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BSI Standards Publication

Tanks for transport of dangerous goods — Guidance and recommendations for loading, transport and unloading

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National foreword

This Published Document is the UK implementation of CEN/TR 15120:2013. It supersedes PD CEN/TR 15120:2005 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee AUE/18, Tanks for the transport of dangerous goods.

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

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Tanks for transport of dangerous goods - Guidance and recommendations for loading, transport and unloading

Citernes destinées au transport de matières dangereuses - Lignes directrices et recommandations pour le chargement, le transport et le déchargement

Tanks für die Beförderung gefährlicher Güter - Leitlinien und Empfehlungen für Ausfüllung, Beförderung und Entladung

This Technical Report was approved by CEN on 28 January 2013. It has been drawn up by the Technical Committee CEN/TC 296.

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Management Centre: Avenue Marnix 17, B-1000 Brussels

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Foreword

This document (CEN/TR 15120:2013) has been prepared by Technical Committee CEN/TC 296 “Tanks for the transport of dangerous goods”, the secretariat of which is held by AFNOR.

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

This document supersedes CEN/TR 15120:2005.

The main changes compared to the previous edition are:

— additional statement concerning spray deflectors added to 5.2.1;

— additional statement concerning pressure balanced footvalve pressure relieving added to 5.3.3;

— new section 5.3.4 concerning cap for loading and unloading adaptor added;

— additional statement clarifying where 5.5 kPa pressure shall be measured in 5.4.1;

— reference to EN12971 removed from 5.4.1;

— flame arrester specification updated to meet latest standards in 5.4.5;

— additional statement concerning positioning of an overfill probe added to 5.5.1;

— Annex A – statement concerning height of loading adaptors changed to reflect Directive 94/63/EC;

— Annex A – additional statement defining minimum adaptor spacing added.

1 Scope

This Technical Report provides guidance and recommendations to enable the transfer of product and vapour between the loading gantry, the tank truck and the service station.

The European Parliament and Council Directive 94/63/EC (VOC Directive) requires operators to ensure that petroleum vapours are not emitted into the atmosphere during loading and unloading. The recommendations and guidance given in this document are intended to assist users in meeting the requirements of this Directive.

This Technical Report acknowledges that, for climatic and logistical reasons, alternative technical solutions are commonly used in the Arctic Region.

This Technical Report gives guidance and recommendations for loading at terminals and discharge at service stations or customer premises of tank trucks transporting dangerous substances of Class 3 of ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road – (flammable liquids) which have a vapour pressure not exceeding 110 kPa at 50 °C and petrol, and which have no sub-classification as toxic or corrosive.

2 Normative references

The following documents, in whole in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12972, *Tanks for transport of dangerous goods — Testing, inspection and marking of metallic tanks*

EN 14564:2013, *Tanks for transport of dangerous goods — Terminology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 14564:2013 and the following apply.

3.1
arctic region
region comprising Finland, Norway and Sweden

3.2
authorisation to load
authorisation of a tank truck loader by a terminal operator to load the required goods into the tank truck following the verification of his or her competence including any required certification and its associated validity

3.3
driver
person in charge of the tank truck, having responsibility for driving and who might or might not also be responsible for its loading and/or discharge

3.4
overfill
filling of a tank truck or one or more of its compartments to the extent that the total volume loaded into a compartment exceeds the maximum permitted volume

3.5
overfill prevention system
gantry-mounted controller connected to sensors mounted at a pre-determined high level in a tank truck that will, in the event that a sensor detects liquid, signal the gantry control valve to cease loading flow in order to prevent the overfilling of the tank truck

3.6
overloading
loading of a tank truck such that its total weight exceeds that permitted by local road regulations, or the load imposed by one or more axles exceeds the local maximum authorised weight for that axle

3.7
tank truck
truck which conforms to the definition of either tank-vehicle, demountable tank, tank container or tank swap body given in EN 14564

3.8
safe loading pass
permit issued to a tank truck upon verification by inspection that its design and maintenance satisfy safety and gantry compatibility requirements

3.9
tank truck loader
person responsible for loading the tank truck in accordance with the load plan

Note 1 to entry: The tank truck loader is sometimes called the filler.

3.10
tank truck operator
legal entity/company that provides funds, tank trucks and personnel in order to transport dangerous goods as described in Clause 1

3.11
terminal operator
person or company in charge of terminal operations, including the responsibility for storage, handling, loading of dangerous goods and providing the information with regard to the specifications of the product to be loaded

3.12
maximum permitted volume
maximum volume of the compartment, or in total

Note 1 to entry: Maximum permitted volume means the same as the term "degree of filling", which is used in the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR).

3.13
frustrated delivery
delivery where the driver is unable to unload the intended volume

4 Bottom loading gantry function and operation

4.1 Gantry loading equipment

4.1.1 General

Arrangements to permit loading of tank trucks, equipped according to this document, should be available on at least one gantry at each arctic loading facility.

4.1.2 Overfill prevention system

Loading gantries should have meters to determine the volume loaded into a tank truck compartment. The primary overfill prevention system should comprise the pre-setting of the gantry loading meter by the tank truck loader for each tank truck compartment separately before it is loaded.

4.1.3 Level detection — Secondary shut off (overfill prevention) system

The gantry-based components of the overfill prevention system should conform to EN 13922. The plug should be able to connect with the connector within the tank connection envelope as described in Annex A. It should be considered as a secondary overfill prevention system in the event that the primary volume limiting system (meter pre-set) does not operate.

NOTE In the arctic region, 2-wire thermistor sensors with a positive temperature coefficient conforming to national standards and individual tank truck mounted shut-off devices are commonly used.

4.1.4 Coupler for bottom loading

Couplers for bottom loading should be operationally compatible with adaptors for bottom loading and should be able to connect with them within the tank connection envelope as described in Annex A.

Where tank trucks fitted with valves which can be closed against product flow are loaded, a surge pressure of 2 500 kPa should not compromise the integrity or functions of the coupler.

In order to prevent the accumulation of any electrostatic charge, there should be electrical resistance of less than 10 ohms across a metallic coupler and adaptor, and less than 10^6 ohms in other cases, when connected.

NOTE In the arctic region, couplers for bottom loading with the same functionality but able to connect with an adaptor for bottom loading with a reduced diameter are commonly used.

4.1.5 Vapour collection system

The vapour collection coupler should conform to EN 13081 and should be able to connect with the vapour collection adaptor within the tank connection envelope as described in Annex A.

NOTE In the arctic region, a vapour collection coupler with the same functionality but with a reduced diameter are commonly used.

4.1.6 Drive away restriction

A system to prevent unauthorised movement of a tank truck may be provided.

4.2 Loading conditions

4.2.1 Maximum loading rates per loading arm

The maximum loading rate per loading arm should not exceed the values given in Table 1.

