HM-264 LNG by Rail Technical Briefing

PHMSA OHMS 6/7/2021

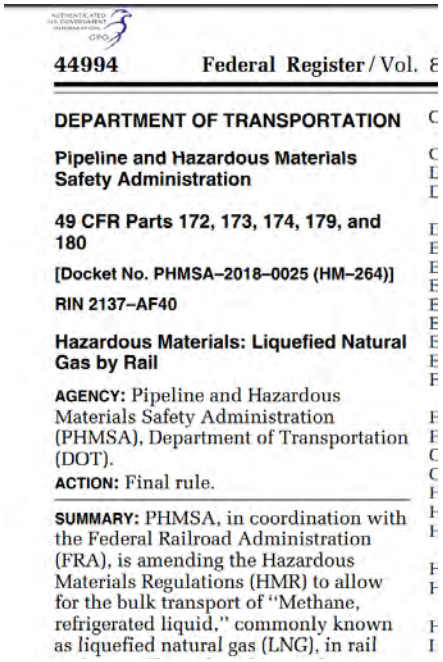
Introduction

Presentation Summary

- HM-264 rulemaking summary and current status
- Packaging decisions
- Operational control decisions

Rulemaking Summary

- HM-264 final rule published July 24, 2020
- Authorizes transportation of LNG in DOT-113C120W9 tank cars
- Additional operational controls



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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

Current Legal and Operational Status

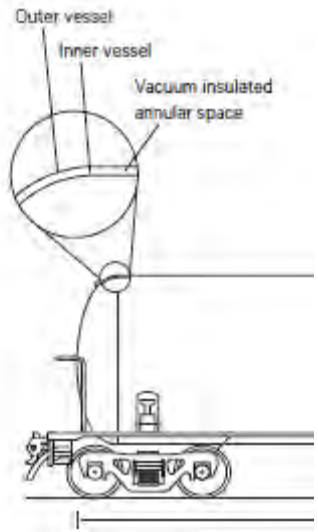
- Legal challenges
- Operational status

DOT-113 Packaging Technical Decisions

Inner Tank and Thermal Insulation

- Inner tank, insulation, and filling density limitation, relief valve role

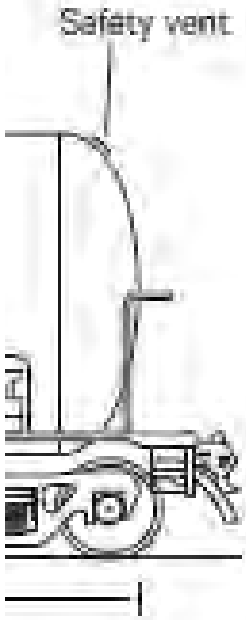
- Determination of suitability

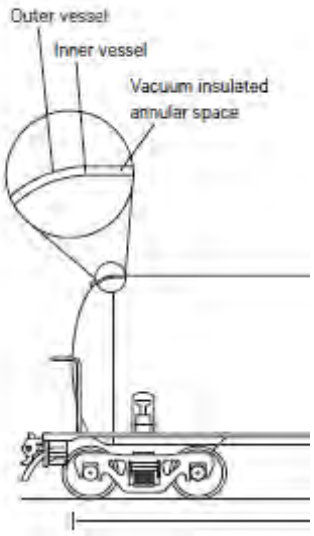


Inner Tank Material of Construction and Pressure Rating

- ASTM A 240/A 240M Type 304 or 304L stainless steel

- 120 psig test pressure





Insulation and Thermal Performance

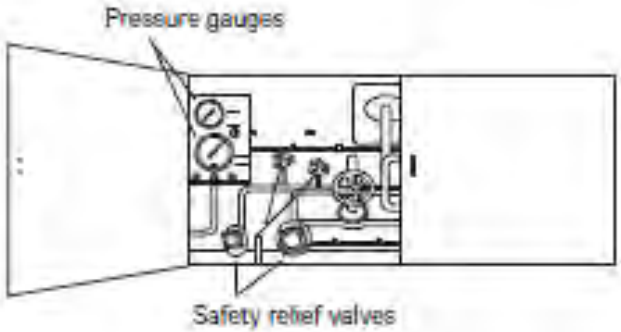
- Insulation system specification (§ 179.400-4)

