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LPG equipment and accessories — Filling and discharge procedures for LPG rail tankers

National foreword

This British Standard is the UK implementation of EN 14841:2023. It supersedes BS EN 14841:2013, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee PVE/19, LPG containers and their associated fittings.

A list of organizations represented on this committee can be obtained on request to its committee manager.

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LPG equipment and accessories - Filling and discharge procedures for LPG rail tankers

Équipements pour GPL et leurs accessoires -
Procédures de chargement et déchargement des
wagons-citernes pour GPL

Flüssiggas-Geräte und Ausrüstungsteile - Füll- und
Entleerungsverfahren für Eisenbahnkesselwagen für
Flüssiggas (LPG)

This European Standard was approved by CEN on 24 April 2023.

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European foreword

This document (EN 14841:2023) has been prepared by Technical Committee CEN/TC 286 “Liquefied petroleum gas equipment and accessories”, the secretariat of which is held by NSAI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 2023, and conflicting national standards shall be withdrawn at the latest by November 2023.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 14841:2009.

In comparison with the previous edition, the following technical modifications have been made:

- Removal of the Annex A on the Environmental checklist;
- Addition of a reference to CEN/TS 16765;
- A new Annex A was added giving recommendations on the personal protection equipment;
- Updating of the Introduction;
- In addition to the discharge of LPG, requirements for the filling of LPG were also added;
- The document was harmonized in both the filling and the discharge sections with EN 13776;
- A new clause on Integrate shut down systems was added.

This document will be submitted for reference in:

- the RID [4]; and/or
- the technical annexes of the ADR [5].

NOTE These regulations take precedence over any clause of this standard. It is emphasized that RID/ADR are being revised regularly at intervals of two years which can lead to temporary non-compliances with the clauses of this standard.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

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Introduction

This document calls for the use of substances and procedures that can be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

The frequencies of the different types of pressure vessel inspection are given by the relevant international regulations concerning the transport of dangerous goods.

Protection of the environment is a key political issue in Europe and elsewhere. For CEN/TC 286 this is covered in CEN/TS 16765 [1], and this Technical Specification should be read in conjunction with this document. CEN/TS 16765 provides guidance on the environmental aspects to be considered regarding equipment and accessories produced for the LPG industry and the following is addressed:

- a) design;
- b) manufacture;
- c) packaging;
- d) use and operation; and
- e) disposal.

It is recommended that companies using this document develop an environmental management policy. For guidance, see EN ISO 14001 [2].

It has been assumed in the drafting of this document that the execution of its provisions is entrusted to appropriately qualified and experienced people.

All pressures are gauge pressures unless otherwise stated.

NOTE This document requires measurement of material properties, dimensions and pressures. All such measurements are subject to a degree of uncertainty due to tolerances in measuring equipment, etc. It can be beneficial to refer to the leaflet "Measurement uncertainty leaflet" SP INFO 2000 27 [3].

1 Scope

This document specifies procedures for filling, discharge and handling operations as well as emergency procedures for rail tankers used for the transport of liquefied petroleum gas (LPG).

This document does not apply to “tank containers” and “batteries of receptacles”.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

CEN/TS 16769, *LPG equipment and accessories* Terminology

3 Terms and definitions

For the purposes of this document, the terms and definitions given in CEN/TS 16769 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

4 General operation

Handling operations such as:

- accepting rail tankers upon arrival;
- filling and/or discharge of LPG; and
- preparation and returning rail tanker

shall be carried out under the supervision of a competent person (e.g. operator of the site) and shall be in accordance with the site procedures.

5 Procedures

5.1 General

Site procedures in written form including emergency procedures shall be available, understood and followed by all persons involved in each operation. This shall be achieved by training and supervision. The responsibilities of the persons involved shall be clearly specified.

The procedures shall include a check of the rail tanker that is to be carried out before it is accepted. This shall include:

- the marking;
- a check of the integrity of the rail tanker;
- a check of tamper evident seals; and
- an identification check of LPG quality and grade.

In case of transfer to/from another tanker, the procedures shall also include the check of that other tanker.

