

# Examination Before Shipping

Best Practices for Loading and Off-Loading  
Tank Cars based on AAR Pamphlet 34

# Background and General Requirements

# Introduction

- This presentation provides general guidelines for the selection of tank cars and recommended procedures for loading and off-loading of the cars.
- The Department of Transportation requires offerors to examine each tank car prior to transportation to ensure the tank is safe and in proper condition for transport (see 49 CFR 173.31 and 174.67).
- This presentation follows the recommended procedures outlined by the Association of American Railroads in Pamphlet 34 *“Recommended Methods for the Safe Loading and Unloading of Non-Pressure (General Service) and Pressure Tank Cars.”*
- This presentation is not a complete and comprehensive set of methods, instructions or procedures applicable for all situations and car types.

# Caution Statement

- CAUTION: *Since the loading and off-loading of tank cars involves the opening of valves, fittings, flanges, caps, plugs and other closures there is always a possibility of product spillage or leakage. While this should be minimized, the operator must be prepared to capture, collect, and dispose of any spilled or leaked product in an environmentally-acceptable manner.*

# HazMat Training

- Prior to loading or off-loading a tank car, operating personnel MUST receive appropriate hazardous material training related to the function the operator will perform.
- Training MUST cover the Department of Transportation's regulations with respect to loading and off-loading of tank cars.
- Each hazmat employer MUST certify that the operator was properly trained and tested.

# Secure Access to Track

- When placing a tank car for loading/off-loading, and before un-securing any closure:
  - Securely block access to the track by use of derails, aligned and locked switches, bumper blocks, or other such apparatus.
  - Place blue caution signs (sometimes known as “*blue flags*”) on the track to warn persons approaching the cars.



# Set the Hand Brake

- The car must have the hand brakes set before starting loading/off-loading activities.



# Block a Wheel

- The car must have one wheel blocked against movement in both direction before starting loading/off-loading activities.





# Preparation for Product Transfer

- Before loading/off-loading, inspect the car for damage. If damaged, contact the car owner for further instructions before loading.
- Tank car tanks containing flammable or combustible gases or liquids should be electrically grounded and bonded during loading and off-loading operations.
- Grounding and bonding of cars carrying other commodities is also encouraged.
- Document loading/off-loading inspections on a checklist.

# Remain in Attendance

- During the loading/off-loading process, monitor the operation:
  - Trained and designated personnel
  - Monitored by a signaling system.
- Do not allow the loading/off-loading operation to stand unattended or unmonitored while connections are attached to the car.



# Attendance Exception

- Attendance is not required when piping is attached to the top outlet of a tank car, equipped with a protective housing cover, under the following conditions:
  - All valves are tightly closed;
  - The piping is not connected to the hose or other off-loading equipment and is fitted with a cap or plug of appropriate material and constructions; and
  - The piping extends no more than 6-inches from the outer edge of the protective housing.

# Attendance Exception

- In the absence of an operator, a tank car may stand with off-loading connections attached, where no product is being transferred, under the following conditions:
  - Facility operator must designate a hazmat employee responsible for on-site monitoring;
  - When using a signaling system, the system must be capable of alerting the designated hazmat employee;
  - The tank car and facility shut-off valves must be closed;
  - Brakes must be set and one wheel blocked in both directions;  
and
  - Access to the track must be secured.

# Discontinuing Operations

- If necessary to discontinue operations for a period of time, close all valves, remove all connections, and prepare the car as if ready for transportation.
- Operations may be discontinued on an attended or monitored car by closing valves on the car and closing valves at the facility without disconnecting hoses.

# Body Position

- When operating gauging devices, top operated bottom outlet valves, or any other top fittings or closures, operators should not stand directly above or place any part of their body directly above the gauging device, valve, fitting, or closure.



# Gauging Devices

- Prior to attempting to move the gage rod, loosen the packing gland nut slightly. Do not use a wrench for additional leverage to raise and/or lower sticking gage rods. Remember to retighten the packing gland nut prior to offering for transportation.



