

Petroleum Crude by Rail



Steven Wolfe – Hazmat Inspector
USDOT/FRA
Menifee, CA

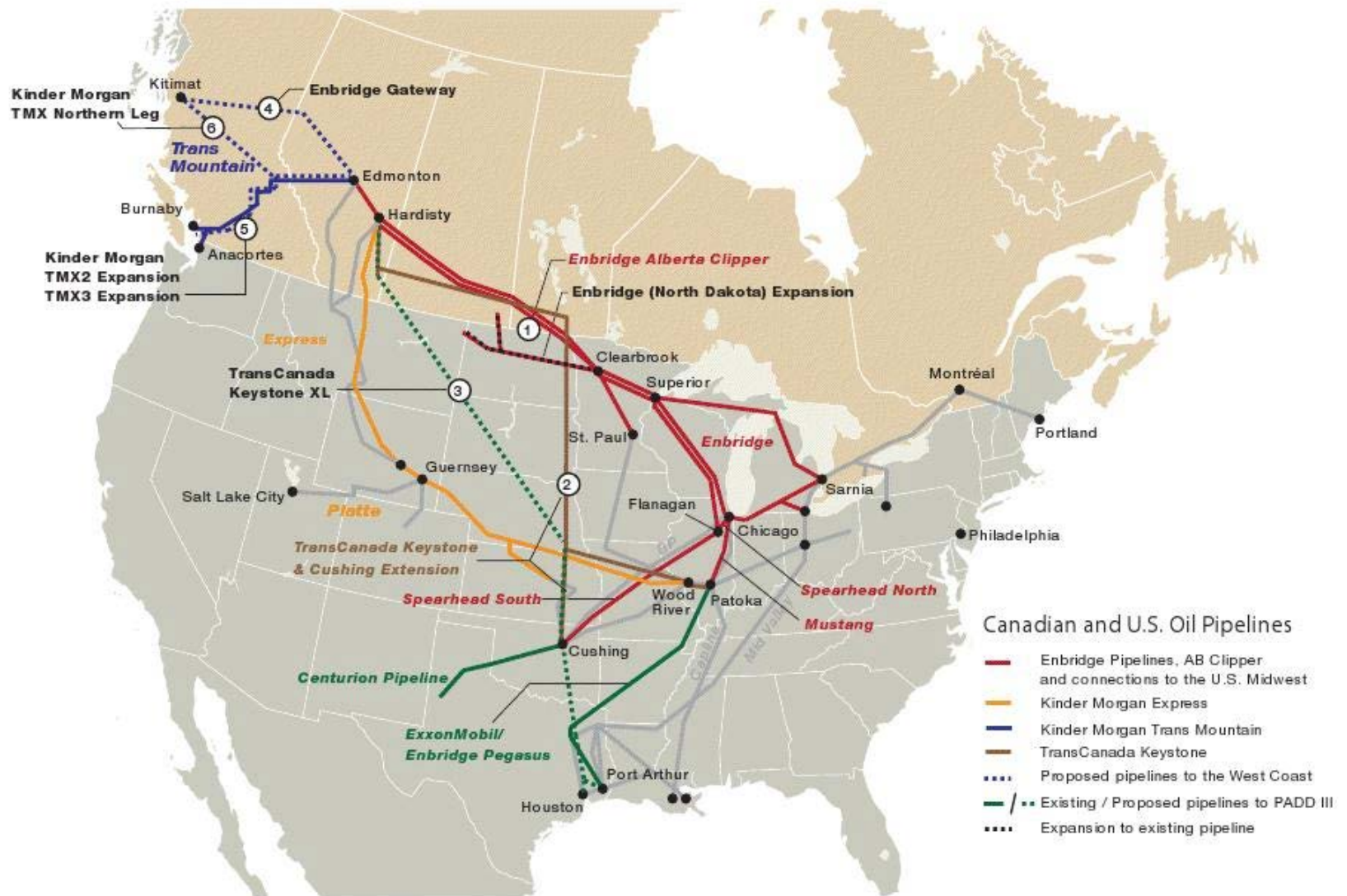
Petroleum Crude Facts

- According to the *AAR Annual Report of Hazardous Materials Transported by Rail* for 2012, crude oil shipments have increased 443 percent since 2005.
- The first quarter of 2013 saw a 166 percent increase in crude oil shipment by rail over the first quarter of 2012
- Growth is expected to continue for the foreseeable future.
- The most frequently transported hazardous material in 2012.

