Course Agenda

• BNSF Hazmat Team
• Introduction and History of Rail Equipment
• Types of Railcars and Response Considerations
• Wrap up and Questions
HAZMAT Manager Region Map

BNSF HAZMAT

BNSF HAZMAT REGION MAP
Railcar Knowledge for the First Responder - Tank Cars
Tank Car History

- Early tank cars were simply wooden vats placed on a flat car.
- Riveted cast iron increased capacity and strength.
- Fusion welded cars became the standard in the 1940’s.
Modern DOT-117 Tank Car
Tank Car Construction

- Tank Cars can be constructed of various metals including:
  - Carbon Steel
  - Nickel
  - Aluminum

- Hemispherical Heads are Pressed into shape
- Rings are rolled for the body
- Heads and Rings are Welded together robotically
- Tanks are hydrostatically tested after welding
Tank Car Shell Thicknesses

- 105A600W: 1 1/8"
- 105A500W: 3/4"
- 112A400W: 11/16"
- 112J340W: 9/16"
- 111A100W: 7/16"
- IM 101: 1/4"
- IM 102: 1/8"

ISO Tank
Tank Jacket
Tank Cars
Tank cars are generally divided into three classifications:

• **Low-Pressure (General Service) Cars:**
  - Tank test pressures up to 100 psi (1/5 of tank burst pressure)
  - Working pressures up to 165 psi (will explain later)
  - For Hazardous and Non-Hazardous commodities

• **Pressure Cars:**
  - Tank test pressures from 100 - 600psi (1/5 of tank burst pressure)
  - For Hazardous commodities
  - Generally transports Liquefied Compressed Gasses but can transport liquids as well

• **Cryogenic Cars:**
  - Most are low-pressure, CO2 is in pressure car
  - Most move inert atmospheric gasses (CO2, Argon)
  - Some but very few shipments of Flammable Liquid Ethylene (flammable gas) and Anhydrous Hydrogen Chloride (toxic/corrosive gas) are also moved by rail.
  - Tank within a tank
A specification is a set of standards or regulations that specify how a car is to be designed and constructed. This includes the type of materials used for the tank, plate thickness, type of welding or plate connections and the vessel pressure ratings.

Tank cars are built to a specific standard as indicated by car type. The authorizing agencies include USDOT (DOT), Transport Canada (TC) and the American Association of Railroads (AAR).

AAR car are only authorized to move

The specification must be stenciled on all railroad tank cars.
What’s the Specification look like?

**Reference AAR Field Guide for Tank Cars for more information**
Other Tank Car Markings

- Reporting Marks
- Capacity
- Qualification Stencil & Build Date
- Weights
Reporting Marks & Tank Capacity

- Unique Number for Each Rail Car
- Located on the Left Side, Both Ends, some cars also stencil the reporting marks on top
- Capacity of tank car at 100% volume with water on ends
Light Weight & Load Limit

Car Weights – Left side underneath Reporting Marks

PPGX 2988

LD LMT 201600 LBS 91450 KGS
LT WT 61400 LBS 27850 KGS
LC 10-86 1 1/2 INCH HF COMP SHOES
Qualification Stencil - RIGHT SIDE

- Tank Car Specification
- Safety Valve / Vent Pressure
- Inspection Dates
- Build Date
- Placard
Railcar Orientation

Orientation Terminology
• B end (with handbrake)
• A end (no handbrake)
• Left – looking at car from B end
• Right – looking at car from B end
• Axles/Wheels counted from B end
Double Shelf Couplers reduce risk of tank car head punctures in derailments or from bypassed coupling.
Railcar Trucks

Center Bowl with Pin

Truck Assembly
Truck Assembly

- Axle
- Wheel
- Side frame
- Springs
- Roller bearing
- Side bearing
- Center bowl
Insulation
• Used to control commodity temperature change
  • Wrapped Fiberglass
  • Poured in Expanding Foam

Thermal Protection
• Protects tank steel from flame impingement
  • Ceramic Fiber material
  • 100 minutes protection – Pool Fire
  • 30 minutes protection – direct Flame impingement
Jacket

- Installed Over Insulation or Thermal Protection
- 1/8” Thick
- NOT STRUCTURAL
Head Shields

- Head shields, made of half-inch steel, are attached to the ends of specified tank cars to help prevent puncture of the tank shell.
- May not be visible (underneath jacket)
Pressure Cars
Liquid valves are placed in-line with the length of the car.