It is recommended that the tank truck be suitable for high speed loading (see 5.2.1).

NOTE Table 1 has been adapted from CLC/TR 50404 and gives the flow rates for diameters of pipe used in loading systems, including tank truck pipework, such that the accumulation of the electrostatic charge on the surface of the liquid does not exceed acceptable limits. The reduced values given in brackets apply to non high speed loading tank trucks.

Maximum loading rates ($vd < 0{,}5$) are given for design purposes; loading rates may be reduced for safety reasons depending upon specific circumstances.

Table 1 — Conductivity

	Conductivity								
Product class and sulphur content [*S*] mg/kg[a]	pS/m								
	Known > 50			Known > 10			Known < 10, or unknown		
		max. loading rate			max. loading rate			max. loading rate	
		l/min			l/min			l/min	
	$v \times d$[c]	DN[b]	DN	$v \times d$	DN	DN	$v \times d$	DN	DN
		80 mm	100 mm		80 mm	100 mm		80 mm	100 mm
Gasoline (any S level)[d]	< 0,5	1 900	2 400	< 0,5	1 900	2 400	< 0,5	1 900	2 400
							(< 0,38)	(1 400)	(1 800)
Diesel or gasoil with $S > 50$ and all other fuels	< 0,5	1 900	2 400	< 0,5	1 900	2 400	< 0,5	1 900	2 400
							(< 0,38)	(1 400)	(1 800)
Diesel or gasoil with $S < 50$	< 0,5	1 900	2 400	< 0,5	1 900	2 400	< 0,35	1 300	1 650
				(< 0,38)	(1 400)	(1 800)	(< 0,25)	(940)	(1 200)

NOTE 1 Flow rates given in this table prevent the accumulation of the electrostatic charge on the surface of the liquid reaching unacceptable levels.

NOTE 2 Information on product sulphur content and conductivity would normally be provided by the terminal operator.

NOTE 3 Values in brackets apply to non high speed loading tank-vehicles.

NOTE 4 The maximum loading rates given in Table 1 may be reduced for safety reasons depending upon specific circumstances.

NOTE 5 DN = d × 1 000.

[a] mg/kg = mass fraction (ppm).

[b] DN = diameter (nominal) of loading pipe (mm).

[c] $v \times d$ = flow velocity in metres per second [m/sec] × nominal internal pipe diameter in metres [m].

[d] Reduced flow rates are applicable in arctic or severe winter conditions.

4.2.2 Maximum liquid pressure

Where systems include valves that can be closed against the loading flow, including pressure-balanced valves, it should be ensured that:

— the maximum static pressure in the pipework upstream of the isolating valve does not exceed 1 Mpa;

— pressure-balanced footvalves conform to EN 13316.

4.2.3 Maximum vapour back pressure

The maximum back-pressure created by the gantry vapour recovery system should be 5,5 kPa (55 mbar).

NOTE The maximum back pressure of 5,5 kPa is a requirement of the VOC Directive 94/63/EC.

Controls may be provided to ensure that this maximum back pressure is not exceeded.

4.3 Loading operations

Before loading is permitted, procedures should exist to ensure that there is authorisation to load and to accommodate the loading of both empty and not-empty compartments. For not-empty compartments, the volume and grade of the retained goods should be determined prior to loading.

If the surface on which the tank truck is standing is not conductive (see CLC/TR 50404 for guidance), the tank truck should be bonded to earth before any operation (e.g. opening fill covers, connecting loading couplers) is carried out. The bonding resistance between the tank truck and the gantry should be 10^6 ohms or less.

Procedures should exist to ensure that overloading does not occur.

5 Tank truck function and equipment

5.1 Tank truck compartment – Compartment identification

The tank truck compartments should be clearly identified with the numbering starting from the front of the tank (see Annex C).

5.2 Tank truck compartment — Control of static electricity

5.2.1 General

As an electrostatic charge is generated within the dangerous goods whenever they are being loaded into a tank truck, precautions should be taken to ensure the safe dissipation of the charge.

Metal-to-metal connections should have an electrical continuity of 10 ohms or less.

Non-metallic conductive components should be installed such that electrical continuity of 10^6 ohms or less exists across the interface to the adjacent component.

Where the functionality of an electrical system requires one or more insulating blocks to be inserted between components, it should be ensured that the electrical continuity across the components does not exceed 10^6 ohms.

The tank should be mounted such that there is electrical continuity of 10 ohms or less between the tank and wheel rims and 10^6 ohms or less between the tank and a conductive road surface.

Spray deflectors or other methods should be used to minimise spraying and jetting of liquid from the footvalves during the loading process.

5.2.2 Central conductor

Tank trucks where all compartments meet the criteria given in the following list may be referred to as high speed loading tank trucks. Other tank trucks should be deemed as non high speed loading tank trucks (see 4.2.1 for effect on loading rates). Every tank truck should carry either a document or an indelibly marked plate (see Annex C) or both identifying whether it is a high speed loading tank truck or a non high speed loading tank truck.

For high speed loading tank trucks, compartments and any chamber therein should:

a) have a nominal capacity $<$ 2 000 l; or

b) have a nominal capacity $\geq$ 2 000 l and $\leq$ 15 000 l, and be equipped with

   1) at least one full height baffle or surge plate; or

   2) at least one central conductor, so that no part of the liquid surface, in plan view, is > 0,8 m from one of the conductors or the tank shell; or

c) have a nominal capacity $>$ 15 000 l.

NOTE A chamber is the space created in a compartment when that compartment is subdivided by baffles or surge plates into spaces of smaller capacity (as per CLC/TR 50404).

A central conductor should be an electrically continuous metallic uninsulated cable, wire or tube, which has electrical continuity with the tank shell of $\leq$ 10 ohms.

If a cable or wire, the central conductor should:

— have a diameter $\geq$ 2 mm and $\leq$ 10 mm, or $\geq$ 50 mm;

— be fixed to the roof and to the floor of the compartment or chamber; and

— have sufficient strength to withstand flexing caused by loading and transport operations, including its end fittings and attachments.

If a tube (which may be a dip, drain, service or vapour recovery tube), the central conductor should:

— have a diameter $\geq$ 50 mm; and

— be fixed to the roof of the compartment or chamber and continued to the floor or vice versa.

A central conductor should not retain product.

Any overfill or other probe in a compartment should be fitted $<$ 0,5 m from a compartment division, or a baffle, surge plate or central conductor.

5.3 Tank truck loading equipment

5.3.1 Tank contents determination

Provision should be made for determining the empty or not-empty condition of each tank truck compartment prior to loading.

A plate, as shown in Annex C, should be fitted adjacent to the adaptor showing the maximum permissible filling volume of each compartment.

5.3.2 Adaptor for bottom loading and unloading

The bottom loading adaptor should conform to EN 13083. If the system is fitted with valves which can be closed against the loading flow, e.g. pressure balanced footvalves conforming to EN 13316, a surge pressure of 2 500 kPa should not compromise the integrity or functions of the adaptor/coupler.

