Organisation intergouvernementale pour les transports internationaux ferroviaires
Zwischenstaatliche Organisation für den internationalen Eisenbahnverkehr
Intergovernmental Organisation for International Carriage by Rail

OTIF/RID/CE/GTP/2018-B/Add.2

9 January 2019

Original: English

Final report of the 10th session of the RID Committee of Experts' standing working group

(Krakow, 21 to 23 November 2018)

Annex III: Checklists for the filling and emptying of gas tank-wagons

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Checklists for the filling and emptying of gas tank-wagons

Guidelines – introductory text

These guidelines have been developed in cooperation with CEFIC, EIGA, AEGPL and UIP in the form of checklists for tank-wagons for gases to help fillers and unloaders of gas tank-wagons comply with RID safety obligations, particularly with respect to the leaktightness of tank-wagons.

Filling and discharging of rail tank-wagons

Four checklists to help avoid leaks from tank-wagons carrying gases of Class 2 of RID

Introduction

According to RID 1.4.3.3 (a) and (f), the filler shall ascertain that:

- prior to the filling both the tanks and their equipment are technically in a satisfactory condition,
- after filling that all closures are in a closed position and that there are no noticeable leakages.

According to RID 1.4.3.7.1 (b) and (d), the unloader

- shall before and during unloading, check whether the tank has been damaged to an extent which would endanger the unloading operation;
- shall, immediately following the unloading of the tank, ensure the closure of valves and inspection openings.

In addition, the filler and the unloader are required to comply with the requirements of paragraphs 4.3.3.3 and 4.3.3.4 (Provisions for the filling of liquid gas tank-wagons) and 7.5.1.2 (Provisions concerning loading, unloading and handling).

The filler and the unloader must establish procedures to ensure that they fulfil all the requirements they have in accordance with RID Chapter 1.4.

The main aim behind standardised checklists is to avoid leaks from tank-wagons for gas by means of correct and professional handling on the part of operating staff working for fillers and unloaders. They include the necessary steps (checkpoints) in the appropriate sequence, which is normally observed when filling or emptying gases into or from tank-wagons in the procedure to ensure leaktightness. They may need to be supplemented by the user with other specific operational steps/procedures (operating instructions).

Gases to which a tank code is assigned in column (12) of Table A of RID Chapter 3.2 containing the letter "B" in the third part must be:

- **filled** from the **bottom** through three mutually independent closures, mounted in series, consisting of the bottom valve in conjunction with the external shut-off device (side valve, blank flange or screw cap); and
- **discharged** through the **bottom** shut-off device (side valve, blank flange or screw cap).

Gases to which a tank code is assigned in column (12) of Table A of RID Chapter 3.2 containing the letter "D" in the third part, such as UN 1017, UN 1053, UN 1064, UN 1076 and UN 1079 shall be

- filled from the top and
- discharged from the top

through dip pipes in combination with other closing devices (triple closure in series, liquid phase valves and gas phase valve with blank flange, mounted on the manhole cover).

Four checklists have therefore been developed, covering respectively bottom filling, bottom discharge, top filling and top discharge.

They set out a chronological sequence of the steps necessary for the filling and discharge of tank-wagons. If they use them as an aid, users can then be sure that they have followed the steps fully in the correct sequence. If one of the steps cannot be carried out properly, the filling or discharge process is interrupted or stopped until the discrepancy/fault is rectified. This should enable errors and unsafe situations to be recognised in advance and avoided. Damaged tanks or service equipment are not allowed for transport. Further measures shall be agreed with the tank-wagon operator (in accordance with the vehicle keeper mark on the wagon).

The term "suitable tool" used in the checklists means a tool with which the necessary force is generated by means of even leverage and damage to the sealing elements is avoided. The equipment used must be in compliance with applicable international regulations, e.g. the explosive atmospheres regulations.

These checklists also reflect the obligations of the filler set out in paragraphs (b), (c), (d), (e) and (g) of RID 1.4.3.3 and the obligations of the unloader set out in paragraphs (a) and (c) of RID 1.4.3.7.1.