# Loading

## Tank Car Selection and Inspection



# Tank Car Selection

- Shippers must ensure that the tank car is authorized for the commodity.
- The tank car must be of sufficient capacity, both by weight and volume to contain the quantity of the product being loaded.
- Applicable requirements such as outage, filling density or weight restrictions must be met.



# Security and Tampering

*NOTE: During the inspection of the car, look for any items that are not typical of standard tank car designs as they may indicate a security breach – follow company-specific procedures or guidelines if such items are found.*

# Inspection of Tank Car

- Examine the tank car for abrasion, corrosion, cracks, dents, distortions, and defects on welds.



# Piping, Valves, and Fittings

- Examine the piping, valves, and fittings for corrosion, damage, and signs of leakage;
- Examine fasteners for condition and securement;



# Bolt, Nuts, and Washers

- Examine bolt and nut threads, and washer faces of nuts for corrosion, rust, and burrs. Replace / correct any damaged components.
- If washers are scored or cupped from previous use, replace with new through-hardened washers.



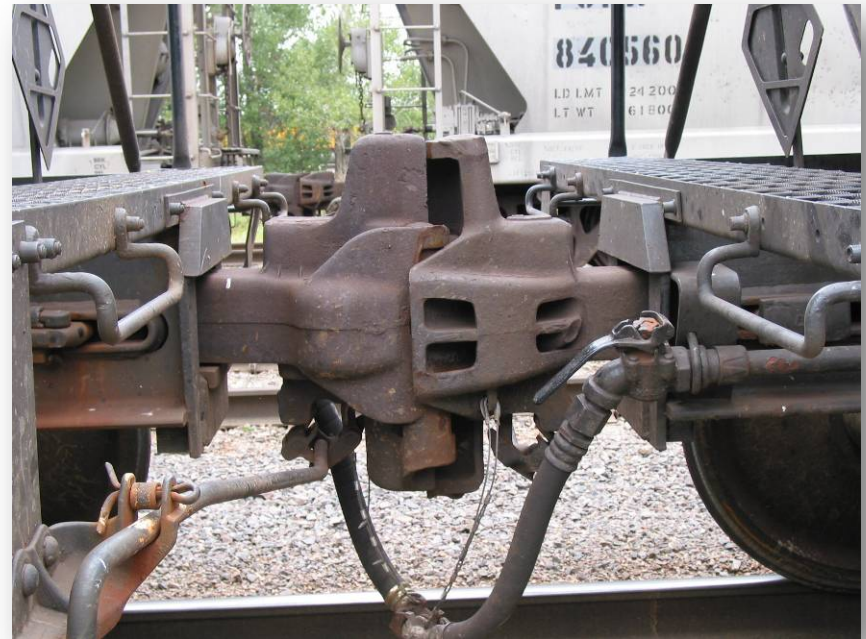
# Closures

- Examine closures for indications of leakage, and the condition of threaded pipe plug closures;



# Coupler Vertical Restraint System

- Examine safety systems:
  - Top and bottom shelf couplers;



# Bottom Discontinuity Protection

- Bottom “skid” protection;





# Protective Housing

- Protective housing and their covers for proper alignment and securement;



# Half-Height Head Shield

- Head protection; and
- Shell protection.



# Inspection of Tank Car

- Examine safety systems (continued):
  - Thermal protection systems
  - Metal jacket for abrasion, corrosion, cracks, dents, distortions, and defects on welds.



