

PHMSA has analyzed this data regarding DOT-113 damage history.⁸ From 1980 to 2017 (a 37-year period), there were 14 instances of damage to DOT-113 tank cars during transportation. Of the 14 instances, there were three instances where a DOT-113 lost lading from breach of both the outer and inner tanks. This is the most serious type of damage. Additionally, there were four instances in which a DOT-113 lost lading from damage or other failure to the valves/fittings. The vast majority of incidents causing damage to the DOT-113s did not result in a loss of hazardous materials.

The first derailment that resulted in the breaching of the inner tank of a DOT-113 took place in May 2011 in Moran, Kansas. Three DOT-113C120 specification tank cars containing “Ethylene, refrigerated liquid” sustained significant damage. Two of the cars were breached in the derailment and initially caught fire. The breach and resulting fire consumed the contents of one of the tank cars. The other two cars were mechanically breached with explosives (i.e., purposely breached) to minimize risk to responders and to expedite the burning and consumption of the entire contents from the two tank cars so that the site could be cleared. The total quantity of refrigerated ethylene spilled was 124,000 gallons. The response cost was estimated at \$210,255, and the total damage estimate was calculated at approximately \$231,000 in 2017.⁹ The other derailment that caused tank failure occurred in October 2014 in Mer Rouge, Louisiana. The rail tank cars were filled with refrigerated liquid argon. One car was a DOT-113A90W specification tank car and the other was an AAR204W tank car (a car equivalent to the concept of a DOT-113 tank car). Both of these tank cars are authorized by special permit. The total quantity of refrigerated argon spilled was 47,233 gallons and the total damage estimate is calculated at approximately \$228,000 (in 2017 dollars). No injuries or fatalities were reported as a result of the release of hazardous materials from either incident. Any breach of the inner tank of a rail car carrying cryogenic materials will most likely result in the loss of the entire contents of the tank, meaning that release amounts will typically equal the original lading amount. For safety reasons, a heavily damaged rail tank car filled with cryogenic material would be emptied prior to removal from the site of the incident. Response and mitigation techniques beyond evacuation for breaches in cryogenic tank cars do not exist or are impractical during a derailment scenario. The breach of a cryogenic tank car will typically result in the loss of the entire volume of material in the tank car. Incidents are rare, though rail incidents can be high-consequence events, given the quantity of hazardous materials in transportation.

LNG Characteristics and Hazards

Methane is a non-toxic, flammable and odorless gas. In an accident, when LNG is spilled and its vapors encounter an ignition source, the vapor will ignite only if the vapor concentration in air is between 5% and 15% volume. Immediate ignition with liquid still on the ground could cause the spill to develop into a pool fire and present a radiant heat hazard. If there is no ignition source, the LNG will vaporize rapidly forming a cold gas cloud that is initially heavier than air, mixes with ambient air, spreads and is carried downwind. The dispersion of the cloud due to wind results in the cloud temperature increasing due to mixing with air and contact with other materials and surfaces. The clouds temperature will remain lower than that of air and continue to travel at ground

⁸ “RSI-AAR Railroad Tank Car Safety Research and Test Project,” RA-19-03, May 3, 2019

⁹ Hazardous Materials Incident Report Form (DOT F 5800.1 (01-2004)), May 23, 2011; Moran, Kansas. RSI-AAR Railroad Tank Car Safety Research and Test Project RA-19-03 May 3, 2019.