Where deficiencies are found, they shall be recorded and reported to the appropriate body (e.g. rail tanker loader) and the rail tanker operator. A rail tanker shall not be filled and/or discharged until any necessary remedial work has been completed.

Copies of checklists and deficiency reports shall be retained.

Personnel carrying out LPG transfer operations shall wear personal protection equipment. The operations of filling and discharging shall be done under constant supervision.

NOTE 1 Recommendations for personal protection equipment are given in Annex A.

The filling and discharge areas shall be inspected for fire hazards prior to beginning operations. Suitable fire protection shall be readily available.

NOTE 2 Responsibilities for fire protection are subject to national regulations.

5.2 Filling

5.2.1 Preparation for filling

5.2.1.1 The rail tanker to be filled shall be moved to the filling area and positioned in accordance with the site procedures.

5.2.1.2 Any device provided to check the loaded quantity (e.g. by weight) shall be operational.

5.2.1.3 Parking brakes and railway wheel chock or other equivalent means shall be applied to prevent unintended movement of any rail tanker involved during filling. The site, where the rail tankers are parked for filling shall be isolated from other rail traffic. If fitted, anti-drive-away interlocks shall be engaged.

5.2.1.4 The electrostatic potential of the rail tanker and the discharging pressure vessel shall then be equalised before the LPG hoses or loading arms are connected.

5.2.1.5 All rail tanker valves shall be checked to ensure that they are in the closed position.

5.2.1.6 Blanking caps or blind flanges shall be removed from the liquid and vapour connections (where fitted and when used) to be used.

5.2.1.7 Ensure that the site is safe for filling LPG and adequate ullage capacity is available. Specific requirements for this shall be part of the site procedures.

5.2.1.8 Hoses and loading arms shall be checked for kinks, wear or obvious damage. Fill-couplings, seals and necessary attachments shall be examined to ensure compatibility and that no dirt or any other foreign matter is present before connection.

5.2.1.9 Connections shall be properly made before starting to fill. Hoses/loading arms shall not be fully extended in making the connections. A check shall be made for any sign of leakage before filling commences. Any leakage shall be rectified before proceeding.

5.2.1.10 If any rail tanker involved in the filling is equipped with foot valve(s), an emergency ripcord shall be connected to the rail hook that will shut down the foot valve in the event of unintended movement of that rail tanker.

5.2.1.11 Precautions shall be taken to ensure that the grade of LPG to be filled is correctly identified and that the rail tanker is suitable for the intended load and that it is correctly labelled (see RID, 4.3.3.2.5 [4]).

NOTE In the RID [4] the terms “placarding” and “orange-coloured plate marking” are used in place of “labelling”.

5.2.1.12 Where fitted, rail tanker loading control systems shall be connected.

5.2.2 Filling operations

Transfer couplings (hoses or loading arms) shall be connected without submitting them to any abnormal stresses. The rail tanker, product terminal and vapour return valves, where applicable, shall be opened in the required sequence and manner in accordance with the site procedures. The connections between the transfer couplings and the rail tanker shall be checked for leakage. Further periodic leakage checks shall be carried out directly after the product transfer operation has begun. In case any leakage is detected, the filling operations shall be stopped immediately in order to make the transfer couplings gas-tight.

It can be necessary to reduce the transfer rates in order to ensure that the maximum fill is not exceeded.

5.2.3 Completion of filling

5.2.3.1 The filling shall be stopped when the maximum fill level of the receiving rail tanker is reached.

5.2.3.2 The rail tanker, product terminal and vapour return valves, where applicable, shall be closed in the required sequence and manner in accordance with the site procedures ensuring that valves closest to the pressure vessel of the rail tanker are closed first. Then the ripcord(s) shall be disconnected.

5.2.3.3 Any LPG between the transfer couplings shall be vented in a safe manner before fully disconnecting.

5.2.3.4 After disconnection of the filling line and any other connections to the rail tanker (vapour return or tanker loading control) all valves of the rail tanker shall be properly closed and the lines stowed. Blanking caps and blind flanges shall be secured in place and checked for leaks.