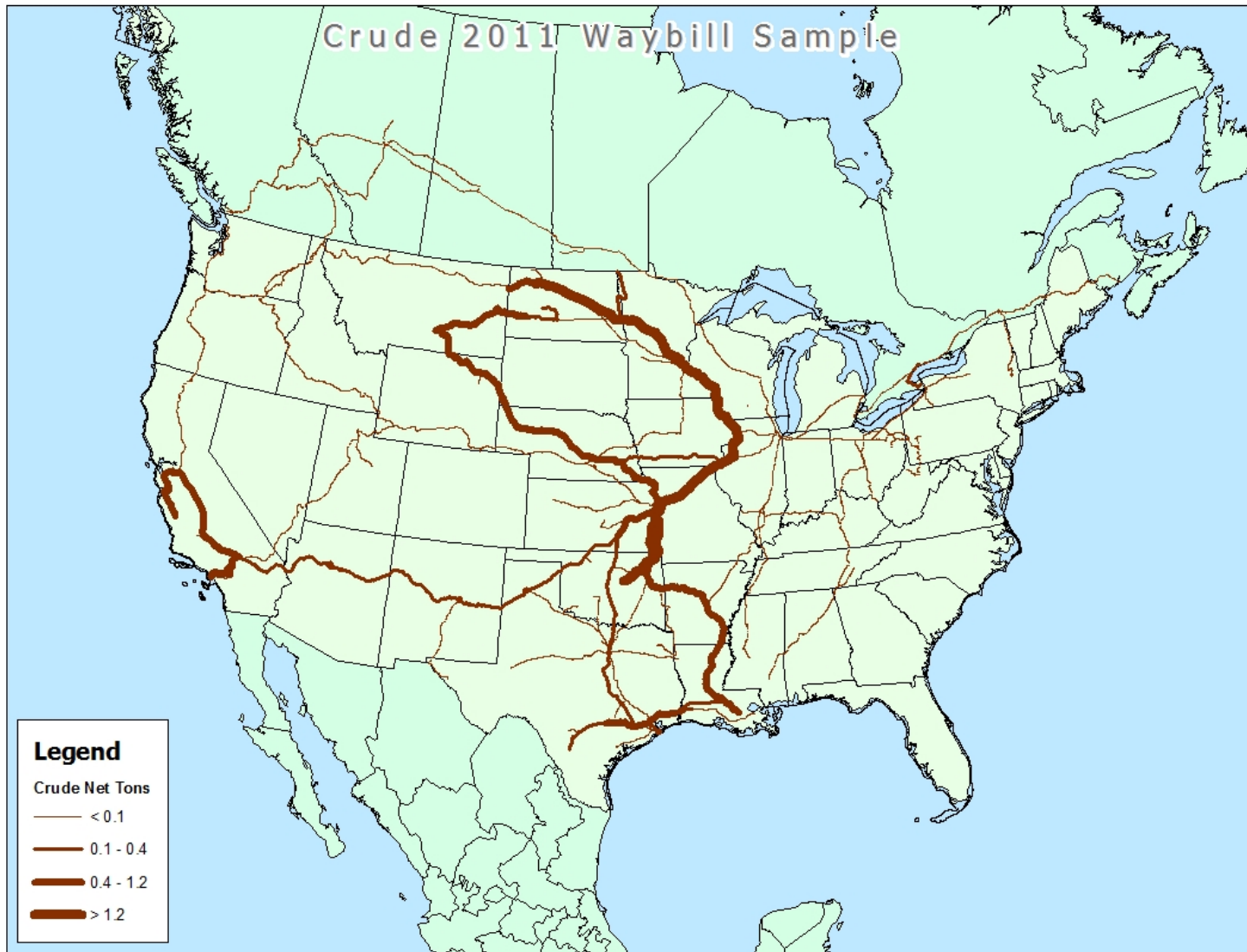
North American shale plays (as of May 2011)



