim that the current known safety record of DOT–113 rail cars provides a meaningful comparison to their understanding of planned large-scale shipments of 100-car trains of LNG throughout the United States. They further commented that PHMSA did not provide adequate data or analysis to support its conclusions about how DOT–113 tank cars and their cargoes will behave in a potential crash on main line rail routes. Additionally, they asserted that PHMSA failed to provide data on the risk of cascading failure of tank cars, noting that the lack of data undermines PHMSA's statement that highway transportation is less safe than rail transportation. Furthermore, the Center requested that PHMSA consider the specific issues surrounding LNG tank cars, such as the placement of valves and other appendages that may be sheared off during a derailment; the puncture resistance of the tank car and potential jacketing to prevent punctures; the heat resistance of LNG tank cars to prevent explosions from fires during derailments; and braking requirements that are adequate for the weight of LNG tank cars.

With respect to concerns about the potential for explosions, the IAFC noted that the DOT–113 tank car is specifically designed to prevent a boiling liquid expanding vapor explosion (BLEVE) and that in the event of an accident, the LNG would initially spread before either warming or freezing. They further noted that if the released LNG were to catch fire, it would most likely be limited to the contents of the specific tank car that experienced the release, rather than spreading to the other tank cars. However, Earthjustice [30] expressed concern regarding two LNG motor vehicle accidents in Spain where a BLEVE was observed, and Physicians for Social Responsibility (PSR) noted that no test data or mathematical models exist to predict whether and when a LNG tank car exposed to an external fire would undergo a BLEVE.

PHMSA Response

PHMSA agrees with RSI–CTC's comment and notes that the HM–91 rulemaking specifically considered that ''methane, liquefied'' (as referenced in the rulemaking) could be shipped in a DOT–113C120W specification tank car.

The safety history of DOT–113C120W tank cars is sufficient to draw a conclusion that these tank cars are appropriate for the bulk transportation of LNG. Please refer to our discussion on the DOT–113C120W tank car in *Section III. B. ''The DOT–113C120W Specification Tank Car''* for further details. Also, please note that PHMSA is enhancing this already suitable packaging with additional outer tank requirements to improve crashworthiness. Although the HM–91 rulemaking published October 16, 1971 [36 FR 20166] and docket was subsequently withdrawn, PHMSA subsequently undertook a separate rulemaking published March 1, 1974

[29] *https://www.phmsa.dot.gov/sites/phmsa.dot.gov/files/docs/standards-rulemaking/rulemakings/archived-rulemakings/67251/36fr-20166.pdf.*

[30] Earthjustice's January 14, 2020 comment was filed on behalf for the Center, Clean Air Council, Delaware Riverkeeper Network, Environmental Confederation of Southwest Florida, Mountain Watershed Association, and Sierra Club.

[HM–115, 44 FR 12826] to authorize the transport of a flammable cryogenic material (ethylene) in DOT–113C120W specification tank cars. While methane (*i.e.,* LNG) was not authorized for transport in that later rulemaking, there is no indication in the record that the omission was due to safety concerns.

With respect to Earthjustice's concern, the above BLEVE incidents that occurred in Tivissa, Catalonia, Spain [31] and Zarzalico, Murcia, Spain [32] with cargo tank motor vehicles transporting LNG do not serve as an appropriate comparison to LNG rail tank cars. The tanks involved in these incidents had a single inner steel tank covered by an envelope of polyurethane foam and a lacquered aluminum jacket as opposed to the tank-within-a-tank design of the DOT–113C120W tank car consisting of an inner and outer tank made of steel. Although the cargo tanks involved in the incidents were both constructed of 304L stainless steel, the insulation material and the outer jacket (constructed of 2mm (0.080 in) of aluminum) held no vacuum. Neither the polyurethane insulation nor the thin aluminum, which were used in the construction and design of the outer tanks, are particularly fire resistant. Therefore, these envelopes around the tanks provided little fire protection in the accident scenarios.

Conversely, the DOT–113C120W tank car has a steel outer tank and a multi-layer insulation system, and is significantly superior in terms of both impact and fire resistance than the cargo tanks involved in the Spanish incidents. The annular space of the DOT–113 design works in combination with a properly functioning pressure relief system to diminish the likelihood of a high-energy event such as a BLEVE. Also, in the case of the Zarzalico accident, a significant portion of the insulation was destroyed by the fire, and in both cases the tank containing the LNG was directly exposed to the fire. Direct contact by flames resulted in increased pressure in the tank, followed by thermal tears of the unprotected tanks due to a decrease in material properties, rapid release of the contents, and subsequent ignition of the vapor cloud. Direct contact by flames on the inner tank of a DOT–113 is significantly less likely due to the more robust design of the DOT–113 tank car.

In response to comments from CPUC and members of the public, PHMSA notes that venting of a flammable cryogenic material, other than that caused by an accident, is prohibited, and is unlikely to occur given the DOT–113C120W tank car's safety features and operational controls to expedite the movement of flammable cryogenic materials. Although there may be rare instances as a result of offeror's failure to properly operate or maintain the pressure relief system, this concern is adequately addressed by existing HMR requirements for monitoring the average daily pressure rise, requirements for routine maintenance of PRDs, and the supplemental requirement adopted in this final rule to monitor the pressure in the tank remotely so that the shipper will be aware of issues that may result in venting before the tank car reaches its destination. Please see our discussion of existing operational controls in the HMR and the tank car design features in *Section III.* ''*Amendments to the Hazardous Materials Regulations Adopted in this Final Rule*'' of this final rule for further discussion of the existing framework that ensures safe, expedited movement of flammable cryogenic materials like LNG.

CPUC's comment brought up concerns over potential secondary fires caused by the release of LNG from a tank car due to exposure to fire, and BLEVEs of tank cars exposed to fire. As stated in the NPRM, DOT–113 specification tank cars are inherently more robust when compared to other specification tank cars, due to their unique design, materials of construction, and their specific purpose to transport cryogenic materials. The tank-within-a-tank design of the DOT–113 specification tank car reduces the probability of cascading failures of other undamaged DOT–113 specification tank cars being transported in a block or unit train configuration. While it is possible that ignition of these vapors could occur if an ignition source is present, the fire would be contained to the proximity of the release point of the vapors from the tank car. Additionally, it is highly unlikely that an undamaged DOT–113 specification tank car involved in a derailment would result in explosion due to a BLEVE due to the design of the tank car, the loading pressure requirements for cryogenic materials, the mandated requirements for redundant pressure relief systems (valves and safety vents) and the insulation systems that are built into each car. It is not possible to state with certainty whether a BLEVE is possible in the case of a LNG tank car derailment, and what conditions need to be present for such an event to occur. However, in a full-scale test [33] conducted in 2018, a double walled portable cryogenic tank was filled with liquid nitrogen (and PRDs operated as designed) and exposed to a greater than 200-minute engulfing propane pool fire. The tank was neither destroyed nor did a BLEVE occur.

Based on the suitability of the DOT–113 design and material of construction for cryogenic material, safety history of the car, and the existing framework in the HMR for hazard communication and operational control, PHMSA concludes that the DOT–113C120W tank car is a safe packaging to transport LNG by rail. PHMSA has evaluated years of LNG transportation via other modes and packagings, both international and domestic, to help assess the potential risks of LNG by rail resulting in our determination that the containment vessel is an equally safe alternative. PHMSA reaffirms that the DOT–113 tank car is suitable for use in LNG service, as it has a demonstrated safety record of over 50 years in the service of similar flammable cryogenic materials.

2. Crashworthiness Assessment/Field Tests

PHMSA received various comments regarding the crashworthiness and general field testing of the DOT–113C120W tank car. Notably, NTSB and other commenters requested that PHMSA and FRA complete a thorough crashworthiness and safety assessment of the DOT–113C120W tank car specification prior to authorizing it for LNG service. Further, they stated that relying on data for the accident history of similar hazardous materials transported in the small fleet of DOT–113 tank cars (as was done in the NPRM) or making engineering assumptions based on the performance of pressure tank cars with different features and operating parameters (as was done in the Exponent Report [34] referenced in the Special Permit 20534 docket) does not provide a statistically significant or valid safety assessment.

[31] *Explosion of a road tanker containing liquefied natural gas.* Eula'ia Planas-Cuchi, Nu´ria Gasulla, Albert Ventosa, Joaquim Casal. Journal of Loss Prevention in the Process Industries 17 (2004) 315–32. *https://www.academia.edu/7741565/Explosion_of_a_road_tanker_containing_liquified_natural_gas.*

[32] *Analysis of the Boiling Liquid Expanding Vapor Explosion (BLEVE) of a Liquefied Natural Gas Road Tanker: The Zarzalico Accident.* E Planas, E. Pastor, J. Casal, J.M. Bonilla. Centre for Studies on Technological Risk (CERTEC). Department of Chemical Engineering. Universitat Politècnica de Catalunya. *https://core.ac.uk/download/pdf/46606613.pdf.*

[33] FRA Full Scale Test titled: ''Fire Performance of a UN–T75 Portable Tank Phase 1: Loaded with Liquid Nitrogen''.

[34] The referenced Exponent Report is a study to examine the risks of bulk transportation of LNG by investigation the potential risk profiles for transport of LNG versus liquefied petroleum gas (LPG) by cargo tank motor vehicle and rail tank car. *https://www.exponent.com/knowledge/alerts/2015/08/bulktransportation/~/media/03b73782ec76446798c70f6ac403ef84.ashx.*

They also called into question how PHMSA determined that the specification DOT–113C120W tank car is an acceptable packaging to transport LNG. They noted their belief that the small number of DOT–113 tank cars in use and the documented 14 incidents referenced in the NPRM, in which three shell breaches occurred between 1980 and 2017, do not provide a demonstrated safety record. The Physicians for Social Responsibility cited the need to develop a new, robust tank car design. The Delaware Riverkeeper Network cited a lack of field tests on the survivability of the DOT–113 tank car loaded with LNG and the lack of simulation of the tank car ''hulls.'' The Puyallup Tribe of Indians stated its belief that PHMSA is in violation of the APA, stating that the NPRM was not supported by a complete and technically sufficient administrative record because there are ongoing and incomplete studies to determine the safety of transporting LNG in DOT–113 tank cars.

Earthjustice questioned the suitability of the DOT–113 tank car noting that ''. . . of the three specific derailments of the DOT113C120 tank car noted by the EA, all three ended up either breaching or needing to be breached and losing their entire cargoes. This represents 4.5% of the entire DOT113C120 tank car fleet.''

PHMSA Response

As noted previously, PHMSA does not agree that Earthjustice's analysis calls into question the suitability of the DOT–113C120W tank car. PHMSA has concluded that the safety history of DOT–113C120W tank cars is sufficient to demonstrate that these tank cars are appropriate for the transportation of LNG, as the DOT–113 tank car has a demonstrated safety record of over 40 years. Since authorized in the HMR, there have been no train-accident related fatalities or serious injuries in over 100,000 shipments of cryogenic material in DOT–113 tank cars. PHMSA has reviewed the approximately 450 Incident Report Form 5800.1 filings involving releases from DOT–113 (or equivalent AAR204W [35]) tank cars. Nearly all of these filings resulted from the non-accidental release of product attributed to defective or improperly secured valves and/or associated fittings and not a breach of the tank. The HMR requirements for the design and material of construction for the DOT–113, as well as existing operational controls and handling requirements for the tank car, have contributed significantly to the strong safety history of the DOT–113.

PHMSA disagrees with the suggestion that the Exponent Report in support of the DOT–SP 20534 is irrelevant to the discussion. That study conducted a quantitative risk assessment addressing unit train movement of LNG in DOT–113 tank cars. The study creates multiple models that estimate the potential damage of an LNG incident. Specifically, transport releases were evaluated along 1-mile long segments with varying population densities. While commenters have claimed that the study does not have a large enough sample size, PHMSA notes that the study used all the available data on DOT–113 incidents. The reason for that perceived lack of data is that DOT–113 tank cars have not been involved in many incidents during the timeframe that DOT–113s have been in use. Given that the study uses all the available data on DOT–113 incidents, PHMSA believes that the study's findings are useful in informing this final rule.

After internal review and in consideration of certain substantive comments received to the NPRM, PHMSA is further enhancing the safety of these tank cars to be equipped with a 9/16th inch thick outer tank and constructed from TC–128 Grade B Normalized steel. This represents a 28% increase in outer tank thickness over the current minimum requirements for a DOT–113C120W tank car in use for other flammable cryogenic materials. PHMSA has concluded that this change will improve the crashworthiness of the tank, thereby improving its effectiveness in retaining LNG contents during a crash scenario. This conclusion is supported by modeling conducted on the DOT–117 specification tank car with a 9/16th inch thick shell and heads used in flammable liquid service when compared with the previous DOT–111 tank cars with 7/16th inch steel. See *Section III. B.* ''*The DOT–113C120W Specification Tank Car*'' for further details on the tank car enhancements added in this final rule.

3. High Nickel Steels for Inner Tanks

The Puyallup Tribe stated that PHMSA failed to provide a sufficient factual basis to support its assertion that the materials used in the fabrication of DOT–113 tank car inner tanks are appropriate for the transportation of LNG. They noted that stationary LNG storage tanks use high nickel steels and that the specifications for American Society of Testing and Materials (ASTM) A240/240M 304, or 304L steels used in DOT–113C120W tank cars provide for a range of nickel content that can equal—but can also extend outside of—the range recommended for stationary LNG tanks. Therefore, they commented that there is no evidence that all steels meeting this specification will have the performance specifications appropriate for storing LNG that is being transported by rail. The Tribe further expressed their belief that PHMSA has not adequately demonstrated why ASTM A240/240M 304, or 304L steel will ensure safe transport of LNG in tank cars.

