

**STANDARD RAIL TANK CARS FOR THE CARRIAGE
OF LIQUID CHEMICALS IN BULK: REQUIREMENTS
FOR DESIGN, CONSTRUCTION AND TESTING**



Responsible Care

ISSUE 1 - AUGUST 2003

SCOPE

These specifications define the design and construction requirements for the tanks and associated equipment of Rail Tank Cars (RTC's) used for the transport of liquid substances for which a normal standard RTC is required (solvents, acids...).

These do not define the requirements for gas RTC's or for RTC's for special product groups.

The inspection and testing requirements and some aspects of the use of RTC's are also defined.



GENERAL

These requirements provide guidance to the Chemical Industry in order to continuously improve the safety standard of RTC's for the transport of dangerous goods.

This specification shall only be applied for RTC's, which are built after the official issue of this document.

For RTC's built before that date, these specifications shall only be applied when special arrangements have been made between lessor and lessee of the RTC's.

The design and construction of RTC's must, as a minimum, and at all times during their use, be in compliance with:

- the international regulations concerning the Carriage of Dangerous Goods by Rail (RID) in general and in addition with
- the requirements for domestic transportation where it applies.



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1. TANK DESIGN AND CONSTRUCTION

Materials of tank construction, including coatings, valves, fittings, gaskets etc. shall be suitable for the specified products and shall fulfil all requirements of the RID regulations and UIC leaflets and all national regulations when applicable.

In addition, for the minimum thickness of the steel sockets, the following standards are recommended:

normal steel: DIN 28115
stainless steel: DIN 28025

Other equivalent standards are also acceptable.

For the shells of RTC's, which are intended for carrying different products, suitable stainless steel is recommended because of its resistance to a wide variety of chemicals.

Compared with mild steel, stainless steel might, in some cases, also have a positive influence on the product quality (e.g. colour) and leak-proofness of the bottom outlet/valve system of the RTC (no rust in seats of valves).

The materials of shells (or protective linings), including all other components, which are in contact with the product, shall not contain substances liable to react dangerously with the product, or form dangerous compounds or degrade the material properties or quality of the carried products.

New or treated stainless steel tanks must be properly pickled and passivated.

In view of the cleaning of the RTC, obstructions and dead pockets in the tank must be avoided. Also on the outside of the tank, all pockets, which can lead to corrosion, must be avoided.

The number of pieces of equipment on the RTC must be kept to a minimum.

For new tanks, all load bearing attachments shall have backing plates of a material and thickness similar to the tank shell. Backing plates shall be fully welded to the shell and shall have all corners well rounded, also a small boring is needed for stress release. For tank cradles, there are also other suitable and proofed constructions practicable.

The tank must be designed for a calculation pressure as required by RID.

It is recommended to have a design pressure of not less than 4 bar gauge.

Atmospherical (vented) tanks even if allowed by national and international regulations, are not recommended.

Vacuum relief valves shall not be fitted.

Hermetically closed shells without vacuum relief valves shall be designed to withstand a minimum external pressure of 0.4 bar .

Internal components such as baffle plates, internal reinforcements, internal ladders and internal heating coils, shall not be fitted.

RTC's without underframe ("*Selbsttragende Kesselwagen*") and RTC's, by which the tank is welded to the underframe over the full length are not recommended for the transport of dangerous liquids.

Tanks must have drainage with welding seams at bottom ground flush.

The tanks shall have an explosion proof design.



2. EQUIPMENT

All components of the RTC shall comply with the RID regulations.

The following standards are recommended but equivalent standards are also acceptable:

Railway applications	Tank Wagons
EN 12561-1	marking of tank wagons for the carriage of dangerous goods
pr EN 12561-2	bottom emptying devices for liquid products including vapour return
pr EN 12561-4	top emptying and filling devices for liquid products
pr EN 12561-5	devices for bottom emptying and top filling of liquids products
pr EN 12561-6	manholes
pr EN 12561-7	platforms and ladders
pr EN 12561-8	heating connections
UIC leaflet 573	technical conditions for the construction of tank wagons

When one of these standards or leaflets is updated or replaced, the new version automatically applies.

2.1 Manhole/manlid

Minimum diameter of the manhole must be 500 mm.

Multi purpose RTC's shall have manholes with swing bolts.

The closing mechanism of the manlid shall be designed in such a way that internal pressure in the RTC can be released safely before the lid can be fully opened.

The manlid must be secured properly when opened less than 120 degrees. No obstacles shall prevent proper closure of the manlid.

The manlid shall be fitted with a joint ring, which is compatible with the product being carried. The joint ring must be fitted in the manlid and not in the manhole collar.

The manlid shall be gas tight according to RID.