In addition to the different steps set out in these checklists

– According to paragraph (h) of RID 1.4.3.3, the filler shall also, in preparing the dangerous goods for carriage, ensure that the placards, marks, orange-coloured plates and labels as well as shunting labels are affixed on the tanks, on the wagon and on the containers in accordance with chapter 5.3 of RID;

– According to paragraphs (e) and (f) of RID 1.4.3.7.1, the unloader shall ensure that:

  - the prescribed cleaning, if applicable, of the wagons is carried out;

  - the wagons, once completely unloaded, cleaned and degassed, no longer display placards, marks and orange-coloured plates that had been displayed in accordance with Chapter 5.3 of RID.

In this document, the RID terminology is used. The following table includes equivalent expressions or examples usually used in the industry.

RID terminology	**Industry terminology or examples**
closing devices	caps/blank (blind) flanges/manlids
external stop-valve	side valve/discharge valve
filling device	loading arm/hose
discharge device	unloading arm/hose
internal stop-valve	bottom valve
manhole cover	inspection lids/manlids
operational openings	filling and/or discharge openings

safety devices	devices to protect against unintentional opening of external and internal stop-valves
service equipment	filling and discharge, breather, safety, heating and heat insulating devices and measuring instruments

Disclaimer

This document is intended for information only and is provided in good faith. While it is accurate as far as the authors are aware, no representations or warranties are made about its completeness. Therefore, no responsibility will be assumed in relation to the contents of this document.

The checklist is a guide and does not exempt the various participants referred to in RID Chapter 1.4 from the respective obligations assigned to them under RID.

November 2018

Points relevant to leaktightness for filling tank-wagons (bottom filling) for gases

1. Before filling			
	Check	**Explanation**	**OK**
1.1[1]	Tank and service equipment in technically faultless condition (visual inspection from the ground).	Before clearance for filling, the tank and service equipment must be visually checked to ensure that they do not show any obvious damage. No damage to tank and items of equipment that might endanger the filling. Verification refers e.g. to the valves, closing devices, the manhole cover, damage on the shell, thermal insulation.	
1.2[1]	Verify that the date of the next tank inspection has not expired.	RID requires the next tank inspection date to be shown on every side of the wagon to inform the filler of the date of expiry.	
1.3	Verify that the dangerous goods are authorised for carriage in this tank.	This verification includes the comparison between the data shown on the movable panel and the permitted gases listed on the tank plate.	
1.4	The last load and its compatibility with the new load must be determined.	The last load must be determined from data reported in the transport documents and by comparison of the product name (reported on the plate of the tank-wagon) with the UN number on the orange-coloured plates and with the product on the loading order. In case of inconsistencies, clarification is needed, e.g. product analysis.	
1.5	The external stop-valves and the closing devices are closed (on opposite side also) and there are no leakages on both liquid and gas phase.	It must be confirmed that the external stop-valves are closed. Seals can help to determine that closing devices and valves have not been handled by other parties. In case of own seals, it should be verified that they are in the same proper condition as when they are installed. It can be assumed that valves on tank-wagons returning with original seals are still leaktight.	
1.6	Check whether the "emergency screws" of the internal stop-valves (gas and liquid phase) are in the "safe" position.	The emergency screw or "ice breaking screw" might have been used if the internal stop-valve could not be opened in a normal way (e.g. because of ice forming on the bottom of the tank). By turning this screw into the internal stop-valve, the valve opens and as a consequence, the safety mechanism no longer closes the internal stop-valve automatically when the rail hook is removed. The valve is no longer functional and is blocked in the open position. For mechanical stop-valves: check whether the bottom valves are locked. For hydraulic valves: check whether the two bolts are present in/near the hydraulic oil reservoir.	

[1] Points 1.1 and 1.2 may also be carried out upon arrival at the facilities (arrival check) rather than directly before filling.