PHMSA Response

PHMSA disagrees with the Puyallup Tribe that there is no factual basis for the existing requirements for ASTM A240/240M 304, or 304L steels. The ASTM 300 series steels required in part 179 for DOT–113 tank cars have a long, successful history demonstrating the suitability of this steel as the material of construction for the inner tank of DOT–113 tank cars.

The 300-grade austenitic stainless steels (304/304L), commonly referred to as ''18–8 grade'' stainless steels, are the only steels authorized in the HMR for use when constructing the inner tank of a DOT–113 tank car. As discussed in *Section III. B.* ''*The DOT–113C120W Specification Tank Car,*'' ASTM A240/240M 304, or 304L steels have the best balance of toughness, strength, and weldability for transportation, along with being able to withstand extremely low temperatures.

By contrast, ASTM A553 steel, also known as ''9% Nickel'' alloy steel, has less ductility and requires special welding protocols. A553 steel can be used for static storage vessels which do not have to withstand the dynamic stress conditions experienced by the tank car during movement and the more frequent thermal cycles of loading and unloading experienced by tank cars. In tank cars, the use of A553 steel is not advisable, due to the physical properties of the steel. The HMR have not approved it for use in tank cars, in part, due to problems encountered with welded repairs.

Therefore, in this final rule, PHMSA is maintaining the requirement to construct the inner tank of a DOT–113 tank car from ASTM A240/240M 304, or 304L steels for the inner tank. Please see *Section III. B.* ''*The DOT–113C120W Specification Tank Car*'' for further discussion of the properties of 304 and 304L steel and the material of construction requirements for the inner tank of a DOT–113 tank car.

[35] The AAR204W is also authorized for the transportation of non-flammable cryogenic materials and has a similar design to a DOT–113.

4. Maximum Permitted Filling Density

AAR, RSI–CTC, and Chart Inc. disagreed with the maximum filling density proposed in the NPRM. Chart Inc. recommended that the filling density be 38.1 percent for a safety relief valve set at 75 psig, thereby corresponding to the 51.1 percent tabulated value for liquid ethylene. Chart Inc. further noted that flammable cryogenic materials in tank cars are required to have a 0.5 percent outage below the inlet of the pressure relief or pressure control valve at the start-to-discharge pressure setting of the valve, with the tank car in a level attitude.

RSI–CTC commented that PHMSA did not provide an explanation as to why it is imposing a maximum filling density that results in 15 percent outage rather than the standard 0.5 percent outage identified in existing regulations for other flammable cryogenic materials authorized by rail tank car. They stated that limiting LNG to a maximum filling density of 32.5 percent would require approximately 13 percent more tank cars to move the same volume of commodity, noting that this could increase the risk in transportation. Moreover, they stated that PHMSA's proposed limit is inconsistent with Transport Canada's regulations, which impose a 37.3 percent maximum filling density. To resolve this issue, they recommended that PHMSA consider adopting a maximum filling density of 37.3 percent, which they point out would harmonize the United States and Canada, as well as reduce the overall safety risk by reducing the total number of tank cars required.

PHMSA Response

PHMSA notes the concerns over the proposed filling density and the potential inconsistencies related to the outage requirements for flammable cryogenic materials. The filling density of 32.5% specified in the NPRM was based on a 15% outage (vapor volume) at PRV start to discharge pressure. The AAR Manual of Standards and Recommended Practices, M–1004 ''Specifications for Fuel Tenders'' requires the LNG filling of tenders used to fuel LNG powered locomotives with 15% vapor volume. The operating demands on tenders combined with the need for more vapor as a fuel and the expected refueling processes make the filling density acceptable for use with fuel tenders. In contrast, tank cars do not require these same considerations, and thus, the filling density should be aligned with other bulk packagings.

After reviewing the comments provided to the NPRM and conducting further technical analysis, PHMSA agrees that the proposed 32.5 percent filling density unnecessarily limits the amount of LNG that can be loaded into the tank car designed for commercial shipments and not locomotive fueling. Calculations were performed through linear regression analysis of authorized filling densities for cryogenic material in cargo tanks (*see* § 173.318). The equations derived during that analysis were compared with filling density values currently authorized for tank cars in § 173.319 for ethylene and hydrogen. The comparison between cargo tanks and tank cars filling density values held true for ethylene and hydrogen, so the equation was therefore used to derive the filling density for LNG in tank cars. This filling density value was compared to the results of calculations conducted by AAR, Transport Canada, and FRA. A filling density of 37.3% by weight is consistent with these four (AAR, Transport Canada, FRA, PHMSA) analyses.

Therefore, in this final rule PHMSA is adopting a 37.3 percent maximum filling density for LNG, which will require approximately 2 percent outage below the inlet of the PRD at the start-to-discharge pressure to prevent the venting of liquid material should the device activate. This represents a greater level of safety than other cryogenic packagings authorized in the HMR and internationally, which only require a 0.5% outage requirement below the PRD inlet at the start-to-discharge pressure. Additionally, a 37.3 percent maximum filling density harmonizes with Transport Canada's TDG regulations. Please see the *Section III.B.* ''*The DOT–113C120W Specification Tank Car*'' discussion for additional discussion of filling density.

5. Maximum Pressure When Offered

RSI–CTC stated that the proposed offering pressure of 15 psig for the Pressure Control Valve Setting or Relief Valve Setting in § 173.319(d)(2) is inconsistent with Transport Canada's requirements, which impose a 10 psig maximum offering pressure, and departs from AAR's practice of assuming a 10 psig maximum offering pressure to determine the individual specification requirements for DOT–113C120W tank cars. They also stated that while PHMSA appears to be relying on § 173.319(e)(1) for its determination that 15 psig is consistent with the 20-day transportation requirement for cryogenic materials and the estimated 3 psig per day maximum pressure increase during transportation, current regulations for DOT–113 tank cars as set forth in part 179, subpart F do not specify a time-in-transit limit for cryogenic materials. Rather, RSI–CTC asserted that both DOT's predecessor and the AAR have historically assumed a 30-day hold time in developing the DOT–113C120W specification. Moreover, the commenter noted that the average daily pressure rise limit of 3 psig per day, as set forth in § 179.319, is an operating specification for shippers designed to trigger inspection of the tank vacuum to ensure thermal integrity and should not be imposed as a design requirement to calculate the maximum offering pressure.

PHMSA Response

PHMSA agrees that the HMR do not specify a time-in-transit limit. However, PHMSA requires notification to FRA if a flammable cryogenic material has not reached the consignee within 20 days. FRA closely monitors any situation requiring notification of more than 20 days in transit, and our experience is that rail carriers act to expedite movement of the tank car to its destination or take swift corrective action to reduce the pressure within the tank if necessary. Therefore, PHMSA believes that the 15 psig maximum offering pressure is appropriate for the transportation of LNG and is consistent with the level of safety provided to other flammable cryogenic materials. Further, the HMR do not prohibit shippers from offering a tank car of LNG at a lower pressure. Please see *Section III.B.* ''*The DOT–113C120W Specification Tank Car*'' and *III.C.* ''*Additional Operational Controls for LNG Transportation*'' for additional discussion of offering pressure and the operational controls for the movement of these tank cars.

6. Insulation

Chart Inc. noted in their comment that Mylar is a plastic material that is incompatible with the potential for flammable gas in the annular space. They further stated that common wrapped insulation used in such tanks is often referred to as MultiLayer Insulation (MLI), Super Insulation (SI), or MultiLayer Super Insulation, which consists of alternating layers of aluminum foil and a non-conducting spacer material. Chart Inc. further explained that fiberglass or Perlite powder can be used as a potential alternative in place of or in addition to the MLI or SI.

PHMSA Response

PHMSA agrees that use of the term Mylar in the preamble of the NPRM was inconsistent with the current design and practice. The DOT–113 construction design relies on a performance standard in § 179.400–4 that does not specify the use of Mylar or any other specific type of material to be used for insulation. In the NPRM, PHMSA inadvertently represented ''Mylar'' as a specification requirement for MLI or SI use on a DOT–113, when in fact, it is not. Please see our discussion of the insulation system and thermal performance monitoring program in Section III of this final rule for more information on DOT–113 insulation requirements.

7. Maximum Gross Rail Weight

RSI–CTC and AAR commented on the existing allowable gross weight of rail tank cars. They stated the FRA provided notice in the **Federal Register** of approval of the operation of certain tank cars in hazardous materials service up to 286,000 pounds GRL, further noting that this approval does not address cryogenic tank cars.[36] Specifically, RSI–CTC recommended adding language in § 179.13 that would authorize a GRL limitation of up to 286,000 pounds, thereby removing the need for FRA approval and allowing for heavier inner or outer tanks. They further stated that authorizing cryogenic tank cars to operate with 286,000 pounds GRL would not increase the volume of commodity transported (which would still be limited to 34,500 gallons) and would enable manufacturers to increase the weight of the tank car by building it with a thicker outer shell, which would enhance the overall safety of these tank cars in cryogenic service.

PHMSA Response

PHMSA acknowledges that the thicker outer tank, as required in this rulemaking, will have a net impact of increasing the overall weight of a loaded DOT–113C120W9 tank car. The added tank thickness is expected to increase the overall weight of the tank car by approximately 11,050 pounds. See the Table 6 below for a comparison of the DOT–113C120W and DOT–113C120W9 tank car weights. PHMSA estimates the light (empty) weight of a DOT–113 tank car for LNG to be approximately 138,050 pounds and the estimated weight of allowable LNG that can be loaded into the car at roughly 108,000 pounds. This equates to a maximum gross weight on rail of only 246,050 pounds. However, the request to remove the approval requirement for tank cars greater than 263,000 pounds GRL is beyond the scope of this rulemaking, as it is not specific to LNG and would therefore impact all cryogenic materials transported by tank car. Additionally, while 2011 FRA Notice does not specifically mention cryogenic tank cars, PHMSA and FRA reiterate that the broad language in the FRA's January 2011 approval clearly contemplates application to cryogenic tank cars. Therefore, a DOT–113 tank car manufactured for LNG service after (the effective date of this final rule) is approved for a maximum GRL of 286,000 provided the tank car meets the following criteria:

1. Tank car is constructed in accordance with S–286.

2. The outer shell and heads are constructed with TC–128 Grade B, normalized steel.

Please see our discussion of maximum GRL in *Section III.B.* ''*The DOT–113C120W Specification Tank Car*'' of this final rule for additional details. PHMSA is adding a new section, § 179.400–26, to the DOT–113 specification requirements to indicate clearly that DOT–113C120W9 tank cars exceeding 263,000 lbs. gross weight are (in light of FRA's January 2011 approval) approved by FRA for a maximum gross weight of 286,000 provided they meet the two conditions above.

The following table provides a comparison of the approximate weight of a DOT113C120W tank car with an outer tank shell thickness of 7⁄16 (*i.e.,* the current standard) vs. 9⁄16 *(i.e.,* the standard adopted in this final rule) is provided in the following table. Note that stiffening ring weight changes with outer tank thickness. In this comparison, a thicker outer tank corresponds to less stiffening ring weight.

TABLE 6—GROSS RAIL WEIGHT CALCULATION

[Approximate weights for a DOT113C120W Tank Car]

Outer Shell Thickness.	7⁄16″	9⁄16″.
Inner Tank Thickness.	3⁄8″	3⁄8″.
Combined Tank Weight.	98,250 lbs..	109,500 lbs.
Stiffening Ring Weight.	1,750 lbs.	1,550 lbs.
Fittings/Piping/Housing.	3,800 lbs.	3,800 lbs.
Running Gear	23,200 lbs..	23,200 lbs.
Estimated Light Weight.	127,000 lbs..	138,050 lbs.

8. DOT–113C140W Tank Car Specification

Consistent with its prior petition, AAR reiterated its suggestion that PHMSA adopt the DOT–113C140W tank car standard. However, AAR noted that PHMSA may require more time to evaluate the new tank car specification, as it is not currently authorized by the HMR. Therefore, AAR suggested that PHMSA proceed with authorizing the DOT–113C120W tank car for LNG service at this time and consider authorizing the DOT–113C140W tank car in a future rulemaking.

PHMSA Response

PHMSA agrees that it would take additional time and resources to create and evaluate a new specification (*e.g.,* the DOT–113C140W) not authorized under the current HMR. Furthermore, PHMSA believes the addition of this tank car specification warrants further engineering review and evaluation, including consideration of safety risks presented by the new design specification. Increased thickness and improved outer tank materials, as required in this final rule, require minimal engineering effort; and insofar as PHMSA regulations establish *minimum* thickness requirements for DOT–113 cars, those regulations have always permitted outer tanks of varying thickness above those lower limits.