Fittings or other pieces of equipment on the manlid cover are not allowed.

The manlid must be sealable.

2.2 Pressure/vacuum relief

Pressure/vacuum relief valves shall NOT be fitted if not required.

2.3 Earthing

All parts of the tank wagon shall be bonded by equipotential connections and shall be capable of being electrically earthed.

Earthing lugs must be available on both sides of the RTC, next to the outlet nozzle.

In order to ensure proper bonding with the RTC, the earthing lug shall consist of a stainless steel plate, which must be welded onto the tank.

The earthing plate may never be painted and must be properly marked with international 'earthing' symbol.



2.4 Bottom valve

The bottom (DN 100) valve may be of a mechanical, hydraulical or pneumatical type provided the spring tension has a value of minimum 200 kg.

The bottom valve must be operable from the bottom of the tank and its setting whether opened or closed shall be capable of being verified from ground level.

A label, which clearly indicates the operating instructions of the bottom valve must be attached to the tank near the operating mechanism.

For RTC's which may carry different products, the seating of the bottom valve must be made out of PTFE or equivalent material, which must be compatible with the products carried.

2.5 Bottom discharge connections

The tank shall be fitted with discharge pipework in the form of an outlet tee piece. The arm of the tee shall be directed to each side of the RTC and shall have an horizontal position.

The outlet piece shall be fitted at each end with an outlet (side) valve which may be a globe valve ('Schrägsitz') or a ball valve.

The discharge end of the outlet tee piece may terminate in a 5,5" Whithworth screw-thread (DIN 6602), which is commonly used, and a screw (blank) cap and chain. The standard connection in France is the NFF37008.

Flanges may also be fitted.

For bottom loading and unloading systems, dry break couplings may be used as secondary closure instead of the outlet valve.

If special couplings are not yet fitted, adequate spacing must be foreseen to connect these onto the outlet valves in a later stage.

All screw caps shall be fabricated from stainless steel or the same material as the tank. Plastic caps are allowed but not recommended. The screw caps must be fitted with suitable full-flat-face gaskets.

Outlet valves and bottom valve operation mechanisms shall be capable of being secured and sealed.

All open parts of valves including the spindles must be free of grease.

Only valves and dry break couplings approved by the competent authorities, shall be fitted.

2.6 Top discharge connections

These top connections shall, as a minimum, consist of:

Liquid phase (dip tube) DN 80
Vapour return DN 50

Both connections shall be fitted with:

- a ball- or butterfly-valve and a blank flange, or
- a dry break coupling and a metal cap.

However, dry break couplings should not be used on tanks of crystallisable or highly viscous substances.

These connections should be marked with the following codes:

Red for the liquid phase
Blue for the vapour return

In addition to the colour marking, the names: 'dip tube' (or 'liquid') and 'vapour return' (or 'pressure connection' or 'vapour') shall be marked.

Other connections may be foreseen (e.g. for future fitting of an overfill protection system, temperature- or pressure gauges).

For this purpose, a DN 80 flange connection is recommended with grey colour code and name: 'spare connection'.

Adequate spacing (140 mm) must be foreseen to connect future couplings onto the top valves (e.g. dry break couplings)

A lockable protection cap covering all top connections is recommended.



2.7 Controlled ventilation valves (Auto vent systems)

The RTC may be equipped with an auto vent valve, which opens simultaneously, or preferably before the bottom valve is opened. The system may be of a mechanical or hydraulical design.

The auto vent ('Zwangsbelüftungsventil') valve shall be connected onto a branch pipe with a diameter not less than 50 mm, which extends from the top to the bottom of the tank. This vapour return line shall, at the bottom, be connected with a T-line which is fitted, on both sides of the RTC, with a blind flange DN 80 or a quick coupling with blind cap. A valve may also be fitted (not mandatory). (Remark: if no valve is fitted, there is a risk of exposure to vapours and liquids).

It is recommended that vapour return lines are fitted with a device preventing liquids from entering the vapour return line. If not installed, the following text should appear on the RTC:

- Near the vapour return connection:
"This vapour return line can contain a small amount of liquid.
Take appropriate safety measures before removing the cap."
- Near the operation mechanism of the bottom valve
"In order to prevent liquid entering the vapour return line, wait 10 minutes after placing the rail tank car for loading/unloading before opening the bottom valve"

An auto vent valve, which is not fitted with a vapour return line (direct contact to atmospheric air when opened) is unacceptable.

The working instructions of the auto vent system must be clearly displayed on the tank wall including the instructions to remove the blind flange/cap and to open the valve before starting the loading/unloading.

For RTC's which are equipped with vapour return lines, which are not (yet) connected onto an auto vent valve, a clear indication near the vapour return line must show that it is out of use and, in addition, appropriate measures must be taken to ensure that no connections to the vapour return line can be made.

