

feet). These conditions apply to Lift On/Lift Off of ISOs into well cars since they will be single-stacked.

Table 4. Lifting operation LOC rate due to drops.

Description	Frequency (lift ⁻¹)
50 mm (2-inch) hole	6.7×10 ⁻⁷

3.1.2 Train Accident Rates

LNG shipping by rail is historically uncommon in recent U.S. rail industry history; thus, accident data that are directly comparable to movement of LNG ISO containers do not exist. Thus, Exponent analyzed publicly-available data from the FRA to estimate train accident rates for the QRA. Potential train accidents may occur in a yard when trains are assembled, during switching activities, and when trains travel in the yard and along the line of road. Due to the frequency of simultaneous operations and other factors, accident rates are typically higher in a rail switching yard than on the line of road. However, the speed of trains in yards is significantly slower on average than on mainline track. Thus, at lower speeds, the accident outcomes (e.g., derailment or LOC) are also anticipated to be less likely in rail yards than on mainline track. The following discussion will provide an overview of application of the available data to estimating potential LNG ISO train accident rates.

The FRA Office of Safety Analysis maintains an online database that provides historical accident and failure rate data for the rail industry.²⁰ Accidents in the database include broken equipment, highway grade crossing collisions, train collisions, and derailments. FECR operates a relatively small line with fewer trains, fewer train miles traveled, and fewer potential hazardous materials incidents than Class 1 railroads and many other short-line railroads. In order to provide a larger basis of operation for conservatively estimating accident rates on FECR’s line, the industry data was used and applied to FECR’s train miles.

The FRA industry-wide database for train accidents with reportable damage data²¹ was first queried and downloaded for all accident reports during the twenty-one year period from 1995-2015, yielding a total count of 70,072 accidents. The accidents are identified in the database by category and include multiple types of collisions, explosions, fires, other impacts, and other events. These types of accidents are consistent with the events necessary to lead to an LOC of LNG from an ISO. There were, on average, 3,337 total accidents reported per year for the overall rail industry. The FRA data was filtered for all accidents from 1995-2015 (all railroad

²⁰ Accessible via safetydata.fra.dot.gov.

²¹ FRA Office of Safety Analysis, Report 3.16 – Summary of Train Accidents with Reportable Damage, Casualties, and Major Causes.