NOTE In the arctic region, bottom loading adaptors with the same functionality but with a reduced diameter are commonly used.

The adaptors should be located as described in Annex A to allow the connection of couplers.

5.3.3 Footvalves

Non-pressure balanced footvalves should conform to EN 13308.

Pressure balanced footvalves should conform to EN 13316.

Before the footvalve in the tank compartment is opened, the vapour transfer valve should be open. The footvalve should be open before loading commences.

The footvalve should be closed before the loading or discharge connections are broken.

For pipe systems with pressure balanced footvalves, a pressure relieving device should be installed between the footvalve and loading/unloading adaptor to prevent over-pressurisation of the pipeline from thermal expansion of the liquid.

5.3.4 Cap for the bottom loading/unloading adaptor

The drip cap fitted to the bottom loading/unloading adaptor should conform to EN16249.

5.4 Vapour collection system

5.4.1 General conditions

In order to ensure that vapour is not emitted to atmosphere when the terminal vapour collection system generates a back-pressure of up to 5,5 kPa, care should be taken when designing, operating and maintaining the vapour collection system of the tank truck.

Vents fitted to the compartment, vapour manifold and vapour pipework should be designed and controlled such that vapours from the storage installations at the service stations or terminals are retained, except for the release of internal overpressure and vacuum through the pressure and breather vents (EN 14595).

NOTE 1 The release of internal overpressure and vacuum through the pressure and vacuum breather vents (EN 14595) is a requirement of Directive 94/63 on the control of volatile organic compound (VOC) emissions.

NOTE 2 The vapour collection systems of tank trucks differ depending on whether:

type 1: the pressure and vacuum breather vents exhaust directly to atmosphere; or

type 2: the pressure and vacuum breather vents exhaust into the vapour collection manifold.

To load the maximum number of compartments simultaneously without vapours escaping into the atmosphere, the following should be taken into account:

— the pressure drop of all components installed in the vapour collection system;

— the pressure drop of vapour collection pipework;

— the maximum permitted back pressure of 5,5 kPa (55 mbar).

To allow bottom loading gantries to collect all vapours displaced from a tank truck being loaded, the vapour collection system should be leakproof in accordance with EN 12972.

5.4.2 Vapour collection manifold

A vapour collection manifold should be used when loading or unloading a tank truck with more than one compartment. Where the coaming is used as a vapour manifold, it should be considered as part of the vapour pipework.

A common manifold is suitable for vapour collection when loading or unloading and may be either a separate pipe or the rollover coaming.

The vapour transfer valves should seal the vapour collection manifold from the compartments during transport, except where they incorporate a pressure and vacuum breather vent. Whichever system is used, the manifold should be sealed to atmosphere when a vapour recovery coupler is connected.

The vapour collection system should be provided with a facility to detect the presence of liquid (e.g. sight glass). Where necessary it should be adequately protected against possible over-pressure due to thermal expansion.

5.4.3 Vapour transfer valves

The vapour transfer valves should conform to EN 13082.

Vapour transfer valves should be open before loading or discharge commences.

5.4.4 Pressure and vacuum breather vents

Each compartment should be fitted with a pressure and vacuum breather vent conforming to EN 14595. The pressure breathing capacity should be sufficient to ensure that the maximum working pressure of the tank is not exceeded. The vacuum breathing capacity should be sufficient to ensure that the maximum vacuum rating of the tank is not exceeded under either a gravity or a pumped discharge.

5.4.5 Flame arresters

In order to protect the tank and its contents, together with any vapour pipework, from possible ignition sources, a flame arrester should be fitted to all valves which can breathe directly to atmosphere (excluding the emergency pressure relief valve according to EN 14596 where fitted).

Flame arresters should be of the "end of line deflagration flame arrester" type, that meet the requirements of ISO 16852:2008, 7.3.2.1 Flame Transmission Test, referred to in section 6.9, Table 5 for gas group IIA.

For 100 % ethanol and petroleum fuels containing more than 90 % ethanol, then the test shall be as above but for gas group IIB(1).

5.4.6 Vapour collection adaptor

The vapour collection adaptor should conform to EN 13081.

The adaptor should be operationally compatible with the coupler for vapour recovery and should be located within the tank connection envelope as described in Annex A.

NOTE In the arctic region, a vapour collection adaptor with the same functionality but with a reduced diameter are commonly used.

5.4.7 Interlocks

Interlocks should be provided on the tank truck to ensure that:

— the vapour collection coupler is connected to the vapour collection adaptor before loading can commence;

— the vapour transfer valve is open before loading of the relevant tank compartment can commence.

The interlocks should be linked into the level detection/secondary shut-off system according to EN 13922 such that the permissive signal is not obtained if these conditions are not met.

5.4.8 Vapour flow performance test/calculation

The maximum number of tank compartments that may be loaded simultaneously without vapour release should be identified on a plate permanently attached to the tank truck (see Annex C).

The maximum number of tank compartments that may be loaded simultaneously should be determined for the tank truck types given in 5.4.1 as follows:

a) For type 1 tank trucks, the test method in Annex B should be used, unless a new, untested type 1 tank truck presents only minor changes from a previously tested type 1 tank truck design, in which case a calculation method may alternatively be used.

NOTE Minor changes can be considered to be where:

— the number of compartments is not increased;

— the pipework bore and coaming cross section are not reduced;

— all intersections of pipework are identical in form;

— the internal surfaces of the pipework and coaming are identical in form;

— there are an equal or lower number of compartment vapour lines entering the coaming manifold on a given side of the entrance into the vapour downpipe;

— the vapour transfer vent valves are the same make and type;

— the vapour adaptor is the same make and type.

b) For type 2 tank trucks, either the test method in Annex B or a calculation method can be used.

5.5 High level detection

5.5.1 Overfill prevention sensor

In each tank compartment, an overfill prevention sensor conforming to EN 13922 should be mounted and should be set in accordance with Annex D to prevent liquid being loaded into the body of the transfer valve.

Tank compartments should be individually calibrated to ensure the correct setting of the sensor and verification of the net ullage.

Any overfill prevention sensor should be installed < 0,5 m from a compartment division, baffle, surge plate or central conductor.

The dimension from the sensor reference plane to the sensor trigger level may be identified on a plate permanently attached adjacent to the tank manufacturer’s identification plate (see Annex C).

5.5.2 Gantry connection — Socket location

The 10 pin socket should be located within the tank connection envelope in accordance with Annex A.

5.6 Other tank truck equipment

5.6.1 Manhole cover assembly

Manhole cover assemblies (if fitted) should conform to EN 13317.

5.6.2 Fill hole cover

Fill hole covers (if fitted) should conform to EN 13314.