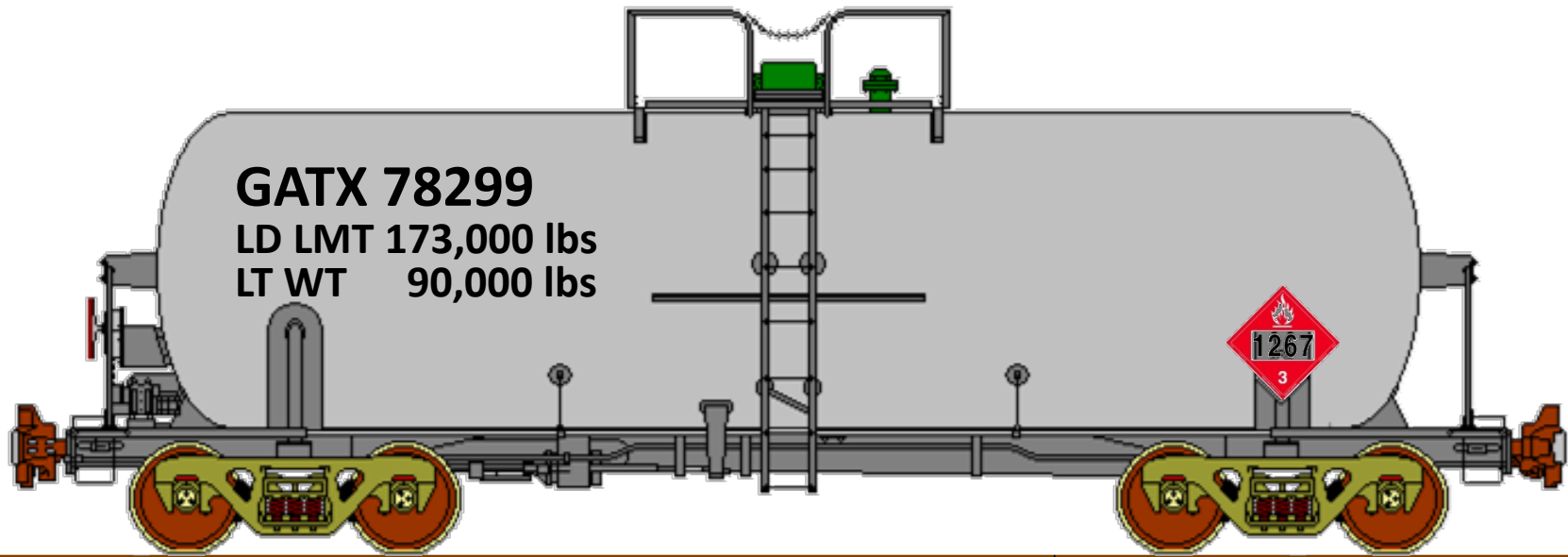
U.S and Canadian Pipelines



Waybill Sample Crude



Classifying Petroleum Crude Oil



Challenges – Rail Transportation

- Multiple truck loads from different well sites being transloaded into a single car
- High levels Hydrogen sulfide gas
- Severe corrosion to tank & service equip
- Impurities in the mix (*wax, sludge, H₂O*)
- Lack of product testing
- Improper classification
- Overloads/Overfilled
- Shortage of tank cars to meet the need



Petroleum Crude Oil

§172.101 Hazmat Table

Proper Shipping Name	Class	ID No.	Packing Group	Special Provisions	Packaging (§173.***)		
					Exception	NB	Bulk
Petroleum Crude Oil	3	UN1267	I	144, 357, T11, TP1, TP8	150	201	243
Petroleum Crude Oil	3	UN1267	II	144, 357, IB2, T4, TP1, TP8	150	203	242
Petroleum Crude Oil	3	UN1267	III	144, 357, B1, IB3, T2, TP1	150	203	242

Residue in underground storage tank requirement

Marking requirement on bulk pkg of Crude Oil emitting **Hydrogen sulfide vapors** - §172.327



(f) Authorizes classifying the material as a **Combustible liquid** in bulk pkgs



(a) **Rail cars:** Class DOT 103, 104, 105, 109, 111, 112, 114, 115 or 120 tank car tanks; Class 106 or 110 multi-unit tank car tanks & AAR Class 206W tank car tanks.