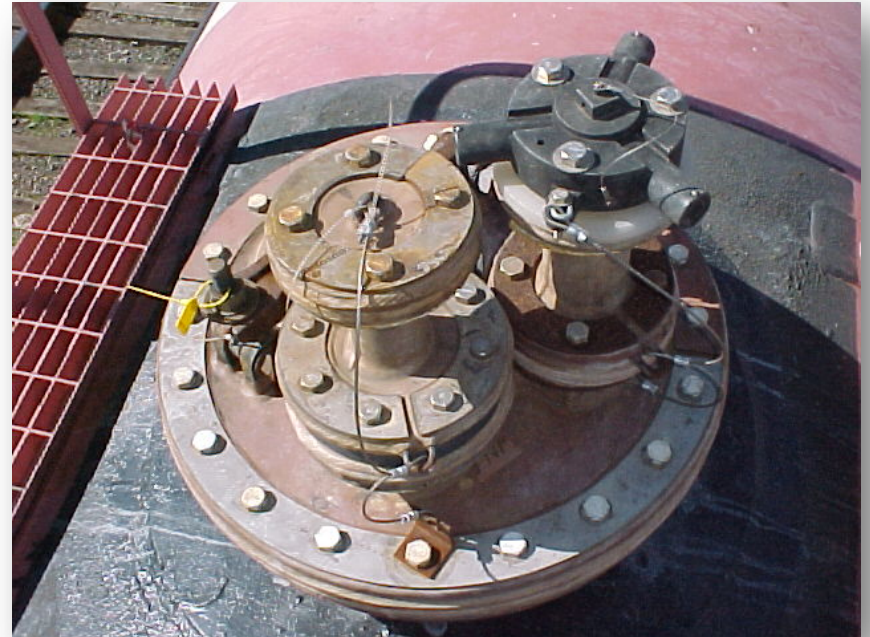
# Qualification Stencil

- Examine the tank car qualification stencil to confirm that the car is not overdue for any inspection or test.
- **Do not load a car with an overdue inspection or test.**

DOT 105 J 400 W			
	STATION STENCIL	QUALIFIED	DUE
TANK QUALIFICATION	MRN	2012	2022
THICKNESS TEST	MRN	2012	2022
SERVICE EQUIPMENT	MRN	2012	2022
PRD: VALVE 300 PSI	MRN	2012	2022
LINING			
TYPE			
88.B.2 INSPECTION	MRN	2012	2022
STUB SILL INSPECTION	MRN	2012	2022

# Service Equipment

- All fittings, valves, gaskets and fasteners must be in proper condition, i.e. not corroded, torn, worn, stripped or otherwise damaged.
- Materials contacting the lading must be compatible with the product being loaded into the car.



# Reclosing PRD

- If equipped with a pressure relief valve, the valve must be inspected to ensure no debris is in its discharge area.



# Telltale Indicator

- If a combination pressure relief device is present, check the telltale indicator to determine the integrity of the rupture disk. These devices must be closed prior to transportation.



Telltale Indicator

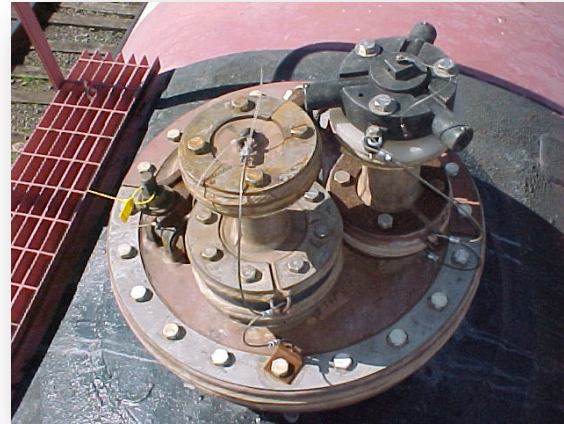
# Internal and External PRD





# Non-Reclosing PRD

- If equipped with a non-reclosing pressure relief device incorporating a rupture disc (*i.e.*, a safety vent), remove the disc and examine both sides of the rupture disc for integrity, proper burst-pressure rating, and condition.



# Bottom Outlet Valve

- If equipped with bottom outlet valve(s), the outlet cap(s) and/or plug(s) must be removed to check the bottom outlet valve for leakage.



# Bottom Washout

- If equipped with bottom washout, the closure and/or plug(s) must be checked for securement and leakage.



# Top-Operated-Bottom-Outlet Valve

- If equipped with a Top Operated Bottom Outlet Valve (BOV), if practicable, loosen the top packing nut and operate the valve to verify proper operation.