- Thermal integrity management (§ 173.319)

Set to Discharge Pressure and Filling Density

- Filling density and pressure control valve relationship

- Maximum offering pressure



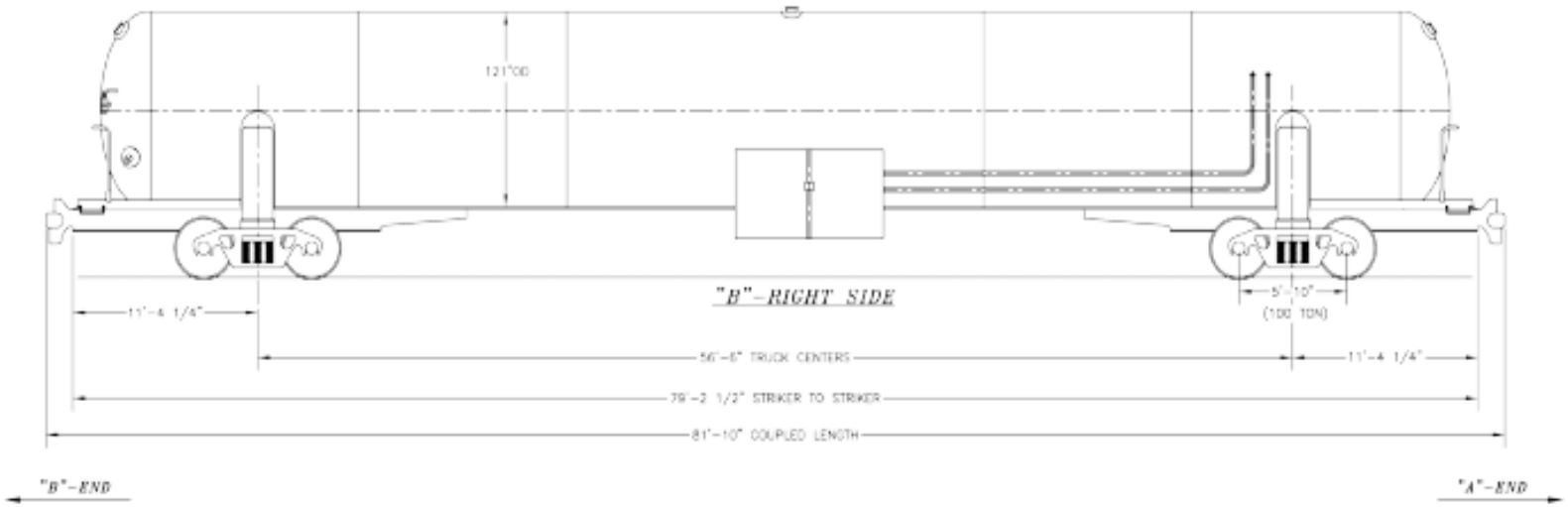
Inner Tank and Lading Retention Conclusion

- Existing DOT-113 inner tank and insulation requirements are suitable for LNG

- Calculated filling density and pressure control valve set-to-discharge values will retain contents during transportation

DOT-113 Outer Tank

- Increased integrity desirable and possible



Derailment Comparison

	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 X 250'W (est)	600'L X 600'W	1200'L x 450'W
General topography of derailment area	Flat field, raised RR bed	Flat/straight tangent track	Flat field, raised RR bed

