



Pressure Tank Car Crashworthiness

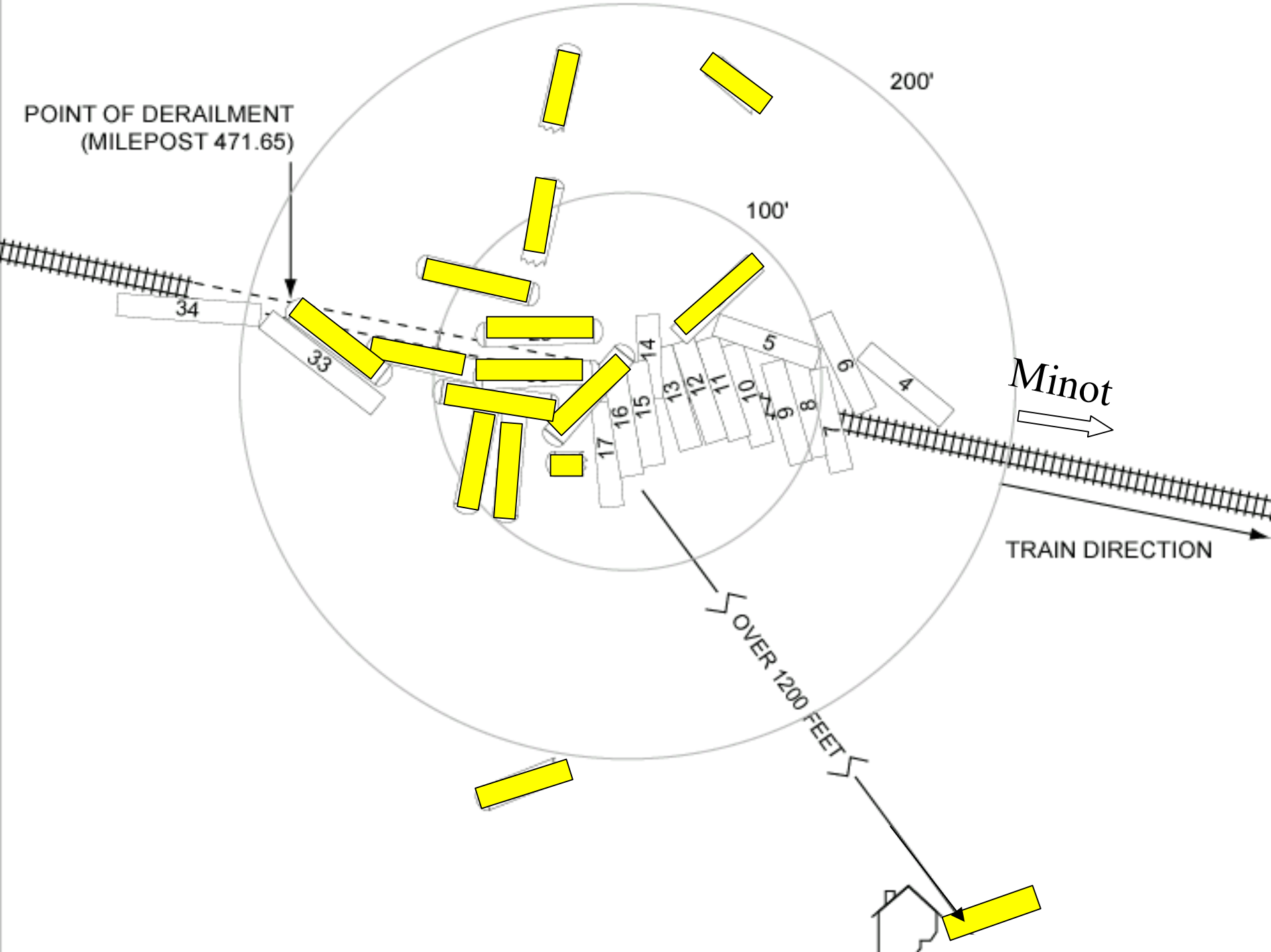
- **Catastrophic tank shell failures**
- **Failure mode and fracture toughness**
- **Reducing risks from pre-1989 tank cars**



Anhydrous Ammonia Loading/Shipping

- **15 pressure tank cars**
- **29,000-gallons of anhydrous ammonia per tank car**
- **Loading temperature of the ammonia: 40° F**
- **Estimated tank shell temperature at time of accident: 36° F**





Tank Car Position in Train – ID #	Ammonia Loaded	Damages	Product Lost
18 – PLMX 4644	29,776 gal	Puncture and tear	100% (leak)
19 – GATX 47814	29,528 gal	Catastrophic rupture	100%
20 – GATX 47837	29,473 gal	Catastrophic rupture	100%
21 – GATX 49248	29,447 gal	Puncture	100% (leak)
22 – GATX 47982	29,481 gal	Catastrophic rupture	100%
23 – GATX 48081	29,213 gal	Catastrophic rupture	100%
24 – PLMX 4504	29,006 gal	Catastrophic rupture	100%





Car #19 - GATX 47814



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Car # 22 - GATX 47982



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Conclusion

The catastrophic fracture of five tank cars increased the severity of the accident by exposing residents to high concentrations of toxic vapors from the instantaneous release of 146,700 gallons of anhydrous ammonia and to the rocketing of portions of tank cars.