# Top-Operated-Bottom-Outlet Valve

- Depending on findings, close the valve and tighten the top packing nut or stop the operation and repair the valve before loading the car.



# Top-Operated-Bottom-Outlet Valve

- If equipped with a Bottom-Operated-Bottom Outlet Valve, if practicable, operate the bottom outlet valve to verify proper operation.



# Top-Operated-Bottom-Outlet Valve

- Depending on findings, close the valve and lock the handle in the closed position or stop the operation and repair the valve before loading the car.



# Bottom Outlet Valve

- The bottom outlet plug and/or cap must remain off its fitting during entire loading process to ensure that the bottom outlet valve is not leaking.





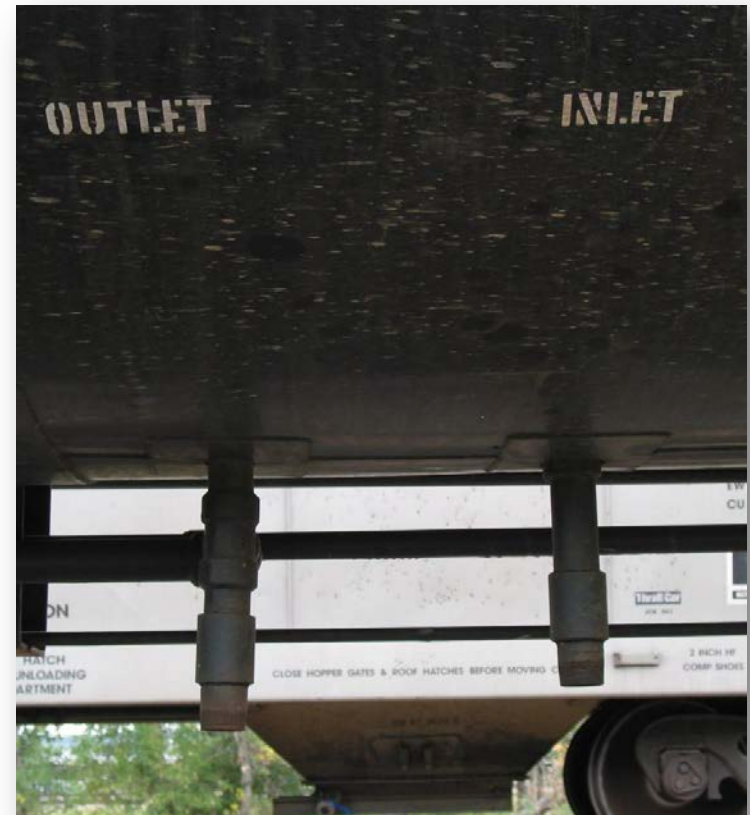
# Auxiliary Valve

- If equipped with an auxiliary bottom outlet valve, the auxiliary bottom outlet valve must be left open with the plug removed during the entire loading process to ensure that the primary bottom outlet valve is not leaking.



# Heating Systems

- If equipped with a heating system, thoroughly inspect the exposed parts of the system.
- If the car is equipped with interior heater coils, remove the caps, be prepared for release of material, and check for leaks prior to loading the car.



# Thermometer Well

- If so equipped, remove thermometer well cap and the magnetic gage rod cover cap slowly to determine if there is a leak.
- Inspect the O-ring on the thermometer well fitting and the magnetic gage rod body and replace as required.
- Verify that adequate ethylene glycol/anti-freeze mixture is present in the thermometer well to allow for taking an accurate product temperature reading.



# Monitoring

- During loading, continually monitor the car for any signs of leakage.



# Outage

- Ensure adequate outage space remains in the car when loading is completed to prevent overloading by volume or by weight and to allow expansion in transit.
- Refer to applicable regulations for correct outage, filling density and other weight restrictions for the commodity loaded.