In contrast, a new inner tank design with a higher test pressure of 140 psig requires significant engineering effort that is beyond the scope of this rulemaking. An inner tank designed to withstand a test pressure of 140 psig has a thicker wall, and has different pressure relief features that would need to be tested extensively prior to authorization for use in transportation. The designs for the new inner tank, the 140 psig pressure relief system, and the new design's thermal performance would each need to be validated. The inner tank, along with the thermal protection provided by the annular space, is the most safety critical component to retaining the contents of the car during normal conditions incident to transportation. The outer tank, on the other hand, shields the inner tank from physical damage, exposure to the elements, and in-train forces, while providing structural support to the packaging. Unlike a change to the inner tank, the enhancements to the outer tank denoted by the new specification suffix would not require the extensive additional engineering review because PHMSA and FRA have access to testing and modeling data that demonstrate the

[36] Notice regarding FRA approval for operating certain railroad tank cars in excess of 263,000 pounds gross rail load. January 25, 2011; 76 FR 4350.

crashworthiness improvements from a thicker 9/16th inch outer tank.

9. PHMSA Determination Regarding Tank Car Design

In summary, PHMSA acknowledges the comments received addressing the appropriateness of the DOT–113C120W tank car for LNG transportation. As discussed in this section, and in Section III, PHMSA has concluded that the DOT–113C120W tank car is an appropriate packaging for LNG transportation.

The existing structure of the HMR—to include requirements for packaging design—provides for the safe transportation of all hazardous materials. The DOT–113C120W9 tank car is a variation of the DOT–113 specification currently authorized in the HMR for use as a packaging for cryogenic material, including flammable cryogenic material like LNG. The ''C'' delimiter for this type of tank car indicates a temperature rating for service that is suitable for LNG. Furthermore, the existing HMR include requirements for components specific to flammable cryogenic material services, such as PRDs and thermal insulation systems.

PHMSA believes that transportation of LNG by DOT–113C120W-specification rail tank car as proposed in the NPRM would be safe if LNG was transported in similar quantities to what is currently done for ethylene. Currently, because of market demand and usage patterns for ethylene, DOT–113 tank cars are transported as part of mixed commodity freight trains at one to three cars per train. However, when transported in larger fleets—in blocks of cars larger than three or in unit trains—there is a higher probability that cars containing this material will be involved in a derailment when a derailment or other accident occurs, leaving the potential for more hazardous material to be released during an incident. While PHMSA cannot predict the number of DOT–113C120W9 tank cars per train the LNG market will support, the agency does have relevant information from ETS's application for DOT SP 20534, which indicates the company plans to operate unit trains of at least 80 cars per train at some point in the future. Therefore, even though the current outer tank specifications of existing DOT–113s are appropriate for the physical properties of LNG, the potential increased risk involved in transporting LNG in blocks of more than three or in unit trains warrants the additional safety margin that is currently available from the tank car manufacturing industry. As a result, PHMSA is amending the DOT–113 specification to require tank cars with a minimum outer tank thickness of 9/16th inch constructed from TC–128 Grade B, normalized steel (those enhancements to be indicated by the specification suffix ''9''). PHMSA believes that this change will further enhance the safety of the DOT–113 tank car by significantly increasing its crashworthiness.

B. Operational Controls

PHMSA did not propose supplemental operational controls in the NPRM beyond the existing requirements in the HMR, but did invite comment on whether PHMSA and FRA should rely on existing regulations and the operational controls in AAR's Circular OT–55, or if additional operational controls may be warranted based on an assessment of risk. PHMSA encouraged commenters to provide data on the safety or economic impacts associated with any proposed operational controls, including analysis of the safety justification or cost impact of implementing operational controls. Further, PHMSA invited comment on the operational controls included in the special permit described above, due to the overlapping content contained in the NPRM.

Numerous commenters expressed concern about the possible operational controls associated with the transportation of LNG by rail. For example, the International Association of Fire Fighters (IAFF) suggested that PHMSA conduct a more expansive safety assessment of the DOT–113 rail car before making the decision to forgo additional operational controls. In the responses below, PHMSA has sorted these comments into the following subtopics: Braking and Routing Requirements, Maximum Train Length and Weight, Speed Restrictions and AAR Circular OT–55, and Separation Distance. Please also see *Section III.C.* ''*Additional Operational Controls for LNG Transportation*'' for more discussion.

1. Braking and Routing Requirements

NTSB, the Transportation Trades Department, AFL–CIO (TTD), New Jersey Department of Environmental Protection (NJDEP), Members of the New Jersey Senate and Assembly, NYDOT, NYDEC, NYDHSES, IAFF, and others commented that PHMSA should require braking and routing requirements for trains carrying LNG. NTSB specifically commented that PHMSA should require that trains be ''equipped and operated with either electronically controlled pneumatic (ECP) brakes, 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.''

Conversely, AAR commented that there is no justification for braking and routing requirements for trains carrying LNG shipments to be as restrictive as the requirements for HHFTs. AAR noted that if PHMSA were to apply braking and routing requirements similar to those imposed on HHFTs to trains carrying LNG, the requirements should only apply to a train transporting 20 or more loaded tank cars of LNG in a continuous block, or to a train carrying 35 or more loaded tank cars of LNG throughout the train.

PSR and the Surfrider Foundation expressed concern that the possibility of a terrorist attack has not been properly considered when looking at the security measures for LNG by rail. They further stated that the urban routing of LNG unit trains would make them highly vulnerable to attack by terrorists and that the predictability and visibility of commercial rail traffic through urban settings would make targeting easy and devastating. The Governor of Washington State, on behalf of Washington State, also expressed concern that the NPRM did not address the risk of terrorist attacks.

PHMSA Response

PHMSA agrees that requiring enhanced braking is necessary for trains meeting an LNG analog of the HHFT threshold (*i.e.,* 20 continuous tank cars of LNG or 35 tank cars of LNG throughout the train). PHMSA and FRA determined that this threshold best captures the higher-risk bulk quantities transported in unit trains, while excluding lower-risk manifest trains. PHMSA and FRA have concluded that the HHFT threshold is suitable for the transportation of LNG because these materials have similar risk profiles when transported in such configurations. If a tank car containing LNG is breached during a derailment, the LNG will behave largely the same way as crude oil or ethanol. The LNG lading will be released as a very cold liquid, creating an LNG pool and likely a fire.

The effective use of braking on a train can result in accident avoidance and can lessen the consequences of an accident by diminishing in-train forces. This can reduce the likelihood of a tank car being punctured and decrease the likelihood of a derailment. PHMSA believes that requiring enhanced braking for these train configurations provides a cost-effective way to reduce the number of cars and the energy associated with train accidents.

In consideration of the comments received, consistent with comments from NTSB and others, PHMSA is adding a requirement that for a single train with 20 or more loaded tank cars of LNG in a continuous block or a single train carrying 35 or more loaded tank cars of LNG throughout the train, each carrier must ensure that the train is equipped and operated with either an EOT device, as defined in 49 CFR 232.5, or a DP system, as defined in 49 CFR 229.5.

Some public commenters, including Earthjustice, noted that PHMSA did not propose a requirement that trains transporting LNG be equipped with ECP brakes, which they suggest would provide an extra measure of safety. PHMSA and FRA did consider adopting ECP brake requirements in this final rule but ultimately determined that such a braking requirement would not be practical.

Freight railroads in the U.S. overwhelmingly rely on conventional air brakes to comply with FRA regulations for stopping a train.[37] This conventional air brake system has been in use since 1869 and has proven to be reliable and effective. Conventional air brakes use air pressure to apply and release the brakes on each car in a train. When air pressure is reduced in a braking application, the air brakes will apply sequentially from the front to the back of the train. ECP brake systems are an alternative braking technology that integrate electronic and pneumatic communications hardware into one package to allow for nearly instantaneous responses to locomotive braking commands throughout an entire train. While some types of ECP brake systems overlay the air brake system, the integrative functions of ECP brakes essentially require the entire train be equipped with operable ECP brakes if the system is to be effective. Except in very rare circumstances where the railroads are capable of keeping and maintaining captive unit train fleets, railroads in the U.S. have not implemented ECP brake systems into their operations.

PHMSA previously considered and adopted ECP brake requirements for a limited subset of HHFTs in its final rule on ''Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains,'' (HM–251; 80 FR 26643, May 8, 2015), based on the potential benefits of those trains' being operated effectively as a captive fleet. However, a subsequent re-evaluation of the HM–251 ECP brake requirements found that even the ''captive'' unit train configurations operating with ECP brakes are not cost-beneficial in the HHFT environment. (HM–251F; 83 FR 48393; Sep. 25, 2018). As a result, PHMSA removed requirements pertaining to ECP brake systems on high-hazard flammable unit trains.[38] PHMSA relies on the analysis in HM–251F to inform its decision in this final rule to not require ECP brakes on trains transporting LNG.

While PHMSA is not implementing ECP brake requirements, both agencies recognize the importance of advanced braking for trains transporting large quantities of LNG. As result, PHMSA is requiring advanced braking in the form of a two-way EOT device or linked and operational DP system located at the rear of the train. The two-way EOT device or DP system at that rear of the train is more effective than conventional brakes because the rear cars can receive the emergency brake command more quickly, which allows the back of the train to start braking quicker than if the train was only equipped with conventional air brakes. This can reduce stopping distances and lessen in-train forces that can cause or contribute to the severity of certain derailments.

The action taken by PHMSA in this final rule, requiring the use of a two-way EOT device or DP unit at the end of the train for a single train with 20 or more loaded tank cars of LNG in a continuous block or a single train carrying 35 or more loaded tank cars of LNG throughout the train, is consistent with the comments of NTSB, Members of the New Jersey Senate and Assembly, and the Attorneys General for various States. It matches the current requirements for HHFTs, which apply to Class 3 flammable liquids that are transported in a single block of twenty cars or 35 cars dispersed throughout a single train. Given the comments received and the similarity in risk profiles with HHFTs, PHMSA and FRA have determined that the requirement for a two-way EOT device or a DP system in the rear of the train is an acceptable safety measure.

Regarding rail routing requirements, PHMSA agrees that requiring additional planning and route analysis will provide safety benefits to the transportation of LNG by rail. The routing requirement will reduce the severity of the consequences of a derailment by requiring that railroads transport LNG on the safest route available to them.

Accordingly, PHMSA is amending § 172.820 to require that a train carrying LNG in a rail tank car be subject to the additional planning requirements of that section. This change will require rail carriers to compile annual data on shipments of LNG and use the data to analyze safety and security risks along rail routes where LNG is transported, assess alternative routing options, and make routing decision based on those assessments.

Regarding the risk of terrorism, 49 CFR part 172, subpart I—Safety and Security Plans, prescribes security requirements for shippers and carriers while a hazardous material is in transportation. Flammables (*e.g.,* LNG) transported in large bulk quantities (*i.e.,* 3,000 liters [792 gallons]) in a single packaging such as a tank car are subject to requirements for development and implementation of plans to address security risks, including preventing unauthorized access to the material, providing for en route security, and personnel security. PHMSA believes these existing requirements adequately address the security risks associated with the transportation of LNG by rail. Please see additional discussion of existing security planning and rail routing requirements in *Section III. A. ''Existing HMR Requirements for Rail Transport of Flammable Cryogenic Material.''*

2. Maximum Train Length/Weight

Some commenters suggested limiting the number of LNG tank cars in a train; however, no commenters provided specific recommendations on what would constitute the preferred maximum number of cars. The National Association of State Fire Marshals (NASFM) noted that although 19 cars of LNG would not trigger the ''Key Train'' requirements, it would be a large enough quantity to present a significant hazard.

AAR noted that research[39] on the safety impact of operating so-called ''long'' trains suggests that there is no increased risk of derailment, further commenting that the use of fewer, longer trains may reduce derailment rates. AAR further stated that PHMSA should not create a limit on train length within the context of this rulemaking.

Others expressed concern that these tank cars could damage and degrade train tracks, leading to potential future derailments. Additionally, a few commenters noted that PHMSA and FRA should assess and fix damaged

[37] 49 CFR part 232.

[38] The HM–251 final rule defined a ''high-hazard flammable unit train'' (HHFUT) as a train comprised of 70 or more loaded tank cars containing Class 3 flammable liquids.

[39] *See* footnote 9, page 3—*https://www.regulations.gov/document?D=PHMSA-2018-0025-0209.*

railroad tracks prior to making any determination on whether it is safe to transport LNG by rail.

PHMSA Response

PHMSA appreciates comments regarding potential limitation of maximum weight and length for trains containing LNG. PHMSA has determined that there should not be a maximum for either in this rulemaking. PHMSA notes that the HMR do not limit the number of shipments a shipper can offer into transportation, and do not restrict the number or type of hazardous materials rail cars a carrier can transport in a train. PHMSA and FRA believe that train length is best determined by individual railroads. The function of determining an individual railroad's appropriate train operating lengths is based on multiple factors. The railroads are best positioned to determine the appropriate train lengths and weight based on multiple factors including, but not limited to, the following: Route characteristics, train make-up, train dynamics, and crew training and experience. Furthermore, FRA notes that damage and degradation to railroad tracks due to the transport of DOT–113C120W9 tank cars is unlikely. All routes used to transport hazardous materials have rail infrastructure to handle trains with rail cars with a GRL of 286,000 pounds. Railroads execute a track and rail integrity inspection program that exceed the minimum Federal requirements. In addition, they are implementing technology that enables the inspection of more miles of track per day and identifies defects with greater reliability.