If the material has a flash point at or above 38°C (**100°F**) & below 93°C (**200°F**), then the bulk requirements of §173.241 of this subchapter are applicable. If the material has a flash point of **< 38°C (100°F)**, then the bulk packaging requirements of §173.242 of this subchapter are applicable.

(a) **Rail cars:** Class DOT 103, 104, 105, 109, 111, 112, 114, 115 or 120 fusion-welded tank car tanks; & Class 106 or 110 multi-unit tank car tanks

Petroleum Crude Oil

§173.241 – Bulk packagings for certain low hazard liquid & solid materials.

(a) Rail cars: Class DOT 103, 104, 105, 109, 111, 112, 114, 115 or 120 tank car tanks; Class 106 or 110 multi-unit tank car tanks & AAR 203W, 206W, and **211 W** tank car tanks.

§173.121(a)

Packing Group	Flash Point <i>(Closed-cup)</i>	Initial Boiling Point
I	-	$\leq 35^{\circ}\text{C}$ (95°F)
II	$< 23^{\circ}\text{C}$ (73°F)	$> 35^{\circ}\text{C}$ (95°F)
III	$\geq 23^{\circ}\text{C}, \leq 60^{\circ}\text{C}$ ($\geq 73^{\circ}\text{F}, \leq 140^{\circ}\text{F}$)	$> 35^{\circ}\text{C}$ (95°F)



Concerns...

- Train...
 - Derailments
 - Securement
 - Handling
 - Emergency Response
- Proper Material Classification
- Appropriate Packaging



NTSB Recommendations to FRA

- Require expanded hazardous materials route planning for railroads to avoid populated and other sensitive areas. (Already required for Explosives, PIH, RAM)
- Develop an audit program to ensure rail carriers that carry petroleum products have adequate response capabilities to address worst-case discharges of the entire quantity of product carried on a train.
- Audit shippers and rail carriers to ensure that they are properly classifying hazardous materials in transportation and that they have adequate safety and security plans in place.

PHMSA Alert



**The Pipeline and Hazardous Materials Safety
Administration**

1200 New Jersey Avenue, SE
Washington, DC 20590
www.phmsa.dot.gov

Safety Alert -- January 2, 2014

Preliminary Guidance from OPERATION CLASSIFICATION

The [Pipeline and Hazardous Materials Safety Administration](http://www.phmsa.dot.gov) (PHMSA) is issuing this safety alert to notify the general public, emergency responders and shippers and carriers that recent derailments and resulting fires indicate that the type of crude oil being transported from the Bakken region may be more flammable than traditional heavy crude oil.

Based upon preliminary inspections conducted after recent rail derailments in North Dakota, Alabama and Lac-Megantic, Quebec involving Bakken crude oil, PHMSA is reinforcing the requirement to properly test, characterize, classify, and where appropriate sufficiently degasify hazardous materials prior to and during transportation. This advisory is a follow-up to the PHMSA and Federal Railroad Administration (FRA) [joint safety advisory](#) published November 20, 2013 [78 FR 69745]. As stated in the November Safety Advisory, it is imperative that offerors properly classify and describe hazardous materials being offered for transportation. 49 CFR 173.22. As part of this process, offerors must ensure that all potential hazards of the materials are properly characterized.

Misclassification

Associated Press

Feds: Oil from Dakota fields improperly classified

By Joan Lowy, Matt Brown

February 4

WASHINGTON — Government investigators have found crude oil being transported from North Dakota's Bakken region was misclassified in samples taken from 11 out of 18 truck shipments en route to rail loading stations, federal transportation officials said Tuesday.