5.6.3 Emergency pressure relief valve

Emergency pressure relief valves (if fitted) should conform to EN 14596.

5.7 Tank truck safety systems

5.7.1 Earthing/bonding

A static earth bond should be provided, conforming to EN 13922:2003, 6.2.1.

NOTE In the arctic region where the alternative 2 wire PTC thermistor is used, separate static earth bonding is commonly used.

5.7.2 Pressure switch

Where footvalves and/or vapour transfer valves are air operated, a pressure switch that detects low air pressure should be fitted to the operating system such that, if the air pressure is or falls below 110 % of the minimum operating pressure of the valves, its contacts should open and the permissive signal to the level detection/secondary shut-off system according to EN 13922 is not obtained or is lost.

Where the interlock fitted to the vapour collection adaptor is also pneumatic (see 5.4.7), the pressure switch may be connected to both.

5.7.3 Tank truck immobilisation

When loading or unloading a tank truck, the parking brake should be applied.

An interlock system may be provided:

— to prevent any connection between the tank truck and the gantry being made until the tank truck is immobilised;

— to prevent unauthorised movement of the tank truck until all gantry connections to it have been removed.

6 Electrical equipment

Equipment not certified for use in a potentially explosive atmosphere should be isolated prior to loading and discharge and may be re-energised once it is safe to do so, e.g. when all loading arms have been disconnected and stowed, and no spillage or vapour cloud is present.

NOTE 1 Terminal operators are obliged to carry out an area classification of the site using an accepted code in accordance with the provisions of the ATEX European Directives 1999/92/EC and 94/9/EC and to select suitable equipment for use in those areas. Equipment certified for use in a potentially explosive atmosphere can be energised during the loading and discharge operations provided the equipment certification satisfies the area classification.

NOTE 2 Annex E shows when an explosive atmosphere may be present or may arise during loading operations.

7 Gantry — tank truck system interfaces

Electronic/automatic product recognition systems, where fitted, should conform to EN 14116.

8 Conditions of operation

8.1 Weather conditions

Loading and discharge operations should not be carried out during electrical storms.

8.2 Switch loading

Where switch loading is practised (the loading of a distillate product into a tank truck compartment that has previously carried petrol and vice versa), no unacceptable contamination should occur due to product remaining in the compartments and/or pipework of the tank truck.

8.3 Leak monitoring

The tank truck loader/driver should stop any loading or unloading operation if leakage of liquid or vapour is detected.

9 Safe loading pass

Every tank truck should have a safe loading pass.

NOTE An example of a model safe loading pass scheme is shown in Annex F.

The following should be documented for the purposes of a safe loading pass:

a) certification of conformity of the overfill prevention system to EN 13922;

b) overfill prevention system probe setting dimensions;

c) certification of maximum number of tank compartments that may be loaded simultaneously;

d) identification of tank truck type (type 1 or type 2);

e) pressure/vacuum breather vent settings (for vapour collection system on type 1 tank);

f) type of footvalves fitted (pressure balanced or non pressure balanced);

g) leakproofness of vapour collection system;

h) identification of high speed loading or non high speed loading tank truck.

10 Discharge

10.1 Site assessment

An assessment of the receiving facilities should be carried out before the first delivery to a service station, following a repair or modification which might affect the delivery and on a regular basis thereafter. The assessment should include:

— access to and egress from the service station;

— access to and suitability of connections;

— grade marking;

— storage tank capacity;

— electrical continuity of pipework and tankage;

— contents measurement;

— overfill prevention system;

— manifolding of pipework;

— venting system;

— flow restriction of liquid and vapour;

— containment of spillage;

— site specific procedures to be followed.

10.2 Control of electrical conductivity

In order to ensure that static electricity is dissipated, the electrical resistance between

— the filling connection and earth bonding of the service station, and

— the service station filling connection and hoses through the adaptors/couplers

should be less than 10 ohms for metal to metal connections and less than 10^6 ohms in other cases, for example if a product identification/data transfer system conforming to EN 14116 is installed.

10.3 Maximum delivery rates

Systems should be designed such that the required maximum delivery rate can be achieved but not exceeded.

10.4 Safety precautions

The person responsible for supervising the delivery of product into the site storage tanks should ensure that any safety precautions required by local regulations are adhered to. Where no local regulations exist, the following precautions should be observed as a minimum:

— ensure the fill area is free from debris and flammable materials;

— place suitable warning and “No smoking - Flammable liquids” signs around the area;

— ensure the provision nearby of suitable fire fighting equipment;

— ensure that persons and/or vehicles not involved in the discharge operation are kept clear of the immediate area;

— ensure that the exit route for the tank truck is clear to allow exit in the event of an emergency.

10.5 Checks prior to discharge

Means should be provided to ascertain the ullage of an underground storage tank to ensure that it is greater than the quantity of product to be delivered into it. Where it is not, the delivery should not be started.

Tanks should be clearly labelled at the point of filling to show:

— the tank capacity;

— the tank number;

— the product contained.

Checks should be carried out on the condition of all connections, hoses and seals.

10.6 Discharge procedure

10.6.1 Operational considerations

The person responsible for the discharge of the tank truck should check whether any site-specific procedures need to be followed.

NOTE The site-specific procedures will have been identified during the site inspection (see 10.1).

The vapour hose connection should be made prior to the opening of the vapour transfer valves on the tank truck.

All connections and hoses should be checked for leakage throughout the delivery.

In the event of a spillage or other irregular occurrence, the delivery should be stopped and the situation assessed prior to continuation of the delivery.

10.6.2 Pumped discharge

Generally only gas oil (heating oil, light fuel oil) and diesel oil may be delivered by pumped discharge.

Petrol should be delivered by pumped discharge only in exceptional circumstances. Pumped discharge of petrol into underground storage tanks should be avoided. Petrol stored in an above ground storage tank may require pumped discharge in which case it should be equipped with an overfill prevention system, earth bonding and a vent pipe at least 4 m in height.

NOTE 1 Pumping of petrol can extend the hazardous area.

NOTE 2 Local regulations might require a written permit to allow the driver to carry out a pumped discharge.

For delivery to static tanks, an overfill prevention system conforming to EN 13616 should be fitted.

If petrol has been delivered by pumped discharge, procedures should exist to avoid contamination of the following delivery.

10.7 Frustrated deliveries

Procedures should be established to deal with frustrated deliveries including determination of the volume remaining on the tank truck and action to be taken.

Annex A
(normative)

Tank connection envelope

The tank connection envelope should be located as shown in Figure A.1 a) for tank-vehicles with the connection on the left-hand side and as shown in Figure A.1 b) for tank-vehicles with the connection envelope on the right-hand side.