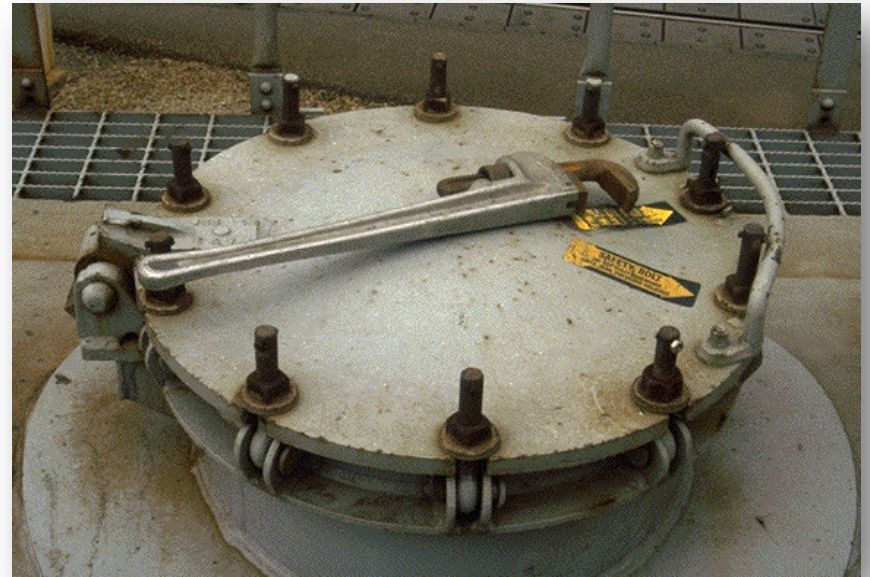


# Final Examination

- When loading is complete:
  - Close all valves after car is loaded
  - Install threaded pipe –plugs (PTFE, Teflon<sup>®</sup>, paste or not more than three wraps of PTFE tape have been found to be acceptable materials for use in sealing plugs and caps.) .
  - Secure all plugs and outlet caps with a suitable tool
  - Re-check the car for any signs of leakage. If there are any signs of leakage and if the leak cannot be stopped, the car must not be offered for transportation.

# Final Examination

- Tighten the manway bolts using the appropriate star pattern and company procedures.



# Final Examination

- After loading, apply and hand-tighten magnetic gauge cover and thermometer well cap.
- After the tank car has passed the appropriate leak test, remove top off-loading valve handles that are not enclosed in a protective housing before the car is offered for transportation.
- Remove product spillage on the tank exterior.



# Check for Tool-Tightness

- *NOTE: All valves, fittings, closures, plugs, caps, and fasteners are to be checked for tool tightness even if the item was not used during the off-loading process (thermometer and magnetic gauging device covers with O-rings are to be hand tight, not tool tight.)*

# Placards and Marking

- Verify that the car has proper placards, identification numbers, and hazard warning markings, if required, before offering the car into transportation.
- Document, per company procedures, the outage level, seal numbers, and product identification information.



# Off-Loading Tank Car Inspection

# Caution Statement

- *NOTE: A car containing the residue of a dangerous good or hazardous material must be offered for transportation in the same condition as a car loaded with that material. It must be leak free, load placarded, marked, closed with seal present if required and properly documented.*

# Examination Prior to Off-Loading

- All fittings seals should be examined before removing them for evidence of tampering.
- Verify that valves and fittings are closed before removing plugs, caps and flanges.
- Any dirt or debris should be removed from the fittings before opening them.
- Before unloading, verify the contents of the tank car and of the receiving vessel for compatibility



# Relieving Pressure

- If the tank car is a general service car, relieve tank pressure by one or more of the following methods:
  - Slowly opening the vent valve.
  - Carefully open the fill hole cover or hinged manway cover. If using the manway cover for pressure relief, use caution when loosening bolts.
  - The bolt(s) by the handle are the safety bolt(s). Loosen the safety bolt(s) by one or two turns at a time, and then loosen the remaining bolts.
- If necessary, vent to a scrubber or vapor collection system.
- Venting is not necessary if the tank car is pressure-unloaded. However, a means to prevent over-pressure must be provided.

