

PAMPHLET 34:

RECOMMENDED METHODS FOR THE SAFE LOADING AND UNLOADING OF NON-PRESSURE TANK CARS

PREFACE

This pamphlet outlines methods for the selection of non-pressure tank cars and recommended procedures for loading and unloading of the cars. These methods are applicable for the transportation of loaded tank cars as well as for the return of tank cars containing residue.

These procedures are general guidelines only. Each user is encouraged to develop specific procedures using these guidelines. A particular location may require the use of additional, or different, precautions for the loading or unloading operations to be performed safely. Experienced, trained personnel, who are knowledgeable about the safety requirements for the specific loading and unloading operation being performed, must be utilized. Appropriate individual company procedures and applicable governmental requirements, including U.S. Department of Transportation or Transport Canada hazardous materials regulations, must be followed.

GENERAL INSTRUCTIONS AND INFORMATION

1. A car containing the residue of a product must be offered for transportation in the same condition as a loaded car.
2. Any product spillage on the tank should be removed. Spills on the ground should be removed or should be collected in accordance with standard plant procedures.

NOTE: Certain spills must be reported to the EPA.

3. Railroad defect cards must not be removed from their holders. Only the car owner or his authorized agent is permitted to remove a card. If a car enters a load/unload area having cardable defects without a defect card to cover, a joint inspection with the delivering carrier should be initiated.
4. All tools and equipment used in connection with load/unload operations should be kept clean and serviceable at all times.
5. Tank cars containing a flammable or combustible liquid must be electrically grounded during load/unload operations. Grounding of cars carrying other commodities is recommended.

GENERAL REQUIREMENTS FOR LOADING AND UNLOADING TANK CARS

1. Both loading and unloading operations, including connecting and disconnecting procedures, must be performed by qualified persons who have been properly trained and who will be responsible for complying with all procedures during the complete operation. Procedures as prescribed by various recognized industry safety recommendations should be followed.
2. All pre-loading and post-loading inspections should be properly documented through use of a check list or other method.
3. The loading or unloading area should have adequate illumination and be free of obstacles or unnecessary equipment.
4. During all times that a car is connected for loading or unloading, the hand brake must be set and the wheels blocked. Caution signs must be placed on the track at the open end or ends of the siding. Unless the track is protected by a closed and locked switch that is within two car lengths of the last car, a derailer service should be installed.

Caution signs should be made of metal, plastic or other suitable material, be 12 inches high by 15 inches wide, and bear the words "Stop—Tank Car Connected" or "Stop—Men At Work". The word "Stop" must be in 4-inch letters, and the other words in at least 2-inch letters. All letters must be white on blue background.

LOADING A TANK CAR

1. Selection and qualification of tank car

- (a) A tank car should be used that is in accord with the AAR's *Manual of Standards and Recommended Practices, Section C-Part III, (Specifications for Tank Cars, Specification M-1002)*. For reference, the relevant DOT regulations are published in the current issue of Bureau of Explosives Tariff No. BOE-6000. In Canada, the regulations of Transport Canada must be followed.
- (b) A tank car must meet the following minimum requirements for transporting the commodity, whether regulated or non-regulated:
 - (1) The tank car must not leak or have defects which could cause the product to escape.
 - (2) The car must have been properly tested and marked.
 - (3) A tank car is to be loaded only with the commodity for which it is authorized by the current Certificate of Construction or Exhibit R-1, and as may be stenciled on the car.
 - (4) Before a tank car can be used for transporting a commodity for which it is not currently authorized, approval must be obtained from the car owner or his agent, supported by AAR and governmental approval, if required.

Before modifying a tank car, the owner must file a Certificate of Construction or an Exhibit R-1 (depending on the nature of the modification) with the Secretary, Mechanical Division, Association of American Railroads and with the Bureau of Explosives, as required by M-1002, *Specifications for Tank Cars*. This includes any change in the loading/unloading arrangements, including manway closures, safety valves or vents, top unloading, or bottom unloading (including auxiliary valves).

2. Shipper responsibility

- Before loading a tank car, the shipper is responsible for the following:
- (a) Safety appurtenances and fittings must be proper for safe transportation of the lading.
 - (b) Fittings, closures, openings and accessible gasket surfaces must be free of corrosion or damage.
 - (c) Valve packings, gaskets and hold-down bolts must be serviceable, not corroded, and be compatible with the commodity. Defective items must be replaced before loading the car.
 - (d) Unless the car is clean, the last contents of the tank must be compatible with the commodity to be loaded.
 - (e) The tank, safety valve and interior heater system (if so equipped) must not be overdue for tests as indicated by the "test due" stencils.
 - (f) The integrity and marked burst pressure of rupture disc, if car is so equipped, must be verified by removal from disc holder. Examine both sides of disc and reinstall disc properly.
 - (g) On tank car with bottom discharge outlet:
 - (1) Remove outlet cap, outlet plug or open auxiliary valve. Be prepared to collect possible leakage. Cap and plug is to remain off, or auxiliary valve to remain open during loading, to check for leaking primary outlet valve.
 - (2) With outlet leg empty, open and close the bottom outlet valve to assure that it functions properly. Lock handle in closed position.
 - (h) On tank cars equipped with interior heater coils, inlet and outlet caps must be removed prior to loading to check for leakage.