3. Speed Restrictions/AAR Circular OT–55

PHMSA received several comments recommending stricter regulations regarding the transport of LNG by rail, including speed restrictions and other operational controls. Numerous commenters, such as NTSB, NASFM, Delaware Riverkeeper Network, Congressman DeFazio, and the Attorneys General for various States, expressed concern that PHMSA did not propose additional safety regulations for the transport of LNG by rail in the NPRM. NASFM noted that, regardless of current industry practice, the AAR Circular OT–55 is ''recommended,'' rather than mandated by regulation. Earthjustice commented that OT–55 is insufficient to keep LNG safe, stating that there is a lack of transparency on its use. They further noted that without further analysis, PHMSA cannot confirm railroads are following OT–55. They also claimed that even if HHFT-style operational controls were put in place, the material is still too dangerous and liable to spill in the event of a derailment and potentially cause a BLEVE or vapor cloud explosion (VCE).

Several commenters, including NTSB, recommended that PHMSA implement operational controls similar to the protections currently in place for HHFTs, as provided in § 174.310.

A few commenters, including AAR and RSI–CTC, noted that they agree with PHMSA's determination that AAR's Circular OT–55 provides a ''detailed protocol establishing recommended railroad operational practices'' for transporting hazardous materials. One commenter further noted that they do not support incorporation of Circular OT–55 by reference because it would disincentivize the development of industry standards that are more rigorous than the Federal requirement. NYDOT, NYDEC, and NYDHSES commented that they would like to see the AAR Circular OT–55 incorporated into the HMR and the HHFT requirements applied to trains carrying LNG.

PHMSA Response

PHMSA notes that AAR's Circular OT–55 is a detailed protocol establishing railroad operating practices for the transportation of hazardous materials, including speed restrictions, which was developed by the rail industry through the AAR.[40] The recommended practices were originally implemented by all Class I rail carriers operating in the United States, with short-line railroads following on as signatories. Also, since Circular OT–55 is an industry practice, new safety procedures can be adopted efficiently and implemented nationally. The industry voluntary approach allows for greater flexibility to stay abreast of fast-changing technology and changes in the market, and facilitates safety by leveraging industry incorporation of OT–55 into their operating rules and cooperation with regulators versus an adversarial enforcement relationship.

Thus, PHMSA believes the operational control recommendations in AAR Circular OT–55 address safety concerns related to train movements of hazardous materials comprehensively, including train speed restrictions in Key Train configuration. OT–55 limits Key Train speed to 50 mph. PHMSA and FRA believe that this maximum speed limit is appropriate for the transportation of LNG based on its similarity to other Division 2.1 flammables, including cryogenic materials, that are allowed to be transported at a maximum speed of 50 mph, and based on the DOT Specification 113 standards. Additionally, AAR's Manual of Standards and Recommended Practices (MSRP) establishes rail equipment standards, including equipment speed restrictions, that limits tank cars (including DOT–113 tank cars) to an operating speed of 50 MPH. This speed restriction is independent of whether they are aggregated into a Key Train configuration or not.

Further, PHMSA and FRA have verified that railroads are implementing and following Circular OT–55 through their operating rules. PHMSA and FRA believe this industry standard reduces the risk of derailments and collisions and therefore decreases the risk involved in the transportation of all hazardous materials, including LNG. Please see *Section III.C.* ''*Additional Operational Controls for LNG Transportation*'' for a full discussion of the benefits of OT–55.

4. Separation Distance

Commenters, including NTSB and the Brotherhood of Locomotive Engineers and Trainmen (BLET), noted that the transportation of LNG would also increase the safety risk for train crews. The NTSB referenced two safety recommendations issued to PHMSA in response to the December 30, 2013, collision of two Burlington Northern Santa Fe (BNSF) freight trains in Casselton, North Dakota (R–17–1 and –2) that resulted in the derailment of 20 tank cars loaded with crude oil and the release of 476,000 gallons. The safety recommendations reference risks posed to train crews and the separation distance and configuration of hazardous materials cars, locomotives, and occupied equipment to ensure the protection of train crews during both normal operations and accident conditions. In the comment to the NPRM, the NTSB urged PHMSA to implement appropriate train crew separation distance requirements, as recommended by Safety Recommendations R–17–1 and –2, issued March 9, 2017. Specifically, the Safety Recommendations are:

R–17–01

Evaluate the risks posed to train crews by hazardous materials transported by rail, determine the adequate separation distance between hazardous materials cars and locomotives and occupied equipment that ensures the protection of train crews during both normal operations and accident

[40] Circular OT–55, ''Recommended Railroad Operating Practices for Transportation of Hazardous Materials,'' *https://www.railinc.com/rportal/documents/18/260773/OT-55.pdf.*

conditions, and collaborate with the Federal Railroad Administration to revise 49 Code of Federal Regulations 174.85 to reflect those findings.

R–17–02

Pending completion of the risk evaluation and action in accordance with its findings prescribed in Safety Recommendation R–17–01, withdraw regulatory interpretation 06–0278 that pertains to 49 Code of Federal Regulations 174.85 for positioning placarded rail cars in a train and require that all trains have a minimum of five nonplacarded cars between any locomotive or occupied equipment and the nearest placarded car transporting hazardous materials, regardless of train length and consist.[41]

AAR commented that there should not be additional buffer car requirements for trains transporting LNG or any other hazardous material. They further noted that it is not justified from a safety and risk standpoint.

PHMSA Response

PHMSA has initiated a research project in coordination with the Volpe Center to address NTSB Safety Recommendations R–17–1 and –2. This effort will result in a report that identifies gaps in the existing studies, areas for further research, and what conclusions can be drawn collectively from the existing knowledge base, if any. PHMSA may consider changes to the separation distance requirements in § 174.85 of the HMR for placarded rail cars and tank cars in mixed commodity freight train and unit train configurations pending the outcome of the study. However, PHMSA is not amending the separation distance requirement in this final rule at this time. *See Section III.C.* ''*Additional Operational Controls for LNG Transportation*'' for further discussion of operational controls include consideration of separation distances.

PHMSA and FRA collaborated under the scope of the Rail Safety Advisory Committee Hazardous Materials Issues Working Group Task No. 15–04 to address the issue of separation distance. Ultimately, due to an absence of consensus of the Working Group participants, as well as a lack of established incident data, the members did not reach agreement on a change to the existing regulation governing hazardous materials in train separation distances. Moreover, PHMSA worked with the Volpe Center in its review of rail accidents occurring between 2006 and 2015 where there was a release of hazardous materials near the head end of the train (occupied locomotive). The study found no reported crew injuries and therefore no injuries that were potentially preventable with additional buffer cars.

5. PHMSA Determination Regarding Operational Controls

The existing structure of the HMR—to include requirements for operational controls—provides for the safe transportation of all hazardous materials. In the NPRM, PHMSA and FRA considered additional operational controls specific to LNG, such as mirroring the operational controls adopted for HHFTs,[42] adopting OT–55 or ''Key Train'' requirements into the HMR, limiting train length, or requiring controls for train composition, speed, braking, and routing.

PHMSA acknowledges the concerns about relying on a widely adopted, voluntary industry standard, rather than imposing regulatory requirements. After internal review and in consideration of certain substantive comments, PHMSA is requiring a two-way EOT device or DP on the rear of any train consisting of 20 or more loaded tank cars of LNG in a continuous block or 35 or more loaded tank cars of LNG throughout the train. Further, PHMSA is requiring that each rail car of LNG must be remotely monitored for pressure and location. Finally, trains consisting of an LNG tank car are subject to route planning and routing analysis requirement. PHMSA believes these operational controls, in conjunction with what is already required under the HMR and the ''Key Train'' requirements in Circular OT–55, will ensure the safe transportation of LNG. PHMSA and FRA have verified that railroads are following and implementing Circular OT–55 through incorporation into their operating rules. PHMSA does not believe that explicit speed restrictions are necessary given the widespread adoption of Circular OT–55. PHMSA and FRA expect that Circular OT–55 will be evaluated by the rail industry regularly and that additional operational safety measures beyond the minimum requirements of the HMR will be included to address operational concerns, as appropriate. FRA actively works with AAR's Hazardous Materials Committee, which is responsible for reviewing and updating of OT–55. The Committee reviews OT–55 annually and determines if an update is warranted. If a change to OT–55 is needed, the Committee will update the document accordingly and will published it as an AAR Casualty Prevention Circular (CPC).

C. Environmental Impacts

PHMSA received many comments recommending further analysis of the environmental impacts associated with this rulemaking. Please refer to the Final Environmental Assessment for discussion and response to comments.

D. Economic Analysis

PHMSA received several comments related to the economic analysis of the rulemaking. Please refer to the Final Regulatory Impact Analysis (RIA) for discussion and response to comments.

E. Emergency Response

Several commenters expressed concern about the perceived emergency response ramifications associated with the transportation of LNG by rail tank car. PHMSA has sorted these into the following subtopics: Training for Emergency Responders, Current Emergency Planning, Evacuation Distances, and Modeling Availability.

1. Training for Emergency Responders

Several commenters are concerned that emergency responders lack the training and expertise to respond to an LNG tank car incident, especially in unit train configurations. They commented that the current emergency response requirements may be insufficient to address an incident involving LNG, including the potential for a BLEVE in accident conditions. The Center requested proper training and notification of local responders to the presence of LNG trains. NYDOT, NYDEC, NJDEP, and NYDHSES suggested that PHMSA provide specific training, resources, and support to emergency response personnel, including cooperation with State fire training agencies to ensure training is consistent, effective, and readily available as a requirement in the final rule, similar to the special permit. NFPA cited previous comments they have submitted to regulatory actions regarding emergency response resources. Specifically, NFPA stated that adding a flammable cryogenic material, like LNG, to the existing HHFT rail shipments posed further challenges to the capabilities and resources for local responders. IAFC recommended that PHMSA work with shippers and carriers to develop and deliver critical product, container and emergency response information, and related training materials for the emergency planning and response communities. Furthermore, the Governor of Washington State, on behalf of

[41] ''Consist'' means the group of rail cars that make up the train.

[42] As defined in § 171.8, a high-hazard flammable train 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.

Washington State, contended that the NPRM did not address crew training and emergency response.

PHMSA Response

PHMSA agrees that proper training and information sharing are necessary ingredients in promoting a safety transportation system and is committed to ensuring emergency responders have the information and tools they need to respond to hazardous materials incidents safely. First, PHMSA notes that Class I railroads typically provide and sponsor training for emergency responders along their routes. Additionally, while large-scale LNG incident response training is available through various organizations,[43] the currently available training is not specific to rail transportation, and PHMSA and FRA are working jointly with relevant industry experts to ensure the availability of appropriate training resources for emergency responders that include rail-specific information. For example, FRA has already provided grant funding to TRANSCAER® to develop and refine LNG by rail emergency response training.[44] Additionally, PHMSA is developing a Commodity Preparedness and Incident Management Reference Sheet similar to that which was created for crude oil transportation. This reference sheet will provide emergency response organizations with a standard incident management framework based on pre-incident planning, preparedness principles, and best practices. Furthermore, it will address transportation safety and precautions; hazard assessment and risk; rail safety procedures; logistics; and the tools, equipment, and resources necessary to prepare for and respond to incidents.

PHMSA required in DOT–SP 20534 that the grantee provide training, conforming to NFPA 472, to emergency response agencies that could be affected between the authorized origin and destination. However, due to the ongoing efforts to ensure adequate emergency response training described above, such a requirement is not necessary in this final rule.

PHMSA is also engaged in outreach activities to educate and gain input from emergency responders directly. In October 2019, PHMSA and the Federal Emergency Management Agency (FEMA) National Fire Academy (NFA) held a Town Hall Meeting in Lancaster County, Pennsylvania.[45] The purpose of the Town Hall Meeting was to seek input from and note concerns of the emergency preparedness community and its stakeholders in the mid-Atlantic region—specifically, Pennsylvania and New Jersey, related to LNG transportation. The meeting consisted of a series of technical presentations on LNG transportation risks and incident response protocols. Then, attendees participated in open discussions related to the topic of general rail transportation of LNG. While attendees provided general inputs on issues related to improving the overall effective response capability in the event of a rail incident of LNG, there was no heightened concern regarding the commodity or mode of transportation. PHMSA found that the emergency responders in attendance were well oriented to the challenges of LNG incident response, as they already have LNG transiting through their communities in other modes of transportation and have improved and adjusted their plans to include LNG.

PHMSA is committed to furthering engagement with emergency responders throughout the country regarding the transportation of LNG by rail through various forms of outreach, to include additional Town Hall Meetings, participation at the annual IAFC conference, trainings, and webinars.

2. Current Emergency Planning

Numerous commenters, to include The Village of Barrington, Illinois, expressed concern for the safety of emergency responders. Several individuals stated their belief that current emergency response plans may be insufficient to address a rail incident involving LNG, further noting that an LNG train derailment could cause severe damage to the surrounding area and that first responders would be unable to control any type of fire or explosions. Additionally, some commenters expressed specific concern that there is no way to extinguish an LNG fire, with the only option to let the fire burn out.

Additionally, the NJDEP requested that emergency response plans be in place to prepare local responders better. They also requested that the emergency response plans include the route and an alternative route analysis, developed with the State and local emergency responders impacted, identifying all sensitive receptors within the 1-mile buffer of the route and any alternative routes, with plans on how to protect public health and safety and the environment. They stated that this information should be shared with the States, providing an opportunity for States to comment on routes and planning.