2.8 Thermometers/manometers

Thermometers/manometers shall not be fitted except when specifically requested by customer.

2.9 Seals/gaskets

All openings, appendages, valves etc. must be fitted with seals/gaskets which are compatible with the products carried.



3. WALKWAYS/PLATFORMS

At least one walkway/platform of 'anti-slip safety grating' construction and a kick plate shall be provided on top of the tank to give safe access to the equipment and fittings.

Walkways / platforms shall be reached by an open rung access ladder.

The platform must fully cover the workplace around domes and connection points.

A connection point for connecting a safety harness is recommended.

The construction shall comply with the pr EN 12561-7.

4. HEATING/INSULATION

For RTC's carrying products which may require heating (e.g. with a high freezing point or high viscosity), the tank, outlet line and bottom valve shall be insulated and heatable.

The vapour return line shall be insulated or worked up into the tank insulation.

The recommended type of insulation is 100 mm thick standard insulation (rockwool, glasswool or equivalent).

The insulation must be of such a nature that it cannot react dangerously with the chemicals to be carried.

Preferably, only external heating coils shall be used.

The maximum working pressure of the heating system must be clearly indicated on the RTC.

When multiple heating systems are fitted, the inlet connections of each circuit must be clearly marked with the name of the circuit.

Inlet and outlet heating pipes shall be fitted with a closing valve which is to be kept closed during transport.

The construction shall comply with the pr EN 12561-8.

For crystallising products it is recommended, before unloading, to heat the tank and the bottom valve first. Heating the outlet line when the bottom valve is frozen may lead to overpressure in the outlet line and damage of the bottom valve.

5. UNDERFRAME

All RTC's must have shunting hooks and shall have lashing devices to be suitable for rail-ferry traffic.

Both ends of the RTC shall be provided with step-on platforms and handgrip.

Axle load, arc radius and axle distance are limited for certain customers and must be agreed upon before delivery.



6. EXTERNAL PAINTING/CLADDING

Resistant and durable external painting is required for mild steel RTC's, which are not insulated.

It is recommended to clad insulated tanks with stainless steel cladding or equivalent material. All joints in the cladding shall be weather-proofed with a suitable seal to prevent the ingress of water into the insulation. Insulated mild steel tanks shall be painted under the insulation to avoid corrosion. Measures must be taken to prevent accumulating condensation within the insulation. Aluminium cladding is not acceptable.

7. PLACARDING AND MARKING

For the placards (large danger labels) mounting plates are recommended. For the orange-coloured plate marking steel frames to hold the plates shall be provided at both sides of the RTC. Steel swing panels with the orange-coloured plates painted on it may also be used. It is however recommended to use steel orange-coloured plates with figures which remain legible after 15 minutes engulfment in fire.

The proper shipping name of the substance carried or name of a group of substances, for the carriage of which the tank has been approved, shall be inscribed on each side of the tank or on a panel.

Movable panels shall be locked.

Railcars used in dedicated service should be labelled as such with clear indication of the carried product.

8. END PROTECTION

Buffer override protection is recommended.

9. TESTING INSPECTION AND CERTIFICATION

Initial and periodical testings and inspections of the RTC must be carried out in accordance with the RID and EN 12972.

The RTC owner must submit test certificates to the lessee upon request.

Prior to putting into service, the lessor of the RTC shall carry out a technical and cleanliness inspection of the RTC.

The required cleanliness shall be defined by means of a national or international recognised 'cleanliness key' (e.g. UIP 'Reinheitsschlüssel').



10. INFORMATION/DATA TO BE SUBMITTED TO THE LESSEE (CONSIGNOR) PRIOR TO PUTTING INTO USE RTC'S

Up-to-date specification sheet including as a minimum:

- arc radius
- length of RTC
- maximum axle distance
- tare weight
- capacity of the tank
- allowable loading weights per loading category
- design-, test- and working pressure
- design temperature
- maximum allowable underpressure
- material of tank shell
- working- and test pressure of heating
- type of connections including type of valves
- auto vent system
- special features
- type of gaskets fitted.

Further information required:

- construction year of RTC
- last inspection/revision and test date of tank and underframe
- UIP cleanliness key .

Disclaimer:

This document is intended for information only and sets out guidelines for the design, construction and testing of standard rail tank cars for the transport of specific goods. The information summarised in this brief is provided in good faith and, while it is accurate as far as the authors are aware, no representations or warranties are made with regard to its completeness. It is not intended to be a comprehensive guide to all the detailed aspects of rail transport equipment.

ECTA wishes to thank the member company BP who generously offered the illustrations for this issue.



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