

Railcar Knowledge for the First Responder

Derek Lampkin

MANAGER, HAZARDOUS MATERIALS

COMMUNITY TRAINING WEBINAR SERIES

BNSFHAZMAT

61

61

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- 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 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.



Densmore Car – Circa 1860







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





Tank Car Types and Classifications

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

What is a DOT Specification?

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- 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





Car Weights – Left side underneath Reporting Marks





Qualification Stencil - RIGHT SIDE



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

CHLORINE INHALATION HAZARD

DOT 105.1500W	STATION	QUALIFIED	DUE
TANK QUALIFICATION	TDEN	1997	2007
THICKNESS TEST	TDEN	1997	2007
SERVICE EQUIPMENT	TXIX	1997	2007
PRD: VALVE 375 PSI	ΤΧΙΧ	1997	2007
LINING			
88.B.2 INSPECTION	TXIX	1997	2007
STUB SILL INSPECTION	ΤΧΙΧ	1997	2007



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







Standard vs Double Shelf Coupler

Double Shelf Couplers reduce risk of tank car head punctures in derailments or from bypassed coupling





Janney Coupler patented in 1897 (Non-tank car Shipments)

Double Shelf Coupler (All Tank Cars)

Railcar Trucks





Center Bowl with Pin

Truck Assembly



Truck Assembly





Insulation/Thermal Protection



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





High Pressure Cars: Valves and Fittings





Liquid valves are placed in-line with the length of the car.

LPG / Ammonia / Propane

High Pressure Cars: Valves and Fittings





Older Style

"Next-Gen"

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

Needle valve on top

Responder can use to

obtain pressure of tank

Excess flow valve under

Usually ¹/₄" NPT

pressure plate

tank

car

ullet

ullet

•

•

Needle Valve

Excess Flow

Valve

Thermometer Well

- Sealed tube in the car
- Used to take commodity temperature
- Filled with anti-freeze
- Should <u>NEVER</u> 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

General Service Tank Car Valves & Fittings

<u>Valves & Fittings</u> - 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

<u>No plate, no vacuum and pressure</u> <u>will increase rapidly!</u>

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"

CO₂ Car Venting

Venting Normal

Not "Normal Venting"

Not "Normal Venting"

Consult the Shipper/Consignee

CO₂ Valve Configuration-Valves

Section VI: Additional Rail Transport Vehicles

Railroad Emergency Response & Hazardous Materials Awareness

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

Coiled Steel Cars - Not a HazMat but.....

Box Cars

Flat Cars - TOFC/COFC

Intermodal Well Cars

Intermodal Portable Tank Containers

HAZMAT Manager Region Map

BNSF HAZMAT REGION MAP

QUESTIONS?

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498

Railroad Emergency Response & Hazardous Materials Awareness