PHMSA Response

PHMSA directs grant programs that are designed to improve hazardous materials safety. For example, the HMEP grants to States, Territories and Native American tribes enhance their emergency response capabilities when dealing with hazardous materials related transportation incidents. The grants, authorized under 49 U.S.C 5116, assists each recipient in performing their hazardous materials response duties and aid in the development, implementation, and improvement of emergency plans for local communities and training for emergency responders to help communities prepare for a potential hazardous materials transportation incident. The hazmat safety grant programs have helped to foster partnerships with State and local communities through ensuring emergency responders are prepared and trained to respond properly to hazmat transportation incidents nationwide. PHMSA believes that these efforts will prepare emergency responders for the risks regarding LNG transportation. PHMSA will continue to assess the effectiveness of these programs and the preparedness of emergency responders. As previously noted, FRA has provided grant funding to TRANSCAER® to develop and refine LNG emergency response training.

Finally, as discussed in Section III of this final rule, PHMSA is revising § 172.820(a) to add a condition requiring any rail carrier transporting a quantity of LNG in a rail tank car to comply with the additional safety and security planning requirements for transportation by rail, which means the rail carrier is subject to collecting commodity data, performing a route analysis, and determining alternative routes. We are further revising the additional planning requirements to add a new condition for rail carriers to factor in transport of LNG to a routing analysis prior to the onset of transport of any loaded tank car of LNG. Once transport of LNG begins for a carrier, it can revert to the standard requirement to compile commodity flow data no later than 90 days after the end of each calendar year and use that data in analyzing the safety and security risks for the transportation

[43] For example, the following organizations provide LNG response training: Texas A&M Extension Service (*https://teex.org/program/lng-emergency-response/*) and Northeast Gas Association (*https://www.northeastgas.org/tql-lng-safety.php*).

[44] *See https://www.transcaer.com/training/online-training-courses/seconds-count-are-you-prepared* for additional information on TRANSCAER®.

[45] *See* the *LNG by Rail Transport Town Hall Meeting Report,* at: *https://www.regulations.gov/document?D=PHMSA-2019-0100-3005.*

route(s), and subsequently identifying alternative routes.

These actions will strengthen the emergency response planning requirements and will assist in getting needed information to emergency responders.

3. Evacuation Distances

Other commenters cited concerns over the feasibility of imposing evacuation distances in an LNG accident. The IAFF commented that an LNG tank car fire would require the evacuation of all people within a 1-mile radius, stating that this would not be possible in most jurisdictions across the United States. They stated that any fire involving multiple LNG cars would place large numbers of the public at risk while depleting many communities of their emergency response resources. They further commented that consequences would be disastrous unless responders receive extensive training specific to an LNG-by-rail event. PSR commented that in the event of an LNG by rail fire and/or explosion, PHMSA would be unable to adequately define the hazard zone and the risk to nearby populations. PSR stated that first responders, health professionals, planners, and concerned citizens would not know the extent of the hazard zone or the nature and degree of risk it poses. PSR further expressed that the dangers clearly call for greater elaboration, including the response measures necessary to minimize harm and protect human life.

Additionally, the City of Zion Fire and Rescue noted that the Emergency Response Guidebook (ERG) uses the same response guidance for LNG and LPG. They stated that a 1-mile evacuation radius would be inadequate for a large LNG fire and that it would not be feasible to implement a larger evacuation distance. Finally, Earthjustice expressed its belief that Sandia and Lawrence Livermore National Lab testing noted that methane fires behave differently than other hydrocarbon fires, and that LNG has a potential for a ''wider than anticipated vapor cloud.''

PHMSA Response

PHMSA disagrees that the 1-mile evacuation distance is not possible and further notes that LNG is currently authorized for transportation by cargo tank and that the recommended 1-mile evacuation distance for LNG tank car fires is consistent with response guidance for cargo tank fires involving LNG. Furthermore, ERG recommends a 1-mile evacuation distance for many hazardous materials; therefore, emergency responders are familiar with this recommended distance, having used this guidance for decades. Additionally, PHMSA updates the ERG regularly in consultation with the response community and other experts, and adjusts recommended protective action distances as part of this process.

PHMSA and FRA are aware of, and have extensively reviewed, the available studies on LNG pool fires and evacuation distances. Specifically, PHMSA has reviewed studies conducted by Sandia National Laboratory [46] for DOE, a study conducted by ABSG for FERC [47] on the hazard characteristics of LNG released over water, and a study on LNG pool fires on land.[48]

The purpose of the ERG and the evacuation distances contained therein is to assist responders in making initial decisions upon arriving at the scene of a hazardous materials transport incident. The ERG should not be considered as substitutes for emergency response training, knowledge, experience, or sound judgment. The ERG also cannot address all possible circumstances that may be associated with a hazardous material release incident. Additionally, each guide page within the ERG provides guidance for responding to incidents involving multiple different but related hazardous materials. In the current 2016 edition of the ERG, LNG has been assigned to Guide 115, ''Gases—Flammable (Including Refrigerated Liquids).'' Guide 115 provides generalized response recommendations for over 100 different hazardous materials. Therefore, this guide page should only be used until a specific incident can be assessed and more appropriate response measures implemented.

Based on PHMSA's review of available literature on the properties of LNG releases, the current evacuation distances are appropriate. Therefore, PHMSA will make no change to the current evacuation distances for LNG.

4. Modeling Availability

The Delaware Riverkeeper Network expressed concern that there are no publicly available modeling estimates by PHMSA or private consultants on the downwind distances for an LNG by rail release and how it can travel into trackside communities. They further commented that there is a need for candid emergency event training materials for rail workers and local emergency responders.

PHMSA Response

PHMSA notes that various software programs are available to model the dispersion of gases, including LNG. Moreover, PHMSA sponsored a study by the UK Health and Safety Laboratory to develop a Model Evaluation Protocol that can be used to evaluate the suitability of vapor dispersion models for predicting hazard ranges associated with large spills of LNG.[49] Finally, the ERG provides an initial evacuation distance for flammable gases including LNG.[50] Therefore, PHMSA believes that there are sufficient tools available to the emergency response community to ensure adequate modeling in the event of an incident.

5. PHMSA Determination Regarding Emergency Response

The existing structure of the HMR—to include requirements for security plans, emergency response information, and training—provides for the safe transportation of all hazardous materials. Notably, 49 CFR part 172, subpart G sets forth the applicability and requirements for emergency response information which must be made immediately available to emergency responders. The HMR currently require the following information to accompany a shipment of LNG by rail:

(1) Immediate hazards to health;

(2) Risks of fire or explosion;

(3) Immediate precautions to be taken in the event of an accident or incident;

(4) Immediate methods for handling fires;

(5) Initial methods for handling spills or leaks in the absence of fire; and

(6) Preliminary first aid measures.

PHMSA believes that the current requirements for emergency response information are appropriate for future movement of LNG by rail. Additionally, PHMSA directs comprehensive grant programs that are designed to improve hazardous materials safety. The hazmat safety grant programs have helped to foster partnerships with local communities and universities to provide resources for emergency preparedness and the implementation of best

[46] *https://www.nrc.gov/docs/ML0933/ML093350855.pdf.*

[47] *https://www.ferc.gov/industries/gas/indus-act/lng/cons-model/cons-model.pdf.*

[48] *https://www.researchgate.net/publication/327900878_Experimental_Study_of_LNG_Pool_Fire_on_Land_in_the_Field.*

[49] *Evaluating vapor dispersion models for safety analysis of LNG facilities.* M.J. Ivings, SE Grant, S.F. Jagger, C.J. Lea, J.R. Steward and D.M. Webber. (September 2016). *https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/Hazardous-materials/RFLNGDispersionModelMEP.ashx.*

[50] *See* section ''*III. E. 3, Evacuation Distances*'' for further discussion.

practices regarding hazardous materials safety nationwide.

F. Comments of General Opposition

PHMSA received hundreds of comments expressing general opposition to the overall intent of the NPRM and the provisions proposed therein to authorize the transportation of LNG in rail tank cars. Many of these commenters voiced general concern about the public health, safety, and/or environmental risks of trains carrying bulk quantities of LNG. There was also opposition to the overall timeline of the rule, and PHMSA's authority to issue it.

Specifically, Theresa Pugh Consulting LLC opposed the transportation of LNG by rail in the lower 48 States, noting that Alaska may be an exception because of extreme circumstances that might require the need for LNG transportation by tank car. PSR and various others expressed concern that LNG by rail would pose risks to people living in proximity to rail lines, especially in densely populated urban and suburban areas. PSR specifically stated that it views issuing a national approval for LNG by rail as premature.

The Guardians of Martin County, Inc. and the Alliance for Safe Trains both expressed concern over LNG trains sharing the same track as passenger trains in Florida. The Guardians of Martin County, Inc. noted the age of infrastructure and population density of the area these trains would pass through. The Alliance for Safe Trains noted that a high-speed rail project will be sharing tracks or riding on parallel tracks to trains carrying LNG. Various commenters, including the Surfrider Foundation, commented that the proposals in the NPRM are extremely dangerous. The Surfrider Foundation stated that LNG is a flammable, volatile, and hazardous material with numerous examples of accidents and safety issues. The Surfrider Foundation further stated that one government study put the hazard range for a vapor cloud at more than 1.5 miles.

The Delaware Riverkeeper Network disagreed with the language in AAR's petition suggesting that DOT and Transport Canada maintain consistent requirements for LNG by rail. They stated that there is insufficient justification to change the HMR because no rail cars of LNG have been transported in Canada to date.

PHMSA Response

PHMSA notes that many of these comments did not contain sufficient information or supporting rationale that could be assessed to determine the provisions authorized in this rulemaking. PHMSA agrees with commenters that the risks related to the transportation of LNG by rail should be assessed and properly mitigated to ensure safety for the public and the environment. As outlined above, PHMSA has assessed the risks posed by the transportation of LNG by rail. PHMSA finds that the design elements of the DOT–113C120W9 rail tank car, the operational controls required in this final rule, combined with the existing HMR requirements that would apply and the voluntary industry standards in AAR Circular OT–55, will provide a safe transportation environment for LNG by rail.

PHMSA acknowledges commenters' general opposition to the transport of LNG on routes that bring this material into close proximity to the public. To address this concern, PHMSA is applying the existing additional planning requirements to the transport of LNG in rail tank cars, which include routing analysis requirements, to factor the risk of LNG transport in route planning. In this final rule, there is no geographical limit to LNG train operations, making routing analysis beneficial. This amendment will require railroads to evaluate safety and security risk factors when assessing the potential routes to be used to transport LNG. The 27 safety and security risk factors required by the route risk assessment provide a robust framework for carrier evaluation of the routes considered for use in LNG transportation.

Trains consisting of, and in some cases made up entirely of, rail cars carrying hazardous materials are moved on the same rail lines as passenger trains across the country. For densely-populated passenger train corridors (*e.g.,* Northeast Corridor and Florida's east coast) railroads typically operate freight trains (with and without hazmat) at night to maximize efficiency and fluidity (*i.e.,* freight trains will not slow down passenger trains, and freight trains will not be placed in sidings to make way for passenger trains). On cross country routes the passenger and freight trains meet with greater frequency. In both cases, the passenger and, more likely, freight trains will be operating under positive train control, which is specifically intended to prevent collisions, or incidents resulting from misaligned switches, incursions into work zones, and overspeed derailments.

G. Comments From the Puyallup Tribe

PHMSA received comments from the Puyallup Tribe of Tacoma, Washington contending that the rulemaking would have potential direct and disparate impacts on the Tribe and its members. The Puyallup Tribe submitted that the rulemaking will result in rail transportation of LNG crossing its reservation (located within the metropolitan area of Tacoma, Washington) and adjacent areas when travelling to and from Puget Sound Energy's planned Tacoma LNG facility. The Puyallup Tribe asserted that rail traffic entails a number of hazards for the Tribe and its members, including the following: Safety risks associated with the release of LNG being transported by rail; degradation of air quality in the area due to more diesel trains operating in the vicinity of the reservation; an increase in rail traffic that would frustrate quiet enjoyment of Tribal lands; and increased exposure to rising sea levels from climate change.

At the Puyallup Tribe's request, PHMSA personnel held a meeting with representatives of the Puyallup Tribe at PHMSA's headquarters in Washington, DC on February 12, 2020. Attendees at the meeting discussed the Puyallup Tribe's concerns regarding the Tacoma LNG facility, as well as the Puyallup Tribe's written comments submitted in the docket for this rulemaking. A summary of the February 12, 2020 meeting has been posted to the docket. PHMSA contacted representatives of the Puyallup Tribe and made itself available for additional meetings.