The adaptors for bottom loading, vapour recovery adaptor and overfill prevention system plug should be arranged in one of the following methods:

a) where the adaptors for bottom loading, vapour recovery adaptor and overfill prevention system plug are fitted inside the cabinet, or where there is no cabinet, they should be arranged as shown in Figure A.2 a);

b) where only the adaptors for bottom loading are fitted within the cabinet, adaptors for bottom loading, vapour recovery adaptor and overfill prevention system plug should be arranged as shown in Figure A.2 b).

The arrangement of the adaptors for bottom loading and vapour recovery adaptor should conform to the dimensions shown in Figure A.3.

The adaptor face, as shown in Figure A.3, should be substantially vertical.

The distance between the vertical centre line of adjacent loading adaptors should be a minimum of 250 mm.

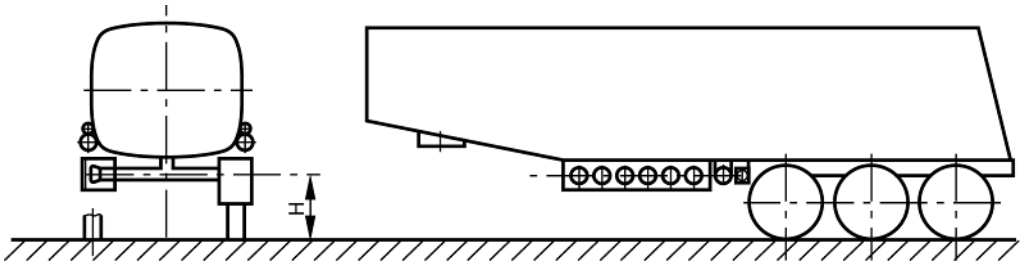
The height from the ground of the centre line of the bottom loading adaptors should be: maximum 1,4 m (unladen), minimum 0,5 m (laden), the preferred height being between 0,7 m to 1,0 m.

The vapaour collection adaptor and earth/overfill connection should generally be to the right of the loading adaptors and height from the ground should be: maximum 1,5 m (unladen), minimum 0,5 m (laden), the preferred height being between 0,7 m to 1,0 m.

NOTE The tank connection envelope described in this annex is applicable to rigid tank trucks, tank trailers and tank semi-trailers.

The loading and vapour arms in terminal gantries should be capable of connecting to adaptors at the maximum and minimum heights described above.

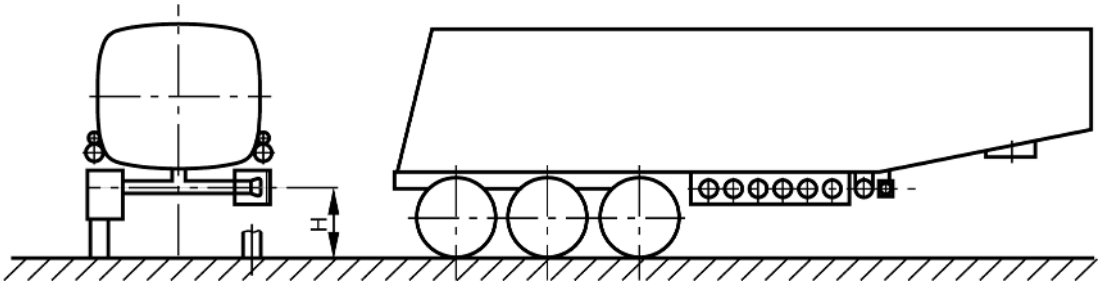
Dimensions in millimetres



Key

H height

Figure A.1 a) — Tank connection envelope — Left hand side

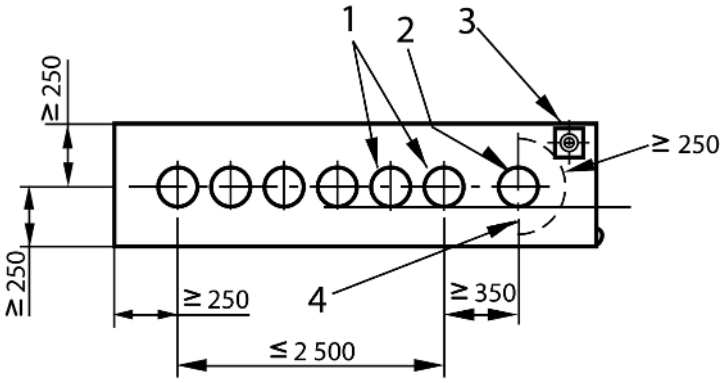


Key

H height

Figure A.1 b) — Tank connection envelope — Right hand side

Dimensions in millimetres

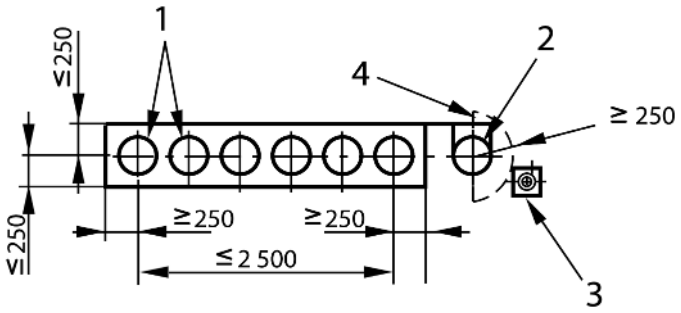


Key

1 bottom loading adaptor conforming to EN 13083
2 vapour collection adaptor conforming to EN 13081
3 10 pin connector conforming to EN 13922
4 free space

Figure A.2 a) — Tank connections inside cabinet or with no cabinet

Dimensions in millimetres

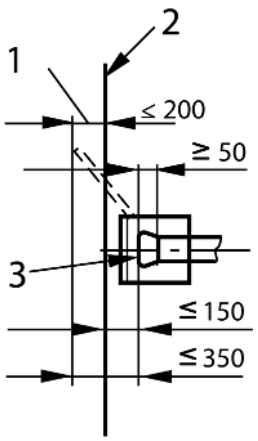


Key

1 bottom loading adaptor conforming to EN 13083
2 vapour collection adaptor conforming to EN 13081
3 10 pin connector conforming to EN 13922
4 free space

Figure A.2 b) — Tank connections where only bottom-loading adaptors are fitted inside the cabinet

Dimensions in millimetres



Key

1 maximum protrusion of opened cabinet door beyond width of tank truck
2 width of vehicle
3 adaptor face

Figure A.3 — Side view of tank connections

Annex B
(normative)

Vapour flow performance test

B.1 General

This test replicates the recovery of petrol vapour from a tank truck during loading by blowing air into its compartments through a manifold under controlled conditions, and includes the measurement of air flow rates and pressures, in order to determine the maximum number of compartments that may be permitted to load simultaneously.

In order to take account of the differences in the physical properties of petrol vapour and air, a conversion factor of 2,0 times the volume (and flow rate) of petrol vapour should be employed to determine the flow rate of air to be used.