5.2.3.5 A final check shall be made to ensure that the rail tanker is in a fit condition to be moved away. There shall be no sign of leakage. The connection made to equalize the electrostatic potential shall be disconnected. The connection for equalising the electrostatic potential of the discharging pressure vessel and the receiving pressure vessel shall not be disconnected until hoses/loading arms are disconnected and stowed.

5.2.3.6 Anti-drive-away interlocks shall stay engaged until the rail tanker(s) can be safely moved.

5.2.3.7 The correct quantity of LPG loaded (as per dataplate of the pressure vessel, see RID, 4.3.3.2.5 [4]) shall be verified. Before leaving the site, verification that the road tanker displays the appropriate hazard warning shall be ensured.

5.2.4 Precautions against overfilling

5.2.4.1 Gauging devices shall be monitored continuously during the filling operation, to ensure that the rail tanker is not overfilled.

5.2.4.2 If a rail tanker is accidentally overfilled, the excess LPG shall be removed in a controlled manner without delay, before departure of the rail tanker.

5.2.4.3 When filling by weight, the tare of the vehicle shall be determined i.e. by weighing before every filling operation to ensure that the vehicle is not overfilled.

5.3 Discharge

5.3.1 Preparation for discharge

5.3.1.1 The discharging rail tanker shall be moved to the discharge area and positioned in accordance with the site procedures.

5.3.1.2 Any device provided to check the discharged quantity shall be operational.

5.3.1.3 Parking brakes and railway wheel chocks or other equivalent means shall be applied to prevent unintended movement of any rail tanker involved during discharge. The site, where the rail tankers are parked for discharging, shall be isolated from other rail traffic. If fitted, anti-drive-away interlocks shall be engaged.

5.3.1.4 The electrostatic potential of the rail tanker and the receiving pressure vessel shall then be equalised before the LPG hoses or loading arms are connected.

5.3.1.5 All rail tanker valves shall be checked to ensure that they are in the closed position.

5.3.1.6 Blanking caps or blind flanges shall be removed from the liquid and vapour connections to be used.

5.3.1.7 It shall be checked that the site is safe for discharging LPG and adequate storage capacity is available. Specific requirements for this shall be part of the site procedures.

5.3.1.8 Hoses and loading arms shall be checked for kinks, wear or obvious damage. If they show wear or damage, they shall not be used in discharge operations until rectified.

5.3.1.9 Fill-couplings, seals and necessary attachments shall be examined to ensure compatibility and that no dirt or any other foreign matter is present before connection.

5.3.1.10 Connections shall be properly made before starting to discharge. Hoses/loading arms shall not be fully extended in making the connections. A check shall be made for any sign of leakage before discharging commences. Any leakage shall be rectified before proceeding.

5.3.1.11 If any rail tanker involved in the discharge is equipped with foot valve(s) an emergency ripcord shall be connected to the rail hook that will shut down the foot valve in the event of unintended movement of that tanker.

5.3.2 Discharge operations

The transfer couplings (hoses or loading arms) shall be connected without submitting them to any abnormal stresses. The rail tanker, product terminal and vapour return valves, where applicable, shall be opened in the required sequence and manner in accordance with the site procedures. The connections between the transfer couplings and the rail tanker shall be checked for leakage. Further periodic leakage checks shall be carried out directly after the product transfer operation has begun. In case any leakage is detected, the discharge operations shall be stopped immediately in order to make the transfer couplings gas-tight.

It can be necessary to reduce the transfer rates in order to ensure that the maximum fill is not exceeded.

5.3.3 Completion of discharge

5.3.3.1 The discharging shall be stopped when the maximum fill level in the receiving pressure vessel is reached or the rail tanker is empty.

The use of a weighing measure system or other LPG content monitoring system should be considered in order to prevent overfilling of the receiving vessel.

5.3.3.2 The rail tanker, product terminal and vapour return valves, where applicable, shall be closed in the required sequence and manner in accordance with the site procedures ensuring that valves closest to the pressure vessel of the rail tanker are closed first. Then the rircord(s) shall be disconnected.