PHMSA Response

PHMSA submits that those of the Puyallup Tribe's concerns predicated on potential rail transport of LNG to and from Puget Sound Energy's Tacoma LNG facility are inapposite. The Tacoma LNG facility is regulated by Washington State and not PHMSA. Further, it does not appear that rail transportation of LNG to the Tacoma LNG facility is currently permitted by the terms of that facility's State authorization; rather, Condition 41 of the Puget Sound Air Agency Authorizing Order specifies that the "sole source of natural gas supply used in all operations" at the Tacoma LNG Facility will be from Canada via pipeline.[51] Nor does the Authorizing Order seem to contemplate rail transportation of LNG from that facility; rather, LNG transported from that facility will be transported by truck, or will be converted to natural gas for supply to customers via Puget Sound

[51] *See* Puget Sound Clean Air Agency, Order of Approval No. 11386 (Dec. 10, 2019) (Authorizing Order); Final Supplemental Environmental Impact Statement: Proposed Tacoma LNG Project at (Mar. 2019) (Tacoma LNG FSEIS). These and other documents in the Puget Sound Clean Air Agency docket can be found at the following link: *https://pscleanair.gov/460/Current-Permitting-Projects.*

Energy's natural gas pipeline distribution system.[52] Indeed, schematics of the Tacoma LNG facility within the Puget Sound Air Agency docket suggest that rail infrastructure neither exists nor is contemplated at the site.[53]

H. Comments Beyond the Scope of This Rulemaking

PHMSA also received miscellaneous comments opposing the bulk transport of LNG by any mode of transportation (to include highway or pipeline), as well as numerous comments pertaining to the ethical ramifications of fossil fuel extraction and usage. Commenters questioned the ethics of, and requested an end to, fracking, use of fossil fuels, and the practice of transporting coal in open railcars near waterways. Commenters also expressed concerns with LNG trains sharing railways with high-speed trains, and high-speed trains having at grade crossings citing safety concerns. These comments either did not provide recommendations for regulatory action, exceeded the scope of PHMSA's authority, or were not within the scope of this rulemaking.

V. Section-by-Section Review

The following is a section-by-section review of the amendments in this final rule.

A. Section 172.101

Section 172.101 provides the HMT and instructions for its use. PHMSA is amending the entry for ''UN1972, Methane, refrigerated liquid'' in the HMT to add reference to the cryogenic liquids in (rail) tank cars packaging section—§ 173.319 in Column (8C). Additionally, PHMSA is amending the entry to add a special provision.

B. Section 172.102

Section 172.102 provides the special provisions and instructions for their applications. PHMSA is amending paragraph (c)(1) to add special provision 440. Special provision 440 requires that each tank car used to transport LNG be remotely monitored for pressure and location. Additionally, the offeror must notify the carrier if the tank pressure rise exceeds 3 psig in a 24-hour period.

C. Section 172.820

Section 172.820 prescribes additional safety and security planning requirements for transportation by rail, specifically, commodity data, a rail routing analysis, and identification of practicable alternative(s). 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, PHMSA is revising § 172.820(a) to add a condition requiring any rail carrier transporting a quantity of UN1972 (''Methane, refrigerated liquid'' (cryogenic liquid) or ''Natural gas, refrigerated liquid'' (cryogenic liquid)) to comply with the additional safety and security planning requirements for transportation by rail. Further, PHMSA is revising paragraph (b) to remove the initial compliance date applicable to HHFTs as these dates have since passed (*i.e.,* rail carriers subject to the additional planning requirements because of transporting HHFTs had to complete the initial commodity flow data collection by March 31, 2016, using 2015 data), and adding a new condition for rail carriers to factor in transport of LNG (UN1972) to a routing analysis prior to the onset of transport of any loaded tank car of LNG. Once transport of LNG begins for a carrier, it can revert to the standard requirement in paragraph (b) that requires it to compile commodity flow data no later than 90 days after the end of each calendar year and use that data in analyzing the safety and security risks for the transportation route(s), and subsequently identifying alternative routes.

D. Section 173.319

Section 173.319 prescribes requirements for cryogenic liquids transported in rail tank cars. Paragraph (d) provides which cryogenic liquids may be transported in a DOT–113 tank car when directed to this section by Column (8C) of the § 172.101 HMT. PHMSA is amending paragraph (d)(2) to authorize the transport of ''Methane, refrigerated liquid'' (*i.e.,* LNG). Additionally, PHMSA is amending the Pressure Control Valve Setting or Relief Valve Setting Table in § 173.319(d)(2) to specify settings for methane in DOT–113C120W tank cars, specifically, a start-to-discharge pressure valve setting of 75 psig; a design service temperature of −260 °F; a maximum pressure when offered for transportation of 15 psig; and a filling density of 37.3 percent by weight.

E. Section 174.200

Section 174.200 prescribes the special handling requirements for Class 2 materials transported by rail. PHMSA is amending this section to include the operational requirements for trains containing tank cars of LNG. PHMSA is adding paragraph (d), which states that for a single train of 20 or more loaded tank cars of ''Methane, refrigerated liquid'' in a continuous block or a single train carrying 35 or more loaded tank cars of ''Methane, refrigerated liquid'' throughout the train, each carrier must ensure the train is equipped and operated with either an EOT device, as defined in 49 CFR 232.5, or a DP system, as defined in 49 CFR 229.5.

F. Section 179.400–5

Section 179.400–5 prescribes the material requirements for the construction of DOT–113 tank cars. Paragraph (b) states that any steel casting, steel forging, steel structural shape or carbon steel plate used to fabricate the outer jacket or heads must be as specified in AAR Specifications for Tank Cars, appendix M. PHMSA is amending this paragraph to require that for tank cars transporting ''Methane, refrigerated liquid,'' the outer shell must be made of AAR TC 128, Grade B normalized steel plate as specified in § 179.100–7(a).

G. Section 179.400–8

Section 179.400–8 prescribes the requirements for plate thickness on the DOT–113 specification tank car. Paragraph (d) states that the minimum wall thickness for the outer jacket shell, after forming, must be no less than 7/16th inch and the outer jacket heads must be no less than ½ inch thick. PHMSA is amending paragraph (d) to require DOT–113 tank cars used in LNG service to have an outer shell and tank head thickness, after forming, of 9/16th inch. Additionally, the shell and heads must be made of AAR TC 128, Grade B normalized steel plate as specified in § 179.100–7(a).

H. Section 179.400–26

PHMSA is adding § 179.400–26 to provide the authorization for a DOT–113 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).

I. Section 180.515

Section 180.515 discusses requirements for marking tank cars as part of their continuing qualification for service. In this final rule, PHMSA is adding the new specification suffix ''9'' to the DOT–113C120W specification to indicate compliance with enhanced outer tank steel and thickness requirements beyond the standard DOT–113C120W specification. In conformance with this change, PHMSA is adding a new paragraph (d) to § 180.515 to require that the ''9'' suffix always remain marked as part of the specification DOT–113C120W9 for these enhanced tank cars, to distinguish

[52] *See* Tacoma LNG FSEIS at 1, 2–2, 2–4 to 2–5.

[53] *See* Tacoma LNG FSEIS at Figures 1–1 and 1–2.

standard DOT–113C120W tank cars (such as those currently used to transport ethylene) from enhanced DOT–113C120W9 cars authorized for LNG. PHMSA intends this new paragraph to reduce confusion for tank car users.

VI. Regulatory Analyses and Notices

A. Statutory/Legal Authority for This Rulemaking

This rulemaking is published under the authority of the Federal hazmat law. Section 5103(b) of the Federal hazmat law authorizes the Secretary of Transportation to ''prescribe regulations for the safe transportation, including security, of hazardous materials in intrastate, interstate, and foreign commerce.'' The Secretary's authority regarding hazardous materials safety is delegated to PHMSA at 49 CFR 1.97. This rulemaking authorizes the transportation of LNG by rail in DOT–113C120W tank cars, with certain enhanced outer tank requirements, subject to all applicable requirements and certain additional operational controls.

B. Executive Order 12866 and DOT Regulatory Policies and Procedures

This rulemaking is considered a significant regulatory action under section 3(f) of Executive Order 12866, ''Regulatory Planning and Review'' [58 FR 51735 (October 4, 1993)], and was reviewed by the Office of Management and Budget (OMB). This rulemaking is also considered a significant rulemaking under the DOT regulations governing rulemaking procedures (49 CFR part 5). E.O. 12866 requires 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.'' Similarly, DOT regulations require that regulations issued by PHMSA and other DOT Operating Administrations ''should be designed to minimize burdens and reduce barriers to market entry whenever possible, consistent with the effective promotion of safety'' and should generally ''not be issued unless their benefits are expected to exceed their costs.'' § 5.5(f)–(g).

Additionally, E.O. 12866 and DOT regulations require agencies to provide a meaningful opportunity for public participation, which also reinforces requirements for notice and comment under the APA.[54] Therefore, in the previously published NPRM, PHMSA sought public comment on revisions to the HMR authorizing the transportation of LNG by rail tank car. PHMSA also sought comment on the preliminary cost and cost savings analyses, as well as any information that could assist in quantifying the benefits of this rulemaking. Those comments are addressed, and additional discussion about the economic impacts of the final rule are provided, within the final RIA posted in the docket.[55]

This final rule adopts the proposal in the NPRM, with certain amendments, to allow the transportation of LNG by rail in an authorized tank car. Under current regulatory standards, LNG is not authorized for transportation by tank car. Therefore, this final rule is considered an enabling rule.

In promulgating this final rule, PHMSA is providing a path for potential benefits that would not otherwise be gained in the absence of this rulemaking, such as increased transportation efficiency, increased modal safety, expanded fuel usage, improved accessibility to remote regions, and increased U.S. energy competitiveness. These benefits are described qualitatively in the Final RIA. The final rule essentially prescribes packaging for a flammable cryogenic material (*i.e.,* LNG) for shippers and rail carriers who choose to transport LNG by rail. The discretionary and voluntary decision of a shipper and railroad company to transport LNG by rail, upon implementation of this final rule, requires full compliance with all existing regulations governing the transportation of flammable cryogenic materials, and the operation of freight and other non-passenger train services; as well as the additional requirements adopted under the final rule, namely, enhanced outer tank design and material standards and operational controls supplemental to the existing operational controls in the HMR.

C. Executive Order 13771

This rulemaking is expected to be an Executive Order 13771 deregulatory action. Details on the estimated cost savings of this final rule can be found in the final RIA posted in the docket.[56]

D. Executive Order 13132

This rulemaking was analyzed in accordance with the principles and criteria contained in Executive Order 13132, ''Federalism.'' This rulemaking may preempt State, local, and Tribal requirements but does not amend any regulation that has substantial direct effects on the States, the relationship between the Federal government and the States, or the distribution of power and responsibilities among the various levels of government. Therefore, the consultation and funding requirements of E.O. 13132 do not apply.

Federal hazmat law, 49 U.S.C. 5101–5128, contains express preemption provisions relevant to this proceeding. As amended by Section 1711(b) of the Homeland Security Act of 2002 (Pub. L. 107–296, 116 Stat. 2319), 49 U.S.C. 5125(a) provides that a requirement of a State, political subdivision of a State, or Indian tribe is preempted—unless the non-Federal requirement is authorized by another Federal law or DOT grants a waiver of preemption under section 5125(e)—if (1) complying with the non-Federal requirement and the Federal requirement is not possible (dual compliance test); or (2) the non-Federal requirement, as applied and enforced, is an obstacle to accomplishing and carrying out the Federal requirement (obstacle test).

Additionally, 49 U.S.C. 5125(b)(1) provides that a non-Federal requirement concerning any of five subjects is preempted when the non-Federal requirement is not ''substantively the same as'' a provision of Federal hazmat law, a regulation prescribed under that law, or a hazardous materials security regulation or directive issued by the Department of Homeland Security (covered subjects test).[57] To be ''substantively the same,'' the non-Federal requirement must conform ''in every significant respect to the Federal requirement. Editorial and other similar de minimis changes are permitted.'' The subject areas covered under this authority are:

(1) The designation, description, and classification of hazardous materials;

(2) The packing, repacking, handling, labeling, marking, and placarding of hazardous materials;

(3) The preparation, execution, and use of shipping documents related to hazardous materials and requirements related to the number, contents, and placement of those documents;

(4) The written notification, recording, and reporting of the unintentional release in transportation of hazardous material; and

(5) The design, manufacture, fabrication, marking, maintenance, recondition, repair, or testing of a packaging or container represented, marked, certified, or sold as qualified

[54] 5 U.S.C. 553; 49 CFR 5.5(i).

[55] *See* Docket No. PHMSA–2018–0025 at *www.regulations.gov.*

[56] *Id.*

[57] Unless the non-Federal requirement is authorized by another Federal law or DOT grants a waiver of preemption under 49 CFR 5125(e).

for use in transporting hazardous material.

This rule addresses subject items (2) and (5) above, which are covered subjects, and therefore, non-Federal requirements that fail to meet the ''substantively the same'' standard are vulnerable to preemption under the Federal hazmat law. Moreover, PHMSA will continue to make preemption determinations applicable to specific non-Federal requirements on a case-by-case basis, using the obstacle, dual compliance, and covered subjects tests provided in Federal hazmat law.

Federal preemption also may exist pursuant to section 20106 of the former Federal Railroad Safety Act of 1970 (FRSA), repealed, revised, reenacted, and recodified at 49 U.S.C. 20106, and the former Safety Appliance Acts (SAA), repealed revised, reenacted, and recodified at 49 U.S.C. 20301–20304, 20306. Section 20106 of the former FRSA provides that States may not adopt or continue in effect any law, regulation, or order related to railroad safety or security that covers the subject matter of a regulation prescribed or order issued by the Secretary of Transportation (with respect to railroad safety matters) or the Secretary of Homeland Security (with respect to railroad security matters), except when the State law, regulation, or order qualifies under the section's ''essentially local safety or security hazard.'' The former SAA has been interpreted by the Supreme Court as preempting the field ''of equipping cars with appliances intended for the protection of employees.'' *Southern Ry. Co.* v. *R.R. Comm'n of Ind.,* 236 U.S. 439, 446 (1915). The train's power braking system is considered a safety mechanism within the terms of the former SAA. 49 U.S.C. 20302(a)(5).