For type 1 tank trucks, the test should be carried out on each tank truck variant produced by a manufacturer, unless a variant presents only minor changes (see 5.4.8) from a previously tested tank truck, in which case a calculation method may alternatively be used.

For type 2 tank trucks, either the test method given in this annex or a calculation method may be used.

B.2 Health and safety

The process of testing the tank truck involves operations and equipment covered by Health and Safety legislation, of which all personnel involved in the test should be aware.

A risk assessment should be carried out, with particular attention given to:

— the design, testing and operation of equipment falling within the scope of the Pressure Equipment Directive 97/23/EC;

— the layout of the test site and its security against unauthorised personnel entering;

— the safety of personnel carrying out and observing the test.

A tank truck which has been in service should be gas-freed, leakproof tested in accordance with EN 12972 and certified gas-free before testing is carried out according to this Annex. During testing, the tank truck should be monitored for vapour presence under the tester's scheme for monitoring tank trucks that have been in service carrying dangerous goods.

B.3 Facilities and apparatus

B.3.1 Test location

The site chosen for carrying out the testing should provide the controlled conditions essential for achieving satisfactory test results as well as adequate security for personnel (see B.3.1).

Testing of the tank truck requires the monitoring of a number of flow meters and pressure gauges; the test location should accommodate their mounting at a single, easily visible and unobstructed position.

B.3.2 Apparatus

B.3.2.1 Air supply

A suitable air supply should be provided, capable of achieving a flow rate of 300 m^3/h for the simulation of each tank compartment being loaded simultaneously, at a pressure up to the setting of the pressure and vacuum breather vents (typically, 7 kPa to 12 kPa (70 mbar to 120 mbar)).

The air supply system should include:

— an intercooler;

— a pressure reduction valve, if necessary;

— a suitable air control valve between the air supply and the intercooler;

— an air receiver.

Where the piping from the air supply to the air distribution manifold involves the use of flexible hoses, suitable hose restraints should be employed.

B.3.2.2 Air distribution manifold

A manifold for the distribution of air to the tank compartments should be provided. The manifold should be constructed from aluminium or other suitable material, 1,75 m long, with a nominal bore diameter of 0,26 m, and fitted with flanged ends. The manifold should have an inlet port (or ports) compatible with the air supply, and sufficient outlet ports of 50 mm bore to suit the expected maximum number of compartments to be loaded simultaneously. A further port should be provided for an emergency pressure relief device.

Each inlet and outlet port of the manifold should be fitted with a 50 mm full-bore ball valve.

Tapping points should be provided for an air pressure gauge (see B.3.2.8) and an air temperature gauge (see B.3.2.9).

B.3.2.3 Manifold emergency pressure relief device

A pressure relief valve set to open at 21 kPa (210 mbar) and capable of passing a flow rate in excess of the capacity of the air supply should be fitted to the manifold.

B.3.2.4 Compartment feed line(s) and flow measurement

Each tank compartment to be tested should be coupled to the air distribution manifold via a feed line, fitted with an orifice plate flow meter (square edge with corner tappings), mounted between flow straighteners. The flow straighteners should consist of straight lengths of clean 75 mm bore metal pipe, 1,5 m long upstream and 0,76 m long downstream of the flow meter to maximise accuracy.

Each flowmeter should have a manometer with a calibrated, graduated scale to read flow up to 300 m^3/h at a nominal pressure of 113,3 kPa (1 133 mbar) and at a temperature of 20 °C.

Each feed line should be connected to the manifold through a flow control valve, and to each tank compartment bottom loading adaptor; to provide flexibility, a 75 mm bore hose should be used as part of each connection.

B.3.2.5 Tank top tapping point

Each tank compartment should be fitted with a pressure tapping point on the tank top; this may be achieved by modifying a blanking plate on a manhole cover accessory port or an item of service equipment, but in either case equipment to the manufacturer's original specification should be refitted at the end of the test. The tapping should be connected to a remote pressure gauge (see B.3.2.8).

B.3.2.6 Vapour outlet back-pressure monitor

NOTE Whereas B.3.2.6.1 describes a method of applying back pressure which is compliant with the VOC Directive, B.3.2.6.2 provides a practical alternative.

B.3.2.6.1 Back pressure applied upstream of the vapour adaptor

It should be noted that where the prescribed back pressure is to be applied immediately upstream of the tank truck's vapour adaptor, the vapour adaptor is not included in the flow test for the determination of the number of tank compartments that may be loaded simultaneously.

A thin sandwich plate with four tapping points set radially at 90° apart should be used to provide a pressure sensing point at the outlet flange of the tank vapour pipe. The bore of the sandwich plate should match precisely the bore of the tank vapour pipe to minimise turbulent flow. The four points should be linked externally by nylon tube in order to average any variation in pressure created at this point by turbulent flow generated in the tank vapour pipe, and a single connection should then be made to a pressure gauge (see B.3.2.8).

B.3.2.6.2 Back pressure applied at the vapour adaptor/coupler interface

Where the prescribed back pressure is to be applied at the interface between the gantry vapour coupler and the tank truck's vapour adaptor, a 'dummy' vapour coupler and pipe assembly should be fabricated that provides:

— a means of securing the adaptor in the open position;

— pressure measurement at four points equally spaced around the circumference at each of three points along the pipe in order to establish average pressure readings.

B.3.2.7 Back-pressure control valve

A 100 mm bore screw-down gate valve should be fitted at the end of the spool piece remote from the tank truck, for throttling the air supply to obtain the maximum permitted back-pressure during testing (5,5 kPa (55 mbar)).

B.3.2.8 Pressure gauges

B.3.2.8.1 General

All pressure gauges should be of the capsule type, and connected to the relevant test point by nylon tube.

Calibration should be to ± 1,6 % FSD in accordance with EN 837-3.

The calibration test temperature should be 20 °C with a temperature error characteristic of ± 0,3 % FSD per 10 °C variation.

B.3.2.8.2 Manifold pressure monitor

The gauge for measuring pressure in the manifold should have a range of 0 kPa to 60 kPa (0 mbar to 600 mbar) and a vapour pipe. A single connection should be made to a vapour outlet pressure monitor (see B.3.2.8.4).

B.3.2.8.3 Tank top pressure monitors

The gauges for measuring pressure in the compartments should have a range of 0 kPa to 16 kPa (0 mbar to 160 mbar).

B.3.2.8.4 Vapour outlet pressure monitor

The gauge for measuring pressure in the vapour outlet should have a range of 0 kPa to 10 kPa (0 mbar to 100 mbar).

B.3.2.9 Manifold air temperature monitor

An air temperature thermocouple (low mass K type) conforming to EN 60584 Class 2 accuracy $\pm$ 0,007 5 $\times$ $|t|$ (where $|t|$ = absolute value of the temperature in °C) or $\pm$ 2,5 °C should be fitted to the air supply manifold.