3. Loading procedures and considerations

- (a) *Outage requirements*—Sufficient outage must be left in the tank to allow for expansion of the commodity while in transit. Section 2.4.1 of M-1002 requires that the tank car must be so loaded that sufficient outage is provided to prevent significant release of the material to the environment under conditions normal to transportation. Consideration must be given to the volumetric expansion characteristics of the liquid and the ambient temperatures to which it will be subjected in transit. Calculations must use a minimum “design liquid temperature” of 105°F for insulated tank cars and 115°F for uninsulated tank cars. “Design liquid temperature” is defined as the temperature at which the tank car will become liquid full if the liquid product reaches that temperature. Below that product temperature the tank will not be liquid full.

The shipper must use the greater of the DOT-specified minimum outage or the shipper’s calculated required outage percentage. In Canada, consult Transport Canada regulations.

Effective after October 1, 1993, DOT will require 1% outage at 105°F for insulated tank cars or 115°F for non-insulated tank cars. For PIH (poison-inhalation hazard) liquids, a 5% outage will be required under these respective conditions.

- (b) *Maximum weight*—Do not exceed stenciled or starded load limit. The maximum loaded weight of car (lading weight plus lightweight) offered for transportation must not exceed the allowable gross rail load limit for the truck size. See Rule 70B.3.b in the AAR Field Manual.
- (c) *Check for leaks*—A loaded tank car tank that shows any evidence of leaking at seams, valves, fittings, connections or heater coils must not be offered for transportation until proper repairs are made.
- (1) A bottom discharge outlet which permits more than a dropping of liquid through the open cap or plug opening *must not* be offered for transportation.
 - (2) If unable to stop leakage, transfer product to another car. Contact car owner or his authorized agent for disposition of leaking tank car. The tank must be stenciled in 3 inch letters “LEAKY TANK. DO NOT LOAD UNTIL REPAIRED”, and the leak location marked with an “X”. See Rule I in the AAR Field Manual.
- (d) *Secure all openings and their protective housings*
- (1) Close all openings with the appropriate closures, i.e., plugs, flanges or caps, wrench-tight.
 - (2) Tighten the bottom outlet cap with a wrench having a handle which is at least 36 inches long. Auxiliary valve caps and plugs are tightened with a suitably sized wrench. Use non-sparking tools, if necessary.
 - (3) Use gaskets that are compatible with the commodity to seal manway covers and outlet valve caps. Luting materials (any substance used to stop a leak; e.g., sodium silicate/water glass) are prohibited on bottom outlet cap or on outlet plug threads. PTFE paste, or a maximum of three wraps of PTFE tape, is acceptable.
 - (4) Interior heater coil caps must be secured wrench-tight before shipping a loaded car.
- (e) *Car seals*—Use of 1/8” steel cable is recommended to secure bottom outlet operating mechanisms that are designed to accept such seals, reference M-1002, Paragraph A4.03 (h). Car seals may be applied to manway cover, top unloading housing, top operating mechanism (for bottom outlet valve) and to the bottom outlet valve or connections to deter tampering with fittings.

4. Post-load (Pre-trip) leak test

After loading, and after all openings have been properly closed and secured, a suitable leak detection test is recommended for tank cars loaded with phosphoric acid, hydrochloric acid, sulfuric acid, or caustic soda prior to release in interchange. Post-load leak testing is desirable for all other commodities.

- (a) Pressurize the tank to at least 10 psi with inert gas or other medium compatible with the shipper’s safety and product quality requirements. Use an appropriate pressure regulator. Relieve pressure after inspection and prior to shipment.
- (b) Check all flanges, valve packing glands and opening closures using a suitable leak detection solution, sonic instrument or by monitoring the pressure over a period of time.

- (c) If leak is found, make appropriate repair and retest. If leak cannot be repaired, DO NOT SHIP CAR.

5. Placards

Apply appropriate placards.

UNLOADING A TANK CAR

1. Pre-unload procedures

- (a) Examine all fittings seals before removal for evidence of tampering.
- (b) Examine all valves to be certain that they are closed before removing caps, plugs or flanges.
- (c) Remove dirt and foreign matter from manway cover, valve caps and closures prior to opening.

2. Unloading a tank car *without* heater coils

- (a) Before opening the manway cover or outlet cap, relieve tank pressure by one of the following means:
 - (1) by opening the vent valve,
 - (2) by carefully opening the fillhole cover,
 - (3) by carefully depressing the vacuum relief valve,
 - (4) by venting to a vapor collection system or scrubber.