# Caution Statement

- *NOTE: CAUTION should be exercised because any tank car may be under pressure.*
- *NOTE: The vacuum relief valve should not be used to vent pressure.*
- *NOTE: Atmospheric venting may create a safety and/or environmental hazard.*

# Steaming Operations

- If equipped with interior heater coils, remove heater coil caps and check for leakage before connecting steam hoses.
- Connect steam hoses to inlet connections of the heating system.
- Use a shut-off valve to control the steam flow. The tank should be vented before and during steaming to prevent excess pressure build-up.
- Caution must be taken when applying steam to the system.





# Steaming Operations

- Apply steam slowly until steam is observed at the heater coil outlet.
- Rapid expansion of the coils could cause breakage of the steam system.
- If steam is bubbling in the product, the interior steam coil is broken. Shut off the steam. If there is a dual system on the car, use the other bank.

# Steaming Operations

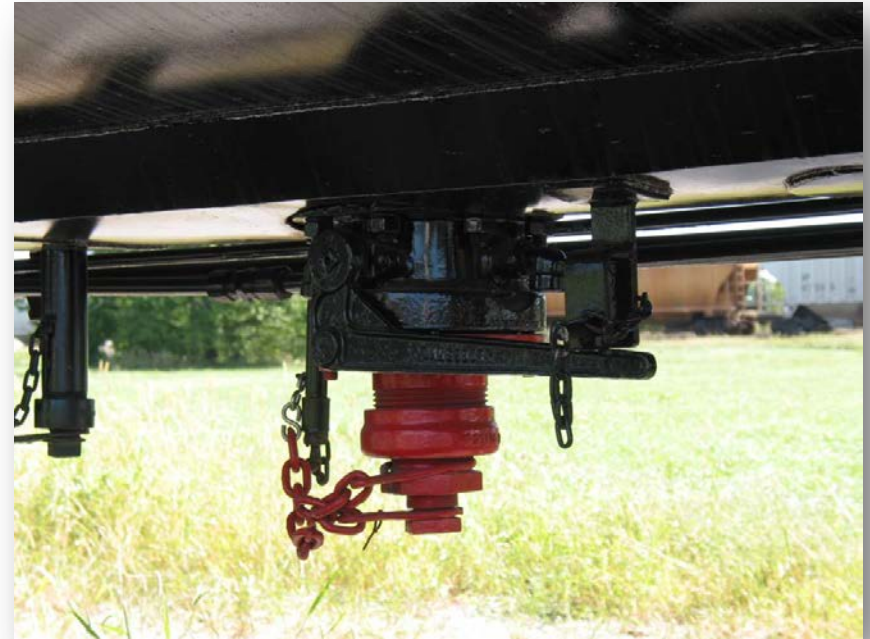
- Steaming operations should be carefully monitored to ensure the product or container does not become over-heated.
- If the bottom outlet valve is steam jacketed, steam should be applied to the outlet steam jacket.
- *DO NOT apply steam directly into the outlet chamber!*

# Steaming Operations

- When unloading general service tank cars with protective coatings and linings it is important to remember that steaming of a partially filled tank car may damage the coating or lining due to localized overheating.
- Once unloading is in process, steam pressure should be reduced or shut off to the car to avoid damaging the protective lining.

# Bottom Outlet Valve

- When unloading through the bottom outlet, with the manway open, take care to prevent contamination of the product or, in the case of flammable materials, sparks or other sources of ignition.
- Verify that the bottom valve is closed before loosening bottom outlet plug or cap.
- Be prepared to collect any materials trapped in the bottom outlet leg upon loosening of the cap/plug assembly.



# Bottom Outlet Valve

- Slowly loosen the outlet cap. If more than 2 - 3 quarts are collected in the containment system, there is a probability of bottom outlet valve leakage.
- Do not remove the cap completely!
- If the valve continues to leak, tighten the cap/plug assembly.
- Inform the tank car owner of the leaking condition and request what action to take.

# Bottom Outlet Valve

- Before opening the off-loading valves, securely attach the transfer system (unloading connections) and perform a leakage test, if possible.
- If a non-pressure tank car is being off-loaded by pumping through the bottom outlet valve or top-mounted liquid valve, provide a means of preventing vacuum (which may cause a collapse of the tank).