DOT-117 and Legacy DOT-113 Impact Tests

- Impact tests and finite element analysis

DOT-113 9/16 Inch Surrogate Impact Test

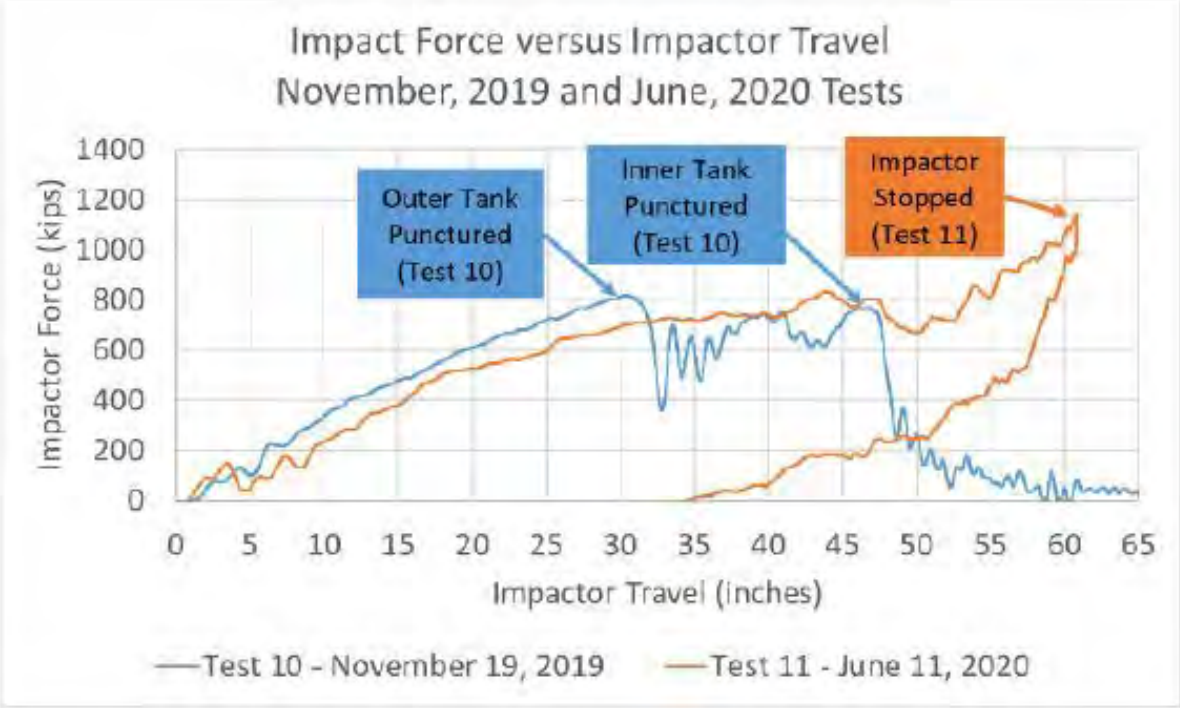


Figure 2. Post-test Photo of the Surrogate

Outer Tank Conclusion

- Basis for 9/16” TC-128B normalized steel

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LNG in Tank Car Operational Controls

Existing Operational Controls

- HMR's training and hazard communication System
- Existing operating requirements
  - Shove tank car to rest
  - 20-day in-transportation requirement
- Rail industry Circular OT-55 requirements adopted by all US railroads, enforced by FRA

Car Handling and Expedited Shipments

- Car handling
  - Care in loading and unloading
  - Unloading facility requirement
  - No cutting off while in motion/striking under momentum
  - Special white background placard
- 20-Day Notification
  - FRA must be notified of any shipment of a flammable cryogenic material in transit for more than 20 days

AAR Circular OT-55

- Key trains
- Key routes
- Adoption and enforceability

Additional Operational Controls in HM-264

- HM-264 adopted additional operation controls for LNG transportation in tank cars:
  - Remote monitoring
  - Routing analysis
  - Braking response

Remote Monitoring

- Location
- Pressure
- Unsafe pressure rise

Routing Analysis

- Any quantity of LNG in a tank car triggers routing analysis

- Risk reduction

Braking

- DP/EOT device for trains with a block of 20 loaded tank cars of LNG, or 35 loaded tank cars of LNG

- Risk reduction

Commenter Operational Controls Not Adopted

- Train length and weight

- Separation distance

Conclusion

Final Decision Points

1. Inner tank + thermal performance
2. Filling density, loading pressure, set-to-discharge
3. Outer tank upgrade
4. Operational controls