\$93,000.00 proposed penalties

EO-28

Establishes six requirements to eliminate the immediate hazard of death, personal injury, or significant harm to the environment, related to the securement of certain unattended equipment

EO-28 Appendix A Materials

- Five or more tank car loads of any one or any combination of materials poisonous by inhalation as defined in 49 CFR 171.8, and including anhydrous ammonia (UN 1005) and ammonia solutions (UN 3318); or
- 20 rail car loads or intermodal portable tank loads of any one or any combination of materials listed in (1) above, or, any Division 2.1 flammable gas, Class 3 flammable liquid or combustible liquid, Class 1.1 or 1.2 explosive, or hazardous substance listed in 49 CFR 173.31(f)(2).

EO-28 Requirements for Rail Carriers

1. Develop Securement Plan for leaving unattended trains outside yards and terminals
2. Develop a process for securing trains outside yard and terminals
 - a) Locomotive cab and reverser
 - b) Dispatcher communication
3. Review and update existing procedures for number of handbrakes
4. Implement operating rules requiring the discussion of securement of any train or vehicle
5. Inspection by qualified employee of any equipment that emergency responders have been on
6. All affected employees must receive notice of EO-28

ANPRM HM-251 P-1577

September 2013

New Car Construction

- PG I & II 286,000 GRL
- Shell Thickness TC 128B
 - 1/2" non jacketed
 - 7/16" jacketed
- Shell Thickness A516-70
 - 9/16" non jacketed
 - 1/2" jacketed
- 1/2" half head shields
- Heads and shells must be normalized steel
- Roll-over protection top fittings
- Reclosing PRD

Additional Considerations

- Thermal Protection
- Roll-over protection top and bottom fittings
- Improve hinged and bolted manways to address common leakage during accidents and NAR's
- Bottom outlet elimination
- Increase outage from 1% - 2% to improve puncture resistance
- Train speed restrictions
- Electronically controlled Pneumatic Brakes (ECP)
- Emergency Response Planning

Railroad Initiative Feb 21, 2014

- 3/25 - Increased Track Inspections. One additional inspection than current FRA requirements
- 4/01 – Braking Systems. Add DPU or two-way telemetry EOT. Provides for more expedient emergency braking
- 7/01 – Use of Rail Traffic Routing Technology to determine safest and most secure rail routes
- 7/01 – Lower speeds with 20 or more and one older DOT 111 car to 40 mph in HTUA's and operate at 50 mph outside of HTUA's
- Continue Community Relations
- 7/01 - Increased Tracksides Technology (every 40 miles)
- 7/01 – Increased ER Training and Tuition Assistance. 1500 first responders in 2014
- 7/01 – Develop an inventory of E/R resources for responding to the release of large amounts of crude oil. Provide DOT with information and upon request to appropriate emergency responders

Petroleum Crude Oil Offerors)
 &)
 Petroleum Crude Oil Rail Carriers \

AMENDED AND RESTATED EMERGENCY RESTRICTION/PROHIBITION ORDER

- requiring persons who offer bulk quantities of petroleum crude oil for transportation in commerce by rail in rail tank cars to ensure that the material is properly tested (conducted with sufficient frequency and quality) and classed in accordance with this Amended Order and the HMR;
- requiring persons who offer bulk quantities of petroleum crude oil for transportation in commerce by rail in rail tank cars to treat Class 3 petroleum crude oil as a Packing Group (PG) I or PG II hazardous material only; and
- prohibiting persons who ordinarily offer petroleum crude oil for shipment as UN 1267, petroleum crude oil, Class 3, PG I, II, or III from reclassifying such crude oil with the intent to circumvent the requirements of this Amended Order.