# Blow-Down

- If the steam supply is still active, shut off the steam and remove connections.
- Check the heating coils for water removal and check for leaks per company procedures.
- If leaks are found, notify the car owner and/or the shipper.

# Caution Statement

- *NOTE: All valves, fittings, closures, plugs, caps, and fasteners are to be checked for tool tightness) even if they were not used during the unloading process again with the exceptions of thermometer and magnetic gaging device covers with O-rings that are to be hand tight, not tool tight.)*



# Piping, Valves, and Fittings

- Examine the piping, valves, and fittings for corrosion, damage, and signs of leakage;
- Examine fasteners for condition and securement;



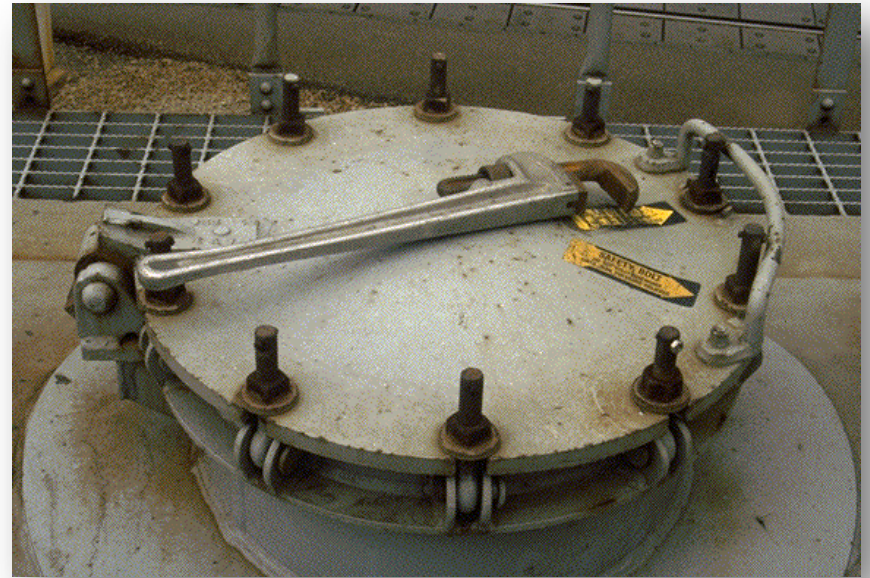
# Bolt, Nuts, and Washers

- Examine bolt and nut threads, and washer faces of nuts for corrosion, rust, and burrs. Replace / correct any damaged components.
- If washers are scored or cupped from previous use, replace with new through-hardened washers.



# Final Examination

- Tighten the manway bolts using the appropriate star pattern and company procedures.



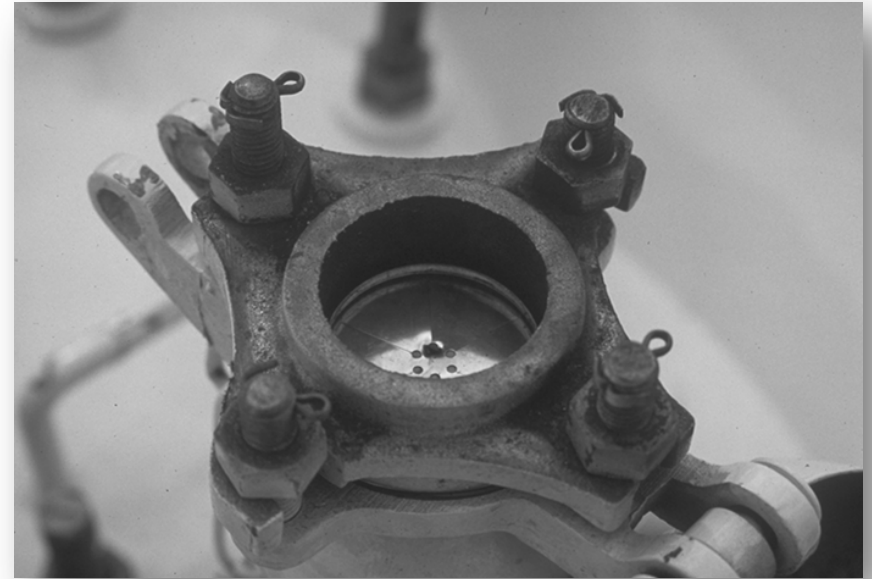
# Reclosing PRD

- If equipped with a pressure relief valve, the valve must be inspected to ensure no debris is in its discharge area.



