

for transportation in the DOT 113C120W tank car and an average 3 psig/day regulatory allowable pressure gain during transportation. The loading pressure was selected because of the 3 psig regulatory requirement, 20-day travel time, and the 75 psig pressure setting for relief valve operation. These loading conditions are like the requirements for refrigerated ethylene. The loading pressure, along with other safety requirements and operational controls minimize the potential of a BLEVE. Therefore, it is not possible to state with certainty whether a BLEVE is possible in case of a LNG tank car derailment and what conditions need to be there for such an event to occur. However, recent full-scale test with a double walled portable cryogenic tank filled with liquid nitrogen (and whose PRVs operated as designed) and exposed to a > 200-minute engulfing LPG pool fire was neither destroyed nor BLEVE'd. A test was performed with liquid nitrogen in a ISO portable tank on a flatbed rail car and exposed to a propane pool fire underneath the rail car. The results are not conclusive because wind conditions prevented the complete fire engulfment of the tank, and loss of data stream. While the flatbed car was seen to bend due to the heat from the fire, there was no significant damage to the ISO portable tank except for loss of vacuum insulation and melting of small parts of the physical insulation. BLEVE phenomenon did not occur.

LNG Release Scenarios

Based on the review of incident reporting and the 50-year history of transporting cryogenic liquids in DOT-113 specification tank cars, there are three (3) possible release scenarios that could occur during the transport of LNG by rail. Ranked in order of estimated probability, they are:

1. Non-accident release (NAR) from service equipment. Probability – moderate; Consequence – Low
2. Outer tank damage resulting vapor release from pressure relief device (PRD). Probability – Low; Consequence – Low to High
3. Inner tank damage resulting in large release/spill. Probability –Low; Consequence – High

Although Scenario 3 has a low probability, a breached inner tank during a transportation accident could have a high consequence due to a higher probability of a fire due to the formation of a flammable gas vapor/air mixture in the immediate vicinity of the spilled LNG. This probability is based on the likelihood of ignition sources (sparks, hot surfaces, etc.) being generated by other equipment, rail cars, or vehicles involved in a transportation accident that could ignite a flammable vapor cloud.

As with any incident involving a hazardous material in transportation, the actual hazard distance created by a material that is spilled or burning will be influenced by many factors. These factors include, but are not limited to the following:

- Spill Size
- Weather (Wind, Temperature, Humidity, Precipitation)
- Terrain Contours (Hills, Valleys)