5.3.3.3 Any LPG between the transfer couplings shall be vented in a safe manner before fully disconnecting.

5.3.3.4 After disconnection of the filling line and any other connections to the discharging rail tanker (vapour return or tanker loading control) all valves of the discharging rail tanker shall be properly closed and the lines stowed. Blanking caps and blind flanges shall be secured in place and checked for leaks.

5.3.3.5 A final check shall be made to ensure that the rail tanker is in a fit condition to be moved away. There shall be no sign of leakage. The connection made to equalize the electrostatic potential shall be disconnected. The connection for equalising the electrostatic potential of the discharging rail tanker and the receiving pressure vessel shall not be disconnected until hoses/loading arms are disconnected and stowed.

5.3.3.6 Anti-drive-away interlocks shall stay engaged until the rail tanker(s) can be safely moved.

5.3.4 Discharging by pumps

5.3.4.1 Operating and safety requirements as stipulated by the pump manufacturer shall be adhered to.

5.3.4.2 The pumps shall be protected against damage due to dry running/cavitation.

5.3.4.3 The use of a supervisory control and data acquisition (SCADA) system or another suitable data logging system for the control of pressure and temperature during discharge by pumps should be considered.

5.3.5 Discharging by compressor

5.3.5.1 When discharging a rail tanker using a compressor it is essential to have the vapour return line connected and open before starting the compressor.

5.3.5.2 Operating and safety requirements stipulated by the compressor manufacturer shall be adhered to.

5.3.5.3 Care shall be taken to avoid exceeding the maximum allowable working pressure of the discharging rail tanker and the receiving tank pressure vessel.

5.3.5.4 Where vapour recovery is required, the liquid outlet valve shall be closed. The compressor valving shall be set for vapour recovery. Care shall be taken not to decrease the pressure in the discharging rail tanker below the pre-specified safe pressure level.

Advantage of any existing pressure differentials should be taken when starting the discharge procedure before starting the compressor.

Negative pressure shall be avoided in the discharging rail tanker because of the danger of air ingress into the discharging rail tanker and possible mechanical damage to the pressure envelope.

5.3.5.5 The use of a supervisory control and data acquisition (SCADA) system or another suitable data logging system for the control of pressure and temperature during discharge by compressors should be considered.

5.4 Integrated shut down system

The use of an integrated shut down system which automatically stops the discharging in case of gas leakage, fire or other hazards should be considered.

6 Emergency procedure

The overall site emergency procedures shall include at least the following for the rail tanker transfer operations:

- LPG leakage;
- LPG fires, including fire fighting plan;
- notification/raising of the alarm (including contact information for emergency services);
- evacuation plan; and
- accidents.

Annex A (informative)

Safety recommendations

These recommendations are minimum requirements, and they do not take precedence over relevant Health and Safety legislation and filling and discharge facility owner requirements.

All operations should be risk assessed and appropriate controls, as are reasonably practicable, should be put in place to deal with the associated risk. Such control measures can include the following protection measures by operators:

- To require all filling operatives of each vehicle to wear the recommended personal protective equipment (e.g. protective glasses, gloves, anti-static safety shoes, anti-static long sleeves jacket or shirt and warning vest, ear plugs);
- to require operatives intervening on any equipment that can result in liquid LPG release or wherever there is a possible discharge at eye level to use a protective visor in addition to the recommended personal protective equipment;
- to require that equipment is always shut down before any intervention (e.g. maintenance or repair);
- to require measures to be taken to minimize the risk of injury during manual handling operation.

Bibliography

- [1] CEN/TS 16765, *LPG equipment and accessories - Environmental considerations for CEN/TC 185 standards*
- [2] EN ISO 14001, *Environmental management systems - Requirements with guidance for use (ISO 14001)*
- [3] Measurement uncertainty leaflet (SP INFO 2000 27, uncertainty), Magnus Holmgren et al published by Swedish National Testing and Research Institute
- [4] RID — *Regulations concerning the international carriage of dangerous goods by rail*
- [5] ADR — *European agreement concerning the international carriage of dangerous goods by road*

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