1. Before filling			
	Check	**Explanation**	**OK**
1.7	The filling devices are properly connected to both liquid and gas phase and internal and external stop-valves on the filling side are opened. Before proceeding it must be checked again that there are no leakages at the interface between the tank-wagon and the facility.	The specific operating instructions for filling the tank-wagon must be observed. The use of a rail hook or similar devices is mandatory to open the internal stop-valves. The sequence of opening the valves is: first the internal stop-valves and then the external stop-valves.	
1.7.1	Verify that the internal stop-valves are leaktight and secured against unintentional opening. Before proceeding check again that there are no leakages.	Make sure that the internal stop-valves are leaktight and secured against unintentional opening. Leaktightness can be verified by depressurizing the T-pipe and then by using a manometer to check that the pressure is not rising again.	
1.8	The maximum degree of filling must be determined to ensure that it will not be exceeded.	The degree of filling must be determined taking into account the maximum loading mass on the movable panel (load categories). Note: The residual load (product that is still present in the tank-wagon before filling) must also be taken into account.	

2. During filling			
	Check	**Explanation**	**OK**
2.1	Supervise filling operation to ensure safe operation throughout the process and prevent overfilling.	For filling, the operating instructions of the tank-wagon must be complied with. Permanent supervision will prevent dangerous situations, such as overfilling and should enable rapid emergency response, if necessary.	

3. After filling			
	Check	**Explanation**	**OK**
3.1	Verify that there is neither	Immediately after filling, the tank-wagon must be checked again to ensure that it is not overloaded or	

3. After filling			
	Check	**Explanation**	**OK**
	overloading nor overfilling.	overfilled, as determined in 1.8. • Overloading means exceeding the maximum gross mass of the tank-wagon. • Overfilling means exceeding the maximum (product related) filling degree, according to RID 4.3.3.2.5. These checks must be carried out using calibrated measuring devices (e.g. by weighing on a calibrated weighbridge). The overloading or overfilling must be remedied by immediate discharge of the excessive load in a safe manner. Further measures shall be agreed with the tank-wagon operator (in accordance with the vehicle keeper mark on the wagon) because: • Overfilling of the tank may generate pressure build-up above the maximum calculation pressure. In this case, the tank-wagon must be emptied completely and must be inspected and tested before bringing back into service. • An overfilled tank may cause excessive forces on bearings and axles. If overfilling has occurred, it must be checked whether the bearings and axles have been overloaded before bringing the tank-wagon back into service.	
3.2	The correct closing sequence of the valves (from inside to outside) must be complied with.	Internal and external stop-valves must be closed in accordance with the operating instructions of the tank-wagon.	
3.2.1	Verify that the internal stop-valves are leaktight and secured against unintentional opening.	Make sure that the internal stop-valves are leaktight and secured against unintentional opening. Leaktightness can be verified by depressurizing the T-pipe and then by using a manometer to check that the pressure is not rising again. Ensure that the valves are locked (e.g. securing pin).	

3. After filling			
	Check	**Explanation**	**OK**
3.2.2	Verify that external stop-valves are closed and secured against unintentional opening (on opposite side also) and there are no leakages on liquid and gas phase.	Any safety devices to protect against unintentional opening of external stop-valves must be used, if available. There must be no gas leakages.	
3.3	Closing devices are properly installed using the correct gaskets and are tightened with suitable tools. There must be no gas leakages	Bolts in blank flanges must be of appropriate length. If tools are used to close and tighten the closing devices, use only suitable tools, e.g. caps of screw couplings must be tightened by means of a wrench, not by a hammer. The closures must be equipped with suitable gaskets. They must be in a proper condition and replaced when necessary.	
3.4	After filling, the tank and service equipment must be checked again to ensure that there are no leakages.	Final (visual) check of all closing devices and valves on both sides.	