UNITED STATES DEPARTMENT OF TRANSPORTATION

Petroleum Crude Oil Rail Carriers)

Docket No. DOT-OST-2014-0067

EMERGENCY RESTRICTION/PROHIBITION ORDER

May 7, 2014

- Requires Rail Carriers to provide certain information in writing to the SERC in each state in which the carrier operates trains transporting 1,000,000 gallons or more of Bakken crude oil
- If notification is not made within 30 days of the date of this order, the rail carrier is prohibited from operating any train transporting 1,000,000 gallons or more of Bakken crude oil
- Information to include the following:
 - Reasonable estimate of trains per week through each county within the state
 - Identity and describe the petroleum crude oil per regulations
 - Provide applicable emergency response information per regulations
 - Identify the routes over which the material will be transported
 - Identify at least one POC to communicate with the SERC's

DEPARTMENT OF TRANSPORTATION

Federal Railroad Administration

[Safety Advisory 2014-01]

Pipeline and Hazardous Materials Safety Administration

[Docket No. PHMSA-2014-0049; Notice No. 14-07]

RECOMMENDATIONS FOR TANK CARS USED FOR THE TRANSPORTATION OF PETROLEUM CRUDE OIL BY RAIL AGENCY:

Federal Railroad Administration (FRA) and Pipeline and Hazardous Materials Safety Administration (PHMSA),
Department of Transportation (DOT).

ACTION: Notice of Safety Advisory.

- Applies to persons who offer for transportation, or transport, in tank cars by rail in commerce to, from, or within the United States, a bulk quantity of UN 1267, petroleum crude oil, Class 3, that originates or sourced from the Bakken Shale formation
- Encourages offerors and carriers to take additional precautionary measures by urging them to utilize tank car designs with the highest level of tank car integrity (CPC 1232 tank cars – Slide 17)
- Advises offerors and carriers to avoid use of older, legacy DOT Specification 111 or CTC 111 tank cars

Next Steps

- Implement NTSB Recommendations
- NPRM HM-251
- National Safety Program Plan
 - Verifying Railroad implementation of EO-28
 - Inspect unit trains for proper valve securement and classification of material
- Auditing process of RR ER Plans

NPRM – FR# 2014-17764

- Published 08/01/2014
- Hazardous Materials: Enhanced Tank Car Standards and Operational Controls for High-Hazard Flammable Trains (HHFT)
- Proposes:
 - New operational requirements for large volumes of Class 3 flammable liquids
 - Improvements to tank car standards
 - Revision of general requirements of classification and characterization of mined gases and liquids by offerors
- Defines HHFT
 - A train comprised of 20 or more carloads of a Class 3 flammable liquid and ensures that the rail requirements are more closely aligned with the risks posed by the operation of these trains
- ...Closes to comments 09/30/2014

Proposed Changes - Affected Entities

- Offerors/Shippers of all mined gases and liquids
- Rail Carriers, Emergency Responders
- Tank Car Manufacturers, Tank Car owners, Shippers and Rail Carriers

Offerors/Shippers of All Mined Gases and Liquids

- Written Sampling and Testing Program
 - Frequency of sampling and testing
 - Sampling at various points along supply chain
 - Sampling methods ensuring sampling of entire mixture
 - Testing methods to enable complete analysis, classification and characterization of material
 - Duplicate samples for QA
 - Program certification by offeror

Rail Carriers, Emergency Responders

- Routing Analysis
 - 27 safety and security factors per 49CFR 172.820
- Notification to SERC's
 - One million gallons of Bakken crude oil
- Reduced operating speeds
 - 50 mph for all HHFT's in all areas
- PHMSA seeking comments on three speed restriction options
 - 40 mph in all areas
 - 40 mph in HTUA's
 - 40 mph in areas of 100K+ population
 - Seeking comment on 30 mph for HHFT's that do not comply with enhanced braking
- Enhanced Braking – All HHFT's
 - Electronic pneumatic brakes (ECP)
 - Two-way end-of-train (EOT) device
 - Distributed Power (DP)