# Non-Reclosing PRD

- If equipped with a non-reclosing pressure relief device incorporating a rupture disc (i.e., a safety vent), examine the rupture disc for integrity, proper burst-pressure rating, and condition.
- After unloading, perform a careful inspection of the rupture disc for corrosion or damage that may alter the intended operation of the device.



# Non-Reclosing PRD

- There is no need to remove the rupture disc to perform a visual inspection of both sides of the disc for:
  - Tank cars containing the residue of Class 8 Packaging Group I and II materials, with no subsidiary hazard;
  - Class 9 elevated temperature materials; and
  - Most/residue cars in Canada, except Class 2.

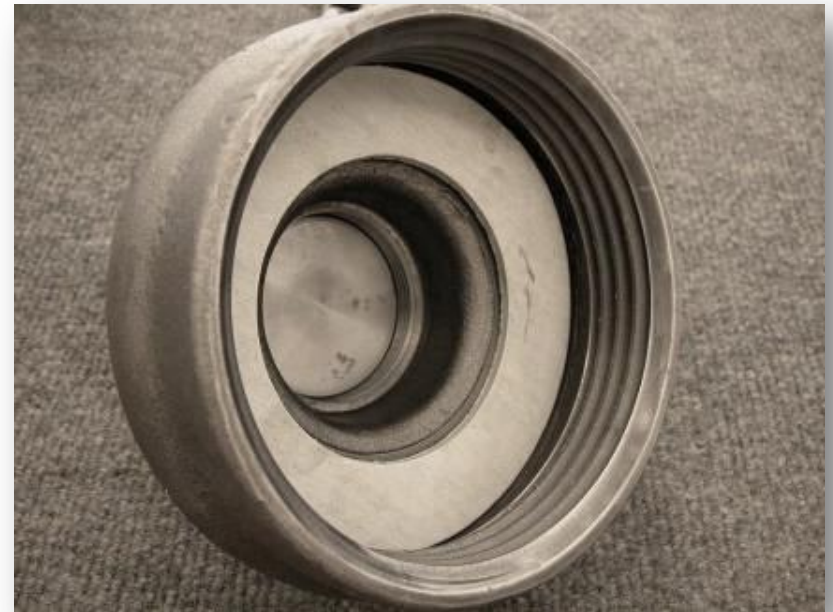


# Nitrogen Pad

- Relieve all pressure used to off-load the car, except for those products that may have a nitrogen padding applied.
- A warning should be applied in the manway area to indicate when nitrogen or other non-life supporting gas is present as a pad.

# Bottom Outlet Gasket

- Verify that the bottom outlet cap gasket is not abraded, cut, deteriorated, or torn.





# Qualification Stencil

- Examine the tank car qualification stencil to confirm that the stencil is legible.
- Do not offer a car into transportation with an illegible qualification stencil. Notify the car owner.

DOT 105 J 400 W			
	STATION STENCIL	QUALIFIED	DUE
TANK QUALIFICATION	MRN	2012	2022
THICKNESS TEST	MRN	2012	2022
SERVICE EQUIPMENT	MRN	2012	2022
PRD: VALVE 300 PSI	MRN	2012	2022
LINING			
TYPE			
88.B.2 INSPECTION	MRN	2012	2022
STUB SILL INSPECTION	MRN	2012	2022

# Placards and Markings

- All cars (except class 9 material under certain circumstances) must be properly placarded and marked before being offered for transportation.
- Ensure proper documentation for transportation is available.