**LPG / Ammonia / Propane**
Liquid valves are placed in-line with the length of the car.

Chlorine
Excess Flow Valves

- Stops product flow if hose breaks during transfer operations or valve is sheared off
- Prevents product flow if tank is upside down
  - Located Under:
    - Liquid Lines
    - Vapor Lines
    - Sample Lines

Chlorine cars have these on liquid lines only
Excess Flow Valves
Magnetic Gauging Device

• Used to determine quantity of commodity in the tank car

• As product rises in the tank car, the gauge rod and float will rise to indicate commodity level

• Enclosed system as the magnet from the rod will engage with the float

• When removing cap, weep holes will identify a damaged internal tube
Sample Line

- Means for extracting small sample quantities from tank
  - Usually ¼” NPT
  - Needle valve on top
  - Excess flow valve under pressure plate
  - Responder can use to obtain pressure of tank car
Thermometer Well

- Sealed tube in the car
- Used to take commodity temperature
- Filled with anti-freeze
- Should **NEVER** have product or pressure in tube

**Note**-When removing cap weep holes will identify a damaged internal tube
Pressure Relief Valves (PRD)

Pressure relief devices are utilized to relieve internal pressure of the tank car to prevent a catastrophic failure.

**Internal Spring**

- May engage due to…
  - Tank Car Overfilled
  - Chemical reaction
  - Broken Spring
  - Excess internal pressure

- May release due to…
  - Failed O-Ring(s)
  - Compromised Spring
  - Incorrect adjusted spring pressure

**External Spring**
Low Pressure / General Service Tank Car
Valves & Fittings - appurtenances attached to tank cars by bolting, threading, or welding. May contain any of the following…

- Man Ways
- Bottom Outlets
- Top Unloading Valves
- Vacuum Relief Valves
- Safety Relief Valves
- Safety Vents
- Heater Coils
- Insulation
- Gauging/Outage
Fittings / Appliances
Fittings/Appliances Cont.
Multi-Compartment Cars

You want it with how many compartments?
Corrosive Service – Low Pressure Car
Cryogenic Tank Cars
Cryogenic Tank Cars

DOT 113 tank cars are used for cryogenic and other low temperature products.

DOT 113 tank cars are easily identified from their absence of a dome and their external vent lines.
Vacuum Plate

- A vacuum is pulled between the tank car and the jacket to ensure the commodity is not exposed to ambient temperatures and pressures.

- The internal pressure will increase approximately 3 psi per day while in transit.

- Cars have a vacuum plate on the top or end and are being held on by vacuum only.

*No plate, no vacuum and pressure will increase rapidly!*
Regulating Road Valve

• Allows the car to release pressure at a set psi and thus cools the liquid while relieving internal pressure and will reclose. Cars are stenciled “Venting Normal”
CO$_2$ Car Venting
Venting Normal
Not “Normal Venting”
Not “Normal Venting”
Consult the Shipper/Consignee
CO$_2$ Valve Configuration-Valves

- **Rupture Disc Assembly**
- **Safety Relief Valve**
- **Regulating Valves (Road Valves)**
Section VI:
Additional Rail Transport Vehicles
Automobile Transport or AutoRack

- 12 to 18 vehicles
- Up to 32 vehicles
- Fuel
- Hydraulic fluid
- Antifreeze
- Freon
- Plastics
- Air Bag Inflators
Mechanical Refrigeration Box Cars

Stop switch
Coiled Steel Cars - Not a HazMat but......
Box Cars
Flat Cars - TOFC/COFC
Intermodal Well Cars
Intermodal Portable Tank Containers