B.4 Procedure

B.4.1 Assembly of test equipment

Prepare the apparatus as described in B.3 without making the connections to the tank.

B.4.2 Tank truck preparation

Certify the tank truck to be gas-free as described in B.2.

Blank off all pressure and vacuum breather vents.

NOTE This might require their removal and plugging of the holes.

Make a connection to each tank compartment for a pressure monitor.

Ensure all manlid fill hole covers are locked closed.

Remove the vapour adaptor and connect the associated sandwich plate, or connect the vapour outlet back-pressure monitor to the vapour adaptor, as required.

Ensure that the vapour collection system is leakproof in accordance with EN 12972.

Open all vapour transfer valves irrespective of the combination of compartments being tested.

Ensure any coaming vent valve to atmosphere, if fitted, is closed.

B.4.3 Connection of air supply

Connect the feed lines from the air distribution manifold to the bottom loading adaptors for the expected maximum number of tank compartments that can be loaded simultaneously. The configuration of tank compartments selected should create the worst conflict of flow in the vapour manifold on top of the tank truck.

B.4.4 Supply of air for flow testing to the tank truck

Activate the air source and open the air control valves. Ensure no air leaks exist.

Adjust the air supply to each tank compartment using the flow control valves on the tank compartment feed lines until each tank compartment flowmeter has a reading of 300 m^3/h.

Adjust the back-pressure control valve to obtain the maximum permitted back-pressure of 5,5 kPa (55 mbar) at the vapour outlet monitor.

Make further minor adjustments of the feed line and back-pressure control valves as necessary to achieve a steady state condition of flow rates and back-pressure.

Once the tank compartment flow rate and back-pressure have remained steady for two minutes, take readings from the tank-top pressure monitors and record.

B.5 Evaluation of results

If any reading from the tank-top pressure monitors exceeds the minimum positive opening pressure of the pressure and vacuum breather vents fitted to the tank truck, repeat the flow test with a reduced number of tank compartments.

If none of the readings from the tank-top pressure monitors exceed the minimum positive opening pressure of the pressure and vacuum breather vents fitted to the tank truck, the test should be repeated for all possible combinations of tank compartments that could be used in loading the tank. Pressure readings from tank-top pressure monitors should be recorded for each combination.

When none of the readings from the tank-top monitors for all combinations of tank compartments exceed the minimum positive opening pressure of the pressure and vacuum breather vents fitted, the number of tank compartments in that series of flow tests represents the maximum number that can be filled simultaneously. This is the number which should be recorded on the tank truck information plate (see B.8).

B.6 Test report

The test report should include the following information:

— tank type and serial number;

— pipework cross-sections, length, bends and intersections;

— all service equipment fitted to the tank;

— the settings of pressure and vacuum breather vents;

— tank dimensions and individual compartment capacities;

— all readings from the tank-top pressure monitors, taken in accordance with B.4.4 and B.5;

— the number of tank compartments that can be loaded simultaneously, as determined in accordance with B.5.

B.7 Preparation of tank truck for re-entry into service

The following procedure should be followed before a tank truck is returned to service after testing:

a) deactivate the air source;

b) ensure there is no residual pressure in the equipment or tank by opening all control valves and by checking that the air pressure monitors read zero;

c) disconnect the tank from the test equipment;

d) replace the original tank equipment removed to make the pressure sensing connections;

e) refit the vapour collection adaptor (if removed);

f) remove the means for blanking the pressure and vacuum breather vents and replace with service equipment to the required pressure and vacuum settings;

g) verify that the tank truck is suitable for service by applying the operator's written scheme. Where any tank equipment has been removed and subsequently refitted, a vapour tightness test as described in B.2 should be carried out.

B.8 Marking of the tank information plate

The tank information plate should be marked with the maximum number of tank compartments that may be filled simultaneously.

NOTE The marking of the tank information plate with the maximum number of tank compartments that may be filled simultaneously is a requirement of the VOC Directive 94/63/EC.

It is recommended that the following are also marked on the tank information plate:

— the required minimum nominal pressure setting of the compartment pressure and vacuum breather vents (applicable to type 1 tanks only);

— a declaration that the determination of the number of tank compartments that can be loaded simultaneously was carried out in accordance with this publication.

Annex C
(normative)

Information plate

The following plates should be made from corrosion resistant material, indelibly marked and securely fastened to the tank structure.

Plates should be fitted to indicate:

a) the number of tank compartments that may be loaded simultaneously (see 5.4.8);

b) the tank compartment capacity;

   These plates should be fitted adjacent to the bottom loading adaptor (and optionally at the discharge adaptor) to identify the maximum permitted volume which may be loaded into that tank compartment;

c) the tank compartment identification number (see also 5.1);

   This plate should be fitted adjacent to the bottom loading adaptor, and the discharge adaptor (if different), to identify the compartment to which it is connected;

d) overfill prevention sensors;

   This plate identifies the type of overfill prevention sensors installed in line with Directive 94/63/EC;

e) high speed loading/non high speed loading tank truck;

   This plate should identify whether or not a tank truck is a high speed loading tank truck as described in 5.2.1;

f) shut off valves;

   This plate should identify whether the valves fitted can close against the loading flow, e.g. pressure balanced footvalves conforming to EN 13316;

g) drain down/non drain down tank truck;

   This plate should identify whether or not – if the overfill prevention system is triggered – the tank truck needs to be drained down before it may leave the terminal.

Plates may additionally be fitted to indicate:

a) pressure/vacuum breather vent information;

   This plate should be fitted on type 1 vapour collection systems to identify the pressure and vacuum setting of the valves;

b) overfill prevention device setting dimensions;

This plate identifies the distance from the sensor reference plane to the sensor trigger level of the probe (see Annex D);

c) operating controls;

This plate identifies the pipework, meters and valves schematically to assist the driver or loader.

NOTE The total number of information plates can be reduced by combining the information onto one plate, with the exception of compartment capacity, compartment identification number and operating controls, which need to be kept on separate plates.

Annex D
(normative)

Overfill prevention sensor setting

The overfill prevention sensor should be set according to the configuration given in either Figure D.1 or Figure D.2, depending on whether the overfilled compartment is corrected before transport or not.

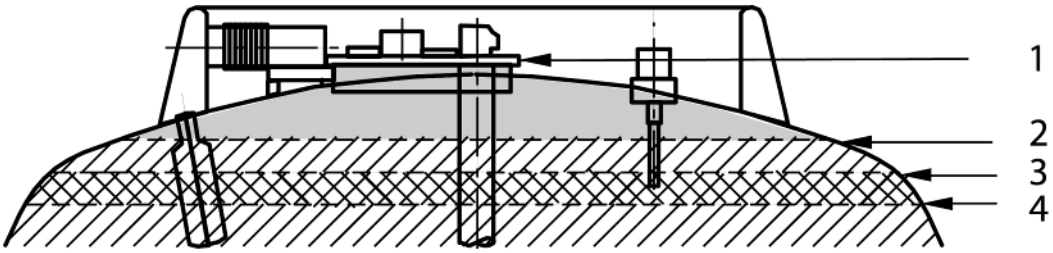
Where the overfilled compartment is not corrected before transport:

a) the distance between level 4 and level 3 should be a minimum of 10 mm and a maximum of 25 mm;

b) volume level 3 to level 2 should be a minimum of 150 l;

c) volume level 2 to level 1 should be at least 3 % of compartment capacity, although the exact percentage might be subject to national regulations.