Caution: Venting to atmosphere may create a safety or environmental hazard.

- (b) Venting is not required when car is to be pressure unloaded, but a means external to the tank’s fittings must be provided to limit pressure buildup in the tank car tank.

Unloading pressure should not exceed 80% of the safety relief valve setting or approximately 25 psi below the burst pressure of the safety vent, if so equipped.
- (c) After pressure or vacuum is released, the seal on the hinged and bolted manway cover can be broken. All nuts may be loosened one to two turns. The cover should be lifted to verify that all pressure has been released from the tank. Manway bolting is designed to allow venting of the tank while preventing the cover from blowing open, but precautions must be taken in event this safety arrangement is inoperative.
- (d) When bottom unloading with manway cover open, care must be taken to prevent product contamination from foreign objects or materials entering the tank. Block manway cover open with a non-metallic block.
- (e) On cars equipped with top-operated bottom outlet valves, the valve rod handle at top of car must be checked to make sure that the valve is closed prior to the removal of the bottom outlet cap or plug.

CAUTION: Be prepared to collect possible leakage in a suitable container before removing outlet cap. If leakage occurs as the outlet cap is being removed, it should not be entirely unscrewed. Sufficient threads should be left engaged and sufficient time allowed to permit controlled release into the container of any accumulated liquid in the outlet chamber. When leakage stops or is materially reduced, the cap may be removed and the unloading connection made. In the event initial leakage rate continues, try closing the outlet valve again. If this fails, retighten outlet cap and top unload car. If a leak develops during pressure unloading, relieve pressure before making repairs or attempting to tighten unloading connection. Leakage should be contained.

- (f) Before opening top or bottom unloading valves, securely attach unloading connections to car.
- (g) When bottom unloading a tank not equipped with a vacuum relief or vent valve, block open the manway cover with a non-metallic block to permit full flow from outlet valve to prevent the possibility of creating a vacuum and collapsing the tank.
- (h) Tank cars must be attended, or monitored by a DOT-approved monitoring system, during the entire unloading period.
 - (i) Do not allow tank cars to stand unattended or unmonitored with unloading connections attached after completing unloading.
 - (j) If necessary to discontinue unloading for a period of time, valves should be closed and unloading connections disconnected. Openings should have closures applied and properly tightened.

CAUTION: On resuming unloading, check for pressure or vacuum buildup. (See C.2(a).

- (k) Pressure used to unload car must be relieved prior to offering car for transportation. A nominal nitrogen pressure pad, up to 15 psig, may be left on car, in which case a caution tag should be applied so indicating.
- (l) Operations on private tracks in private facilities will also be subject to local operational and safety procedures.

3. Unloading a tank car *with* heater coils

For commodities that tend to solidify when in transportation, some tank cars are equipped with various types of internal or external heater systems as indicated by stenciling on car. The following instructions relate to the heater systems only. Unloading procedures as outlined under C.2, **Unloading of tank cars *without* heater coils**, also apply to these cars.

- (a) Remove interior coil pipe caps. Check for evidence of leakage. Connect steam hose or hoses to inlet connections of the heater coil system. Use a shutoff valve to control steam entering the system. Tank should be vented before and during steaming to prevent excessive pressure buildup. Attendance is required per C.2(h).
- (b) A steam trap or shutoff valve may be applied to the outlet connection or connections to control the condensate.
- (c) Caution must be observed when applying steam to the system. Coils can be broken due to rapid expansion of the coil pipes and hammering of the coils.

- (d) Bubbling of steam through the commodity is an indication that an interior coil is broken. Immediately shut off steam. If car is equipped with a dual heater system, one bank of coils may still be operable. Connect steam to each bank to locate the good coil. In event both coils are defective, contact lessee or car owner for a portable coil or for disposition of car.
- (e) During the last hours of heating, steam should be applied to the steam jacket of the bottom outlet valve, if so equipped, to melt any solidified product in the outlet chamber. Under no circumstances should steam be applied directly into the outlet chamber, as this could lift the valve and allow condensate to enter tank, possibly resulting in a dangerous condition.

4. Post-unload procedures

As soon as the car has been unloaded to the maximum extent possible:

- (a) Close all valves.
- (b) Remove unloading connections.
- (c) Apply all other closures (plugs, caps, blind flanges, quick disconnects, etc.) and secure using suitably sized wrenches.
- (d) Install primary bottom outlet valve cap with a wrench having a handle at least 36" long.
- (e) Heater system inlet and outlet caps, on empty cars so equipped, must be left hanging.
- (f) If manway has been opened, check manway cover gasket and replace it if necessary. Close manway cover and tighten all bolts (in a cross pattern) with a suitable sized wrench.
- (g) Check rupture disc. Replace the disc if damaged or blown.
- (h) Reverse placards to show "residue".