Points relevant to leaktightness for unloading tank-wagons (bottom discharge) for gases

1. Before unloading			
	Check	**Explanation**	**OK**
1.1[2]	Tank and service equipment in technically faultless condition (visual inspection from the ground).	Before clearance for unloading, the tank and service equipment must be checked to ensure that they do not show any obvious damage. No damage to tank or items of equipment that might endanger unloading. Verification refers e.g. to the valves, closing devices, the manhole cover, damage on the shell, thermal insulation.	
1.2	The external stop-valves and the closing devices are closed (on opposite side also) and there are no leakages on both liquid and gas phase.	It must be confirmed that the external stop-valves are closed. Seals can help to determine that closing devices and valves have not been handled by other parties. In case of own seals, it should be verified that they are in the same proper condition as when they were installed. It can be assumed that valves on tank-wagons returning with original seals are still leaktight.	
1.3	Ascertain that the product in the tank-wagon is the correct one.	The load must be determined from particulars in the transport documents, by comparison of the product name (reported on the plate of the tank-wagon) with the UN number on the orange-coloured plates, and with the product on the unloading order. In case of inconsistencies, clarification is needed, e.g. product analysis.	
1.4	Check whether the "emergency screws" of the internal stop-valves (gas and liquid phase) are in the "safe" position.	The emergency screw or "ice breaking screw" might have been used if the internal stop-valve could not be opened in a normal way (e.g. because of ice forming on the bottom of the tank). By turning this screw into the internal stop-valve, the valve opens and, as a consequence, the safety mechanism no longer closes the internal stop-valve automatically when the rail hook is removed. The valve is no longer functional and is blocked in the open position. For mechanical stop-valves: check whether the bottom valves are locked. For hydraulic valves: check whether the two bolts are present in/near the hydraulic oil reservoir.	

[2] Point 1.1 may also be carried out upon arrival at the facilities (arrival check) rather than directly before unloading.

1. Before unloading			
	Check	**Explanation**	**OK**
1.5	The discharge devices are properly connected to both liquid and gas phase and internal and external stop-valves on the unloading side are opened.	The specific operating instructions for unloading the tank-wagon must be observed. The use of a rail hook or similar devices is mandatory to open the internal stop-valves. The sequence of opening the valves is: first the internal stop-valves and then the external stop-valves.	
1.6	Before proceeding check again that there are no leakages.		

2. During unloading			
	Check	**Explanation**	**OK**
2.1	Supervise the unloading operation to ensure safe operation throughout the process.	For unloading, the operating instructions of the tank-wagon must be complied with. Permanent supervision will prevent dangerous situations and should enable rapid emergency response, if necessary.	

3. After unloading			
	Check	**Explanation**	**OK**
3.1	Check whether tank-wagon and discharge device are empty of liquefied gas (by means of suitable measures).	Suitable measures are: level indicating device, weighing, “no flow” sensors, etc. E.g., the T-pipe and discharge device can be emptied by purging with nitrogen.	
3.2	The right closing sequence of the valves (from inside to outside) has to be complied with.	Internal and external stop-valves must be closed in accordance with the operating instructions. These instructions are usually displayed on the tank-wagon.	
3.2.1	Verify that the internal stop-valves are leaktight and secured against unintentional opening.	Make sure that the internal stop-valves are leaktight and secured against unintentional opening. Leaktightness can be verified by depressurizing the T-pipe and then by using a manometer to check whether the pressure is rising again. Ensure that the valves are locked (e.g. securing pin).	

3. After unloading			
	Check	**Explanation**	**OK**
3.2.2	Verify that the external stop-valves are closed and secured (on opposite side also) and there are no leakages on both liquid and gas phase.	If tools are used to close and tighten the external stop-valves, use only suitable tools. Any safety devices to protect against unintentional opening of external stop-valves must be used, if available. There must be no gas leakages.	
3.3	Closing devices are properly installed using the correct gaskets and are tightened with suitable tools. There must be no gas leakages.	Bolts in blank flanges must be of appropriate length. If tools are used to close and tighten the closing devices, use only suitable tools, e.g. caps of screw couplings must be tightened by means of a wrench, not by a hammer. The closures must be equipped with suitable gaskets. They must be in a proper condition and must be replaced when necessary.	
3.4	After unloading, tank and service equipment must be checked again to ensure that there are no leakages.	Final (visual) check of all closing devices and valves on both sides.	
3.5	The pressure in the tank must be sufficient to counter an inadmissible external overpressure (the tank must be protected against underpressure).	When the external overpressure might be greater than the tank resistance, adequate measures must be taken to protect the tank against deformation. This is especially applicable for low pressure liquefied gases, e.g. sufficient pressure can be achieved by filling them with nitrogen or another inert gas.	