E. Executive Order 13175

This rulemaking was analyzed in accordance with the principles and criteria contained in Executive Order 13175, ''Consultation and Coordination with Indian Tribal Governments'' and DOT Order 5301.1, ''Department of Transportation Policies, Programs, and Procedures Affecting American Indians, Alaska Natives, and Tribes.'' The Department assessed the impact of the rulemaking on Indian tribal governments and determined that it would not significantly or uniquely affect Tribal communities or Indian tribal governments because it neither sets national requirements for transporting LNG via rail, nor imposes substantial compliance costs on Indian tribal governments, nor mandates Tribal action.

PHMSA is committed to satisfying its obligations under E.O. 13175 and DOT Order 5301.1 related to Tribal outreach to ensure meaningful and timely engagement of Tribal governments in PHMSA rulemaking. As discussed above, PHMSA personnel have conducted a face-to-face meeting with representatives of the Puyallup Tribe to solicit their concerns during the development of this final rule. PHMSA has addressed those concerns, as well as the written comments submitted by the Puyallup Tribe, in the final rule and final EA. Further, since the February 2020 meeting with the Puyallup Tribe, PHMSA has contacted representatives of the Puyallup Tribe and extended invitations for follow-up meetings with PHMSA leadership. The Puyallup Tribe has not accepted PHMSA's invitation to conduct further meetings.

F. Regulatory Flexibility Act, Executive Order 13272, and DOT Policies and Procedures

This rulemaking complies with the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*), which requires agencies to consider whether a rulemaking would have a ''significant economic impact on a substantial number of small entities'' to include small businesses, not-for-profit organizations that are independently owned and operated and are not dominant in their fields, and governmental jurisdictions with populations under 50,000. This rulemaking has been developed in accordance with Executive Order 13272, ''Proper Consideration of Small Entities in Agency Rulemaking'', and DOT's procedures and policies to promote compliance with the Regulatory Flexibility Act to ensure that potential impacts of draft rules on small entities are properly considered.

(1) a statement of the need for, and objectives of, the rule.

The amendments to the HMR made in this final rule, which enable LNG to be transported by rail, are intended to provide relief by authorizing the transportation of LNG in tank cars with enhanced crashworthiness features and additional operational controls with no anticipated reduction in safety. This final rule creates options for transporting LNG, which otherwise would be limited to trucks, or maritime transportation modes; or, alternately, re-gasification and movement by pipeline in a gas state. This rule enables movement by rail, thereby giving shippers an alternate mode that may offer cost or other advantages over existing permitted modes to ship LNG. It lifts the blanket prohibition on movement of LNG by rail tank cars.

(2) a statement of the significant issues raised by the public comments in response to the initial regulatory flexibility analysis, a statement of the assessment of the agency of such issues, and a statement of any changes made in the proposed rule as a result of such comments.

PHMSA addressed public comments filed under the NPRM, as well as the Special Permit. The comments were addressed by topic and addressed accordingly. Please refer to *Section IV.* ''*Summary and Discussion of Comments to the Rulemaking Docket,*'' of the preamble.

(3) the response of the agency to any comments filed by the Chief Counsel for Advocacy of the Small Business Administration in response to the proposed rule, and a detailed statement of any change made to the proposed rule in the final rule as a result of the comments.

PHMSA did not receive comments filed on behalf of the Chief Counsel for Advocacy at the Small Business Administration (SBA).

(4) a description of 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 Regulatory Flexibility Act of 1980 requires a review of proposed and final rules to assess their impact on small entities, unless the Secretary certifies that the rule would not have a significant economic impact on a substantial number of small entities. ''Small entity'' is defined in 5 U.S.C. 601 as a small business concern that is independently owned and operated, and is not dominant in its field of operation. As far as the railroad industry, the SBA stipulates in its size standards that a ''small entity'' in the railroad industry is a for profit ''line-haul railroad'' that has fewer than 1,500 employees, a ''short line railroad'' with fewer than 1,500 employees, a ''commuter rail system'' with annual receipts of less than $16.5 million, or a contractor that performs support activities for railroads with annual receipts of less than $16.5 million.[58]

Federal agencies may adopt their own size standards for small entities in consultation with SBA and in conjunction with public comment. Under that authority, FRA has published a final statement of agency policy that formally establishes ''small

[58] U. S. Small Business Administration, ''Table of Small Business Size Standards Matched to North American Industry Classification System Codes, August 19, 2019. *https://www.sba.gov/sites/default/files/2019-08/SBA%20Table%20of%20Size%20Standards_Effective%20Aug%2019,%202019.pdf.*

entities'' or ''small businesses'' as railroads, contractors, and hazardous materials shippers 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,[59] and commuter railroads or small governmental jurisdictions that serve populations of 50,000 or less. *See* 68 FR 24891 (May 9, 2003) (codified at 49 CFR part 209, appendix C). PHMSA is using this definition for the rule.

The final rule would be applicable to all railroads, although not all requirements would be relevant to all railroads. Railroads operating on the general system are required to use two-way EOT regardless of type of load unless exempted under 49 CFR 232.407(e). Two-way EOT devices cost approximately $4,000. As stated in the Final RIA, most Class III railroads, due to their type of train operation, are not required to have two-way EOT devices, except in certain situations. FRA regulations provide exceptions from the requirement to use two-way EOT device in 49 CFR 232.407(e). For Class III railroads that would be required to install two-way EOT devises, the monetary burden of the requirement to purchase and install those devices is less than 1% of the average annual revenue of small railroad entities. Therefore, the impact of this requirement is also minimal.

As further stated in the Final RIA, there are two other types of entities that are subject to the rule in addition to railroad companies: shippers, and tank car manufacturers (to the extent of design specifications). There are three main types of shippers: oil and gas companies, chemical companies and oil and fuel logistics companies. PHMSA estimated the number of small entities that could potentially be impacted by this rule using its own registration data and the Dun and Bradstreet data.

PHMSA first queried pipeline-related entities. The SBA definition of a small entity for those business categories is set at 1,000 employees or, in the case of annual revenue thresholds, is set at $27.5 million. PHMSA applied the following NAICS codes for this analysis: 211130 Natural Gas Extraction, 213111 Drilling Oil and Gas Wells, 213112 Support Activities for Oil and Gas Operations, 325110 Petrochemical Manufacturing, 325199 All Other Basic Organic Chemical Manufacturing, and 486210 Pipeline Transportation of Natural Gas. PHMSA's queries identified a total of nine small entities: six under 213112 Support Activities for Oil and Gas Operations and three under 486210 Pipeline Transportation of Natural Gas.

PHMSA also conducted a similar but broader query of companies that may potentially ship LNG by rail using PHMSA's PDM system in conjunction with the Dun and Bradstreet data. The query identified several potential subsets of SBA-size small entities; however, there is considerable overlapping in definitions and variation in operations among the codes to render a specific number(s). One possibly relevant NAICS code for this rule is industrial gas manufacturing (NAICS 32512). This industry is comprised of establishments primarily engaged in the manufacturing of organic and inorganic gasses in compressed, liquid or solid forms. The industry has a 529 entities earning a total of almost $10 billion in annual sales in the U.S. (2018). The companies are comprised mainly of large well-established entities. A small entity within that industry has an annual revenue of $28.23 billion (2019). The cost burden to shippers of this rule consist of the purchase and installation expense of remote monitoring devices and of a thicker outer tank for DOT–113 Tank Car in LNG Service. As stated in the Final RIA, the current estimated cost of remote monitoring devices is approximately $2,400-$4,000 per car depending upon the vendor plus additional costs for monitoring software. The estimated cost of the requirement to install 9/16-inch outer shell on all DOT–113 tank cars in LNG service is an additional $15,000 to $20,000 for the additional and higher-quality steel, plus $3,000-$5,000 for additional construction expenses. The base cost of an existing 7/16-inch outer tank DOT–113 is approximately $725,000. PHMSA concludes that the impact of this rule is less than 1% of average annual revenue for these entities.

Therefore, PHMSA concludes that this rule does not impose a significant burden on small entities in this category.

(5) a description of the projected reporting, recordkeeping and other compliance requirements of the rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for preparation of the report or record.

PHMSA is revising 49 CFR 172.820 to require any rail carrier transporting a tank car quantity of UN1972 (Methane, refrigerated liquid (cryogenic liquid) or Natural gas, refrigerated liquid (cryogenic liquid)) to comply with the additional safety and security planning requirements for transportation by rail. PHMSA estimates that this rule does not impose a significant information collection and recordkeeping burdens on small entities. Please refer to *Section VI.G.,* ''*Paperwork Reduction Act,*'' of the preamble for additional information about the potential burdens associated with this requirement.

(6) a description of the steps the agency has taken to minimize the significant economic impact on small entities consistent with the stated objectives of applicable statutes, including a statement of the factual, policy, and legal reasons for selecting the alternative adopted in the final rule and why each one of the other significant alternatives to the rule considered by the agency which affect the impact on small entities was rejected.

The Regulatory Flexibility Act directs agencies to establish exceptions and differing compliance standards for small entities, where it is possible to do so and still meet the objectives of applicable regulatory statutes. PHMSA considered three regulatory alternatives (including a ''no action'' alternative) when developing the NPRM. The alternatives (other than the 'no action' alternative) were designed in accordance with necessary safety, engineering and operational specifications. These specifications, as such, do not provide leeway for variation of design or degrees of stringency. The chemical characteristics of LNG combined with the potential to be transported in blocks of 20 or more tank cars or unit trains require specific packaging (*i.e.* tank car) which costs approximately $750,000 per tank car according to PHMSA and FRA estimates. The operational control specifications, as mentioned above, do not impose a significant monetary burden on small entities.

Other entities subject to this rule include rail tank car manufacturers. Although PHMSA does not regulate these entities, it does regulate the design specifications of rail tank cars. PHMSA estimates there are approximately seven rail tank car manufacturers in the U.S., none of which are considered small entities. The impact of the rule, in this case, is potentially positive, since it will generate new purchase order opportunities for those entities.

[59] The Class III railroad revenue threshold is $39,194,876 or less, for 2018. (The Class II railroad threshold is between $39,194,876 and $489,935,956; and the Class I railroad threshold is $489,935,956 or more.) *See* Surface Transportation Board (STB), available at *https://www.stb.gov/econdata.nsf/d03c0c2161a050278525720a0044a825/1acf737531cf98ce8525841e0055e02e*.

G. Paperwork Reduction Act

Section 1320.8(d), Title 5, Code of Federal Regulations requires that PHMSA provide interested members of the public and affected agencies an opportunity to comment on information collection and recordkeeping requests. As detailed in *Section V.C.* ''*Section172.820*'', PHMSA is requiring any rail carrier transporting a tank car quantity of UN1972 (Methane, refrigerated liquid (cryogenic liquid) or Natural gas, refrigerated liquid (cryogenic liquid)) to comply with the additional safety and security planning requirements for transportation by rail. PHMSA currently accounts for burden associated with safety and security planning requirements in OMB Control Number 2137–0612, ''Hazardous Materials Security Plans.'' PHMSA estimates that this revision will lead to the following increase in burden:

Annual Increase in Number of Respondents: 0.

Annual Increase in Number of Responses: 8.

Annual Increase in Burden Hours: 677.

Annual Increase in Salary Costs: $41,170.

Under the Paperwork Reduction Act of 1995 (Pub. L. 96–511), no person is required to respond to an information collection unless it has been approved by OMB and displays a valid OMB control number. As this revision was not proposed in the NPRM, PHMSA will publish a separate 60-day and 30-day notice to provide an opportunity for public comment on the proposed estimated increase in burden.

Requests for a copy of this information collection should be directed to Steven Andrews or Shelby Geller, Office of Hazardous Materials Standards, Pipeline and Hazardous Materials Safety Administration, 1200 New Jersey Avenue SE, Washington, DC 20590–0001, Telephone (202) 366–8553.

H. 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.

I. Unfunded Mandates Reform Act

Unfunded Mandate Reform Act of 1995 (UMRA), 2 U.S.C. 1501 *et seq.,* requires agencies to assess the effects of Federal regulatory actions on State, local, and Tribal governments, and the private sector.[60] For any NPRM or final rule that includes a Federal mandate that may result in the expenditure by State, local, and Tribal governments, in the aggregate of $100 million or more (or $169 million adjusted for inflation) in any given year, the agency must prepare, amongst other things, a written statement that qualitatively and quantitatively assesses the costs and benefits of the Federal mandate.[61] A Federal mandate is defined, in part, as a regulation that imposes an enforceable duty upon State, local, or Tribal governments or would reduce or eliminate the amount of authorization of appropriation for Federal financial assistance that would be provided to State, local, or Tribal governments for the purpose of complying with a previous Federal mandate.[62]

The NPRM concluded that the rulemaking does not impose unfunded mandates because it does not result in costs of $169 million or more, adjusted for inflation, to either State, local, or Tribal governments, in the aggregate, or to the private sector and is the least burdensome alternative that achieves the objective of the rulemaking.

In response to the NPRM, Theresa Pugh Consulting, LLC argued that the UMRA requires that PHMSA analyze the costs that State, local, or Tribal governments might incur as a result of responding to potential emergencies caused by the transportation of LNG in rail tank cars.