T/C Mfr's, TC Owners, Shippers, Rail Carriers

- Enhanced Standards for New and Existing Tank Cars
 - PHMSA seeking comment on three options for DOT Specification 117
 - FRA and PHMSA designed car, or equivalent
 - AAR 2014 tank car, or equivalent
 - Jacketed CPC-1232, or equivalent
 - Require existing tc's to be retrofitted to meet the selected option. Those not retrofitted would be retired or repurposed, or operated under speed restrictions for up to five years based on PG assignment.
 - New TC Construction for DOT 117 after October after October 1, 2015, if those tank cars are used as part of HHFT.
 - For all three Options, PHMSA proposes the following timelines for tank cars used as part of HHFT:
 - For Packing Group I, DOT Specification 111 tank cars are not authorized after October 1, 2017
 - For Packing Group II, DOT Specification 111 tank cars are not authorized after October 1, 2018
 - For Packing Group III, DOT Specification 111 tank cars are not authorized after October 1, 2020

Currently Authorized

- Bottom Outlet Handle: Optional
- GRL: 263K
- Head Shield: Optional; Bare Tanks half height; Jacket Tanks Full 1/2"
- PRD: Reclosing
- Shell Thickness: 7/16" minimum
- Jacket: Optional
- Tank Material: TC128 Grade B Normalized Steel
- Top fitting protection: Not required. When equipped must be per AAR Specifications for tank cars appendix E paragraph 10.2.1
- Thermal Protection: Optional
- Braking: Not required

Option 1: PHMSA and FRA Designed Car DOT 117A100W

- Bottom Outlet Handle: Handle Removed or designed to prevent unintended opening during accident
- GRL: 286K
- Head Shield: Full ½"
- PRD: Reclosing
- Shell Thickness: 9/16" minimum
- Jacket: 11-gauge weather tight
- Tank Material: TC128 Grade B Normalized Steel
- Top fitting protection: protection system sustaining rollover accident of 9 mph
- Thermal Protection: System in accordance with 179.18
 - Torch fire 30"
 - Pool fire 100"
- Braking: Electronic Controlled Pneumatic Brakes (ECP)

Option 2: AAR 2014 TC

- Bottom Outlet Handle: Handle Removed or designed to prevent unintended opening during accident
- GRL: 286K
- Head Shield: Full ½"
- PRD: Reclosing
- Shell Thickness: 9/16" minimum
- Jacket: 11-gauge weather tight
- Tank Material: TC128 Grade B Normalized Steel
- Top fitting protection: AAR Specifications for tank cars appendix E paragraph 10.2.1
- Thermal Protection: System in accordance with 179.18
 - Torch fire 30"
 - Pool fire 100"
- Braking: In train with Distributed Power (DP) or End of Train (EOT) Devices

Option 3: Enhanced CPC 1232 TC

- Bottom Outlet Handle: Handle Removed or designed to prevent unintended opening during accident
- GRL: 286K
- Head Shield: Full ½"
- PRD: Reclosing
- Shell Thickness: 7/16" minimum
- Jacket: 11-gauge weather tight
- Tank Material: TC128 Grade B Normalized Steel
- Top fitting protection: AAR Specifications for tank cars appendix E paragraph 10.2.1
- Thermal Protection: System in accordance with 179.18
 - Torch fire 30"
 - Pool fire 100"
- Braking: In train with Distributed Power (DP) or End of Train (EOT) Devices

HM – Oil Spill Response Plans for HHFT's

ANPRM Docket No. 2014-0105-(HM-251-B)

- Published 08/01/2014
- PHMSA/FRA Seeking Comment
 - Revisions that would expand the applicability of comprehensive OSRP's to HHFT's.
 - Appropriate thresholds for Comprehensive OSRP's
 - 1,000,000 gallons per train
 - A HHFT of 20 cars or more
 - 42,000 gallons per train
 - Or other threshold
 - Are the current requirements clear enough to understand by RR's (Part 130)
 - Costs associated with
 - Submitting plans
 - Private resources
 - Training/drills/equipment testing
 - Recommended changes to existing basic OSRP's
 - Requirement to submit plans to SERC's, TERC's, Fusion Centers, Coast Guard, etc?
- ...Closes to public comment 09/30/2014

Thank you!