Points relevant to leaktightness for filling tank-wagons (top filling) for gases

1. **Before filling**			
	Check	**Explanation**	**OK**
1.1[3]	Tank and service equipment in technically faultless condition (visual inspection).	Before clearance for filling, the tank and service equipment must be visually checked to ensure that they do not show any obvious damage. No damage to tank and items of equipment that might endanger the filling. Verification refers e.g. to the valves, closing devices, the manhole cover, damage on the shell, thermal insulation.	
1.2[3]	Verify that the date of the next tank inspection date has not expired.	RID requires the next tank inspection date to be shown on every side of the wagon to inform the filler of the date of expiry.	
1.3	Verify that the dangerous goods are authorised for carriage in this tank.	This verification includes the comparison between the data shown on the wagon panel and the permitted gases listed on the tank plate.	
1.4	The last load and its compatibility with the new load must be determined.	The last load must be determined from data reported in the transport documents and by comparison of the product name (reported on the plate of the tank-wagon) with the UN number on the orange-coloured plates and with the product on the loading order. In case of inconsistencies, clarification is needed, e.g. product analysis. Note: Top filling tank-wagons are usually used for one specific product.	
1.5	The stop-valves and the closing devices are closed and there are no leakages on both liquid and gas phase.	It must be confirmed that the stop-valves are closed.	

[3] Points 1.1 and 1.2 may also be carried out upon arrival at the facilities (arrival check) rather than directly before filling.

1. **Before filling**			
	Check	**Explanation**	**OK**
1.6	The filling devices are properly connected to both liquid and gas phase and the stop-valves are opened. Before starting the filling, it must be checked again that there are no leak-ages.	The specific operating instructions for filling the tank-wagon must be observed.	
1.7	The maximum degree of filling must be determined to ensure that it will not be exceeded.	The filling degree must be determined taking into account the maximum loading mass on the wagon panel (load categories). Note: The residual load (product that is still present in the tank-wagon before loading) must also be taken into account.	

2. During filling			
	Check	**Explanation**	**OK**
2.1	Supervise filling operation to ensure safe operation throughout the process and prevent overfilling.	For filling, the operating instructions of the tank-wagon must be complied with. Permanent supervision will prevent dangerous situations, such as overfilling and will enable rapid emergency response, if necessary.	

3. After filling			
	Check	**Explanation**	**OK**
3.1	Verify that there is neither overloading nor overfilling.	Immediately after filling, the tank- wagon must be checked again to ensure it is not overloaded or overfilled, as determined in 1.7. • Overloading means exceeding the maximum gross mass of the tank-wagon. • Overfilling means exceeding the maximum (product related) filling degree, according to RID 4.3.3.2.5 These checks must be carried out by using calibrated measuring devices (e.g. by weighing on a cali-brated weighbridge). The overloading or overfilling must be remedied by immediate discharge of the	