The final rule, as revised based on comments received, does not include a Federal mandate that may result in an aggregate expenditure by State, local, and Tribal governments of $169 million or more. Additionally, the final rule does not impose a requirement on State, local, or Tribal governments, much less a requirement that the DOT can enforce. In the event State, local, or Tribal governments need additional resources to plan for a potential LNG-related accident, they may request grants from PHMSA's Hazardous Materials Emergency Preparedness funds, established under 49 U.S.C. 5116(h), to support development, improve, and carry out emergency plans.

In conclusion, this final rule does not impose unfunded mandates under the UMRA of 1995. It does not result in costs of $169 million or more to either State, local, or Tribal governments, in the aggregate, or to the private sector, and it is the least burdensome alternative that achieves the objective of the rulemaking.

[60] 2 U.S.C. 1531.

[61] *Id.* at 1532.

[62] *Id.* at 658(5)(A), 1555.

J. Environmental Assessment

The National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. 4321 *et seq.,* requires Federal agencies to consider the consequences of major Federal actions and prepare a detailed statement on actions significantly affecting the quality of the human environment. The Council on Environmental Quality (CEQ) implementing regulations (40 CFR part 1500–1508) require Federal agencies to conduct an environmental review considering (1) the need for the action, (2) alternatives to the action, (3) probable environmental impacts of the action and alternatives, and (4) the agencies and persons consulted during the consideration process (*see* 40 CFR 1508.9(b)). DOT Order 5610.1C, ''Procedures for Considering Environmental Impacts,'' establishes departmental procedures for evaluation of environmental impacts under NEPA and its implementing regulations.

PHMSA has completed its NEPA analysis. Based on the environmental assessment, PHMSA determined that an environmental impact statement is not required for this rulemaking because it does not constitute an action meeting the criteria that normally requires the preparation of an environmental impact statement. As explained in the final EA, PHMSA has found that the selected action will not have a significant impact on the human environment in accordance with Section 102(2) of NEPA.

PHMSA issued and solicited comments on a draft EA posted to the docket along with the NPRM. The final EA and Finding of No Significant Impact has been placed into the docket addressing the comments received.

K. 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 *http://www.regulations.gov,* as described in the system of records notice (DOT/ALL–14 FDMS), which can be reviewed at *http://www.dot.gov/privacy.*

L. Executive Order 13609 and International Trade Analysis

Under Executive Order 13609 (''Promoting International Regulatory Cooperation''), 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 business to export and compete internationally. *See* 77 FR 26413 (May 4, 2012). In meeting shared challenges involving health, safety, labor, security, environmental, and other issues, international regulatory cooperation can identify approaches that are at least as protective as those that are or would be adopted in the absence of such cooperation. International regulatory cooperation can also reduce, eliminate, or prevent unnecessary differences in regulatory requirements.

Similarly, the Trade Agreements Act of 1979 (Pub. L. 96–39), as amended by the Uruguay Round Agreements Act (Pub. L. 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 to protect the safety of the American public. PHMSA has assessed the effects of the rulemaking to ensure that it does not cause unnecessary obstacles to foreign trade. Insofar as the final rule authorizes rail transportation of LNG to domestic U.S. and other North American markets, it would promote foreign trade. Further, the final rule's authorization of rail transportation of LNG aligns U.S. practice with Transport Canada regulations permitting rail transportation of LNG. Accordingly, this rulemaking is consistent with Executive Order 13609 and PHMSA's obligations under the Trade Agreement Act, as amended.

M. Executive Order 13211

Executive Order 13211 (''Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use'') [66 FR 28355; May 18, 2001] requires Federal agencies to prepare a Statement of Energy Effects for any ''significant energy action.'' 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 (including a shortfall in supply, price increases, and increased use of foreign supplies); or (2) is designated by the Administrator of the Office of Information and Regulatory Affairs (OIRA) as a significant energy action.

This final rule is a significant action under E.O. 12866 because OIRA believes it raises novel, legal, and policy issues arising out of legal mandates; however, it is expected to have an annual effect on the economy of less than $100 million. Further, this action is not likely to have a significant adverse effect on the supply, distribution or use of energy in the United States. The Administrator of OIRA has not designated the final rule as a significant energy action. For additional discussion of the anticipated economic impact of this rulemaking, please review the final RIA.

List of Subjects

49 CFR Part 172

Education, Hazardous materials transportation, Hazardous waste, Incorporation by reference, Labeling, Packaging and containers, Reporting and recordkeeping requirements.

49 CFR Part 173

Hazardous materials transportation, Incorporation by reference, Packaging and containers, Radioactive materials, Reporting and recordkeeping requirements, Uranium.

49 CFR Part 174

Hazardous materials transportation, Incorporation by reference, Radioactive materials, Railroad safety.

49 CFR Part 179

Hazardous materials transportation, Railroad safety, Reporting and recordkeeping requirements.

49 CFR Part 180

Hazardous materials transportation, Incorporation by reference, Motor carriers, Motor vehicle safety, Packaging and containers, Railroad safety, Reporting and recordkeeping requirements.

In consideration of the foregoing, PHMSA amends 49 CFR chapter I as follows:

PART 172—HAZARDOUS MATERIALS TABLE, SPECIAL PROVISIONS, HAZARDOUS MATERIALS COMMUNICATIONS, EMERGENCY RESPONSE INFORMATION, TRAINING REQUIREMENTS, AND SECURITY PLANS

■ 1. The authority citation for part 172 continues to read as follows:

Authority: 49 U.S.C. 5101–5128, 44701; 49 CFR 1.81, 1.96 and 1.97.

■ 2. In § 172.101, revise the table entry for ''Methane, refrigerated liquid *(cryogenic liquid) or* Natural gas, refrigerated liquid *(cryogenic liquid), with high methane content)*'' (UN1972) to read as follows:

§ 172.101 Purpose and use of the hazardous materials table.

* * * * *

§ 172.101—HAZARDOUS MATERIALS TABLE

Symbols	Hazardous materials descriptions and proper shipping names	Hazard class or division	Identification No.	PG	Label codes	Special provisions (§ 172.102)	(8) Packaging (§ 173.***)			(9) Quantity limitations (*see* §§ 173.27 and 175.75)		(10) Vessel stowage	
							Exceptions	Non-bulk	Bulk	Passenger aircraft/rail	Cargo aircraft only	Location	Other
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8A)	(8B)	(8C)	(9A)	(9B)	(10A)	(10B)
	*	*	*			*	*		*		*		
	Methane, refrigerated liquid *(cryogenic liquid)* or Natural gas, refrigerated liquid *(cryogenic liquid), with high methane content).*	2.1	UN1972		2.1	T75, TP5, 440.	None	None	318, 319	Forbidden	Forbidden	D	40
	*	*	*			*	*		*		*		

■ 3. In § 172.102, amend paragraph (c)(1) by adding special provision 440 under ''Code/Special Provisions'' to read as follows:

§ 172.102 Special provisions.

* * * * *

(c) * * *

(1) * * *

Code/Special Provisions

* * * * *

440 When this material is transported by tank car, the offeror must ensure each tank car is remotely monitored for pressure and location. Additionally, the offeror must notify the carrier if the tank pressure rise exceeds 3 psig over any 24-hour period.

* * * * *

■ 4. In § 172.820, revise paragraphs (a) and (b)(1) to read as follows:

§ 172.820 Additional planning requirements for transportation by rail.

(a) *General.* Each rail carrier transporting in commerce one or more of the following materials is subject to the additional safety and security planning requirements of this section:

(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, as defined in § 173.403 of this subchapter;

(4) A high-hazard flammable train (HHFT) as defined in § 171.8 of this subchapter; or

(5) A quantity of UN1972 (Methane, refrigerated liquid or Natural gas, refrigerated liquid) when transported in a rail tank car.

(b) * * *

(1) Commodity data must be collected by route, a line segment or series of line segments as aggregated by the rail carrier. Within the rail carrier selected route, the commodity data must identify the geographic location of the route and the total number of shipments by UN identification number for the materials specified in paragraph (a) of this section.

(i) A rail carrier subject to additional planning requirements of this section based on paragraph (a)(5) of this section that has yet to transport UN 1972, must factor in planned shipments of UN 1972 to the commodity data for use in the paragraph (c) route analysis prior to initial transport of the material.

(ii) [Reserved]

* * * * *

PART 173—SHIPPERS—GENERAL REQUIREMENTS FOR SHIPMENTS AND PACKAGINGS

■ 5. The authority citation for part 173 continues to read as follows:

Authority: 49 U.S.C. 5101–5128, 44701; 49 CFR 1.81, 1.96 and 1.97.

■ 6. In § 173.319, revise paragraph (d)(2) to read as follows:

§ 173.319 Cryogenic liquids in tank cars.

* * * * *

(d) * * *

(2) *Ethylene, hydrogen (minimum 95 percent parahydrogen), and methane, cryogenic liquids* must be loaded and shipped in accordance with the following table:

TABLE 1 TO § 173.319(d)—PRESSURE CONTROL VALVE SETTING OR RELIEF VALVE SETTING

Maximum start-to-discharge pressure (psig)	Maximum permitted filling density (percent by weight)				
	Ethylene	Ethylene	Ethylene	Hydrogen	Methane
17				6.60	
45	52.8				
75		51.1	51.1		37.3.
Maximum pressure when offered for transportation.	10 psig	20 psig	20 psig		15 psig.
Design service temperature	Minus 260 °F	Minus 260 °F	Minus 155 °F	Minus 423 °F	Minus 260 °F.
Specification (*see* § 180.507(b)(3) of this subchapter).	113D60W, 113C60W	113C120W	113D120W	113A175W, 113A60W	113C120W9.

Note: For DOT 113 cryogenic tank cars, delimiters indicate the following:
A—authorized for minus 423 °F loading;
C—authorized for minus 260 °F loading;
D—authorized for minus 155 °F loading.
The specification suffix ''9'' indicates the tank car is equipped with (minimum) 9/16 inch TC 128B normalized steel outer jacket and tank heads.

* * * * *

PART 174—CARRIAGE BY RAIL

■ 7. The authority citation for part 174 continues to read as follows:

Authority: 49 U.S.C. 5101–5128; 33 U.S.C. 1321; 49 CFR 1.81 and 1.97.

■ 8. In § 174.200, add paragraph (d) to read as follows:

§ 174.200 Special handling requirements.

* * * * *

(d) For a single train of 20 or more loaded tank cars of Methane, refrigerated liquid in a continuous block or a single train carrying 35 or more loaded tank cars of Methane, refrigerated liquid throughout the train consist, each carrier 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.

PART 179—SPECIFICATIONS FOR TANK CARS

■ 9. 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.

■ 10. In § 179.400–5, revise paragraph (b) to read as follows:

§ 179.400–5 Materials.

* * * * *

(b)(1) Any steel casting, steel forging, steel structural shape or carbon steel plate used to fabricate the outer jacket or heads must be as specified in AAR Specifications for Tank Cars, appendix M.

(2) For DOT–113C120W9 tank cars, the outer jacket shell and outer jacket heads must be made of AAR TC–128, Grade B normalized steel plate as specified in § 179.100–7(a).

* * * * *

■ 11. In § 179.400–8, revise paragraph (d) to read as follows:

§ 179.400–8 Thickness of plates.

* * * * *

(d)(1) The minimum wall thickness, after forming, of the outer jacket shell may not be less than 7⁄16 inch. The minimum wall thickness, after forming, of the outer jacket heads may not be less than 1⁄2 inch and they must be made from steel specified in § 179.16(c).

(2) For DOT 113C120W9 tank cars, the minimum wall thickness of the outer jacket shell and the outer jacket heads must be no less than 9⁄16 inch after forming, and must be made of AAR TC–128, Grade B normalized steel plate.

(3) The annular space is to be evacuated, and the cylindrical portion of the outer jacket between heads, or between stiffening rings if used, must be designed to withstand an external pressure of 37.5 psig (critical collapsing pressure), as determined by the following formula:

$$P_c = [2.6E(t/D)^{2.5}]/[(L/D) - 0.45(t/D)^{0.5}]$$

Where:

P_c = Critical collapsing pressure (37.5 psig minimum) in psig;
E = modulus of elasticity of jacket material, in psi;
t = minimum thickness of jacket material, after forming, in inches;
D = outside diameter of jacket, in inches;
L = distance between stiffening ring centers in inches. (The heads may be considered as stiffening rings located 1⁄3 of the head depth from the head tangent line.)

* * * * *

■ 12. Add § 179.400–26 to read as follows:

§ 179.400–26 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.

PART 180—CONTINUING QUALIFICATION AND MAINTENANCE OF PACKAGINGS

■ 13. The authority citation for part 180 continues to read as follows:

Authority: 49 U.S.C. 5101–5128; 49 CFR 1.81 and 1.97.

■ 14. In § 180.515, add paragraph (d) to read as follows:

§ 180.515 Markings.

* * * * *

(d) The specification marking for DOT 113 tank cars built in accordance with the DOT 113C120W9 specification must display the last numeral of the specification number (*i.e.,* ''DOT 113C120W9'').

Issued in Washington, DC, on June 19, 2020, under authority delegated in 49 CFR 1.97.

Howard R. Elliott,

Administrator, Pipeline and Hazardous Materials Safety Administration.

[FR Doc. 2020–13604 Filed 7–23–20; 8:45 am]

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