3. After filling			
	Check	**Explanation**	**OK**
		excessive load in a safe manner. Further measures shall be agreed with the tank-wagon operator (in accordance with the vehicle keeper mark on the wagon) because: • Overfilling of the tank may generate pressure build-up above the maximum calculation pressure. In this case, the tank-wagon must be emptied completely and must be inspected and tested before bringing back into service. • An overfilled tank may cause excessive forces on bearings and axles. If overfilling has occurred, it must be checked whether the bearings and axles have been overloaded before bringing the tank-wagon back into service.	
3.2	Verify that stop-valves are closed and secured and that there are no leakages on both liquid and gas phase.	Any safety devices to protect against unintentional opening of stop-valves must be used, if available. There must be no gas leakages detected by appropriate methods, e.g. testing devices.	
3.3	Closing devices must be installed properly with the right gaskets, and must be tightened with suitable tools. There must be no gas leakages.	If tools are used to close and tighten the closing devices, use only suitable tools. The blank flanges on the closure that have been used must be equipped with new suitable gaskets. Bolts in blank flanges must be of appropriate length. There must be no gas leakages detected by appropriate methods, e. g. testing devices.	
3.4	After filling, the tank and service equipment must be checked again to ensure that there are no leakages.	Final (visual) check of all closing devices and valves. There must be no gas leakages detected by appropriate methods.	
3.5	The lockable cap (dome cap) must be locked and sealed (when fitted).		

Points relevant to leaktightness for unloading tank-wagons (top discharge) for gases

1. Before unloading			
	Check	**Explanation**	**OK**
1.1[4]	Tank and service equipment in technically faultless condition (visual inspection).	Before clearance for filling, the tank and service equipment must be visually checked to ensure that they do not show any obvious damage. No damage to tank and items of equipment that might endanger the unloading. Verification refers e.g. to the valves, closing devices, the manhole cover, damage on the shell, thermal insulation.	
1.2	The stop-valves and the closing devices are closed and there are no leakages on both liquid and gas phase.	The stop-valves must be confirmed closed. Seals can help to determine that closing devices and valves have not been handled by other parties. In case of own seals, it should be verified that they are in the same proper condition as when they were installed. It can be assumed that valves on tank-wagons returning with original seals are still leaktight.	
1.3	Ascertain that the product in the tank-wagon is the correct one.	The load must be determined from particulars in the transport documents, by comparison of the product name (reported on the plate of the tank-wagon) with the UN number on the orange-coloured plates, and with the product on the unloading order. In case of inconsistencies, clarification is needed, e.g. product analysis.	
1.4	The discharge devices are properly connected to both liquid and gas phase and stop-valves are opened.	The specific operating instructions for unloading the tank-wagon must be observed.	
1.5	Before proceeding it must be checked again that there are no leakages.		

[4] Point 1.1 may also be carried out upon arrival at the facilities (arrival check) rather than directly before unloading

2. During unloading			
	Check	**Explanation**	**OK**
2.1	Supervise the unloading operation to ensure safe operation throughout the process.	For unloading, the operating instructions of the tank-wagon must be complied with. Permanent supervision will prevent dangerous situations and will enable rapid emergency response, if necessary.	

3. After unloading			
	Check	**Explanation**	**OK**
3.1	Verify that stop-valves are closed and secured and there are no leakages on both liquid and gas phase.	If tools are used to close and tighten stop-valves, use only suitable tools. Any safety devices to protect against unintentional opening of stop-valves must be used, if available. There must be no gas leakages.	
3.2	Closing devices are installed correctly with the right gaskets and have been tightened with suitable tools. There must be no gas leakages.	If tools are used to close and tighten the closing devices, use only suitable tools. The closures must be equipped with suitable gaskets. They must be in a proper condition and must be replaced when necessary. Bolts in blank flanges must be of appropriate length.	
3.3	After unloading, the tank and service equipment must be checked again to ensure that there are no leakages.	Final (visual) check of all closing devices and valves. There must be no gas leakages detected by appropriate methods, e.g. testing devices.	
3.4	The lockable cap (dome cap) must be locked and sealed (when fitted).		

3. After unloading			
	Check	**Explanation**	**OK**
3.5	The pressure in the tank must be sufficient to counter an inadmissible external overpressure (the tank must be protected against underpressure).	When the external overpressure might be greater than the tank resistance, adequate measures must be taken to protect the tank against deformation. This is especially applicable for low pressure liquefied gases, e.g. sufficient pressure can be achieved by filling them with nitrogen or another inert gas.	