NOTE 1 An accurate means of calculating the required percentage of volume level 2 to level 1 is given in 4.3.2.2.1 and 4.3.2.2.2 of the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR).



Key

1 level to "liquid full"
2 level of liquid after operation of overfill prevention system which should be below the level of opening into vapour transfer valve
3 level at which overfill prevention sensor is triggered
4 nominal capacity level of tank compartment

Figure D.1 — Sensor setting where the overfilled compartment is not corrected before transport

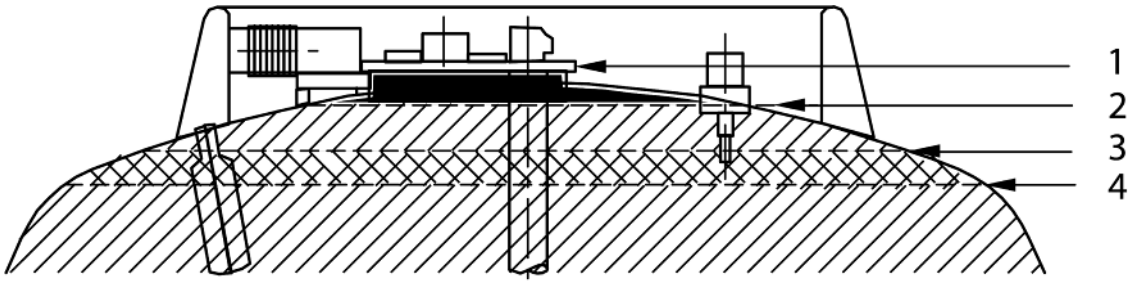
Where the overfilled compartment is corrected before transport:

a) the distance between level 4 and level 3 should be a minimum of 10 mm and a maximum of 25 mm;

b) volume level 3 to level 2 should be a minimum of 150 l;

c) volume level 4 to level 1 should be at least 3 % of compartment capacity, although the exact percentage might be subject to national regulations.

NOTE 2 An accurate means of calculating the required percentage of volume level 4 to level 1 is given in 4.3.2.2.1 and 4.3.2.2.2 of the European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR).



Key

1 level to "liquid full"
2 level of opening into vapour transfer valve
3 level at which overfill prevention sensor is triggered
4 nominal capacity level of tank compartment

Figure D.2 — Sensor setting where the overfilled compartment is corrected before transport

Annex E
(informative)

Illustration of when an explosive atmosphere might be present or might arise during loading operations

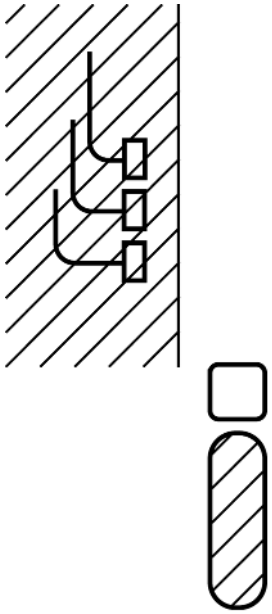


Figure E.1 — Pre-entry

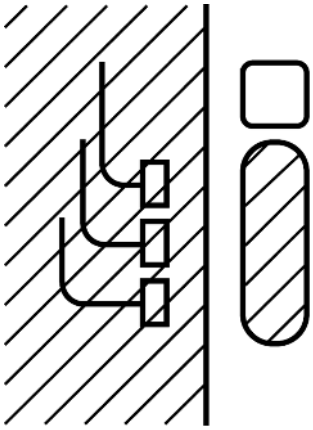


Figure E.2 — Entry before loading starts

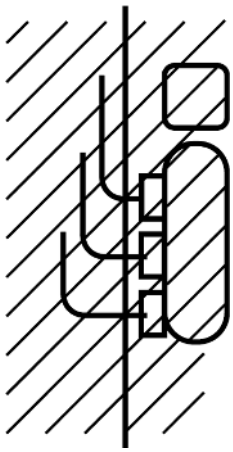


Figure E.3 — During loading

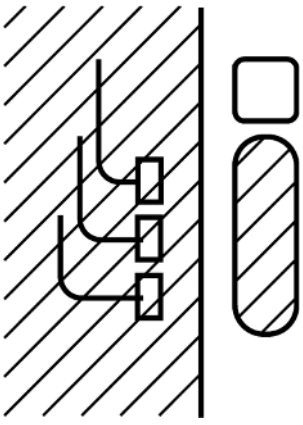
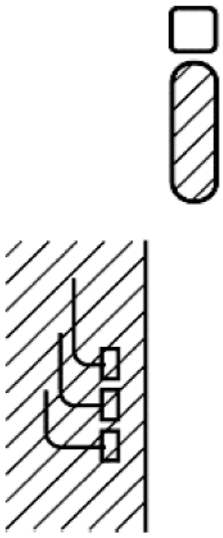


Figure E.4 — Pre-exit (loading completed, arms stowed, no spillage)



Key

Possible presence of explosive atmosphere

Loading arms

NOTE The extent and classification of the hazardous area is not defined in Figures E.1 to E.5.

Figure E.5 — Exit

Annex F
(informative)

Safe loading pass scheme

F.1 Inspection of equipment

The following template lists the different items of tank truck equipment, as detailed in this document, which should be inspected as part of a safe loading pass scheme.

NOTE The items listed are in addition to and complement the requirements of a statutory ADR examination.

Table F.1 — Inspection requirements (1 of 2)

Clause/ subclause	Inspection requirements
5.2.1	Metal to metal connections have electrical continuity of 10 ohms or less.
	Non-metallic conductive components have electrical continuity of 10^6 ohms or less.
5.2.2	It is identified whether the tank truck is high speed or non high speed loading.
	Central conductor has electrical continuity of 10 ohms or less with the tank shell.
	For compartments with capacity ≥ 2 000 l and ≤ 15 000 l, a central conductor is fitted, is secure and no point of the horizontal liquid surface is more than 0,8 m from an adjacent conductor or conductive surface.
	Overfill or other probes are not more than 0,5 m from a division, baffle, surge plate or central conductor.
5.2.1	Electrical continuity of 10 ohms or less exists between the tank and the wheel rims.
5.3.1	Provision exists for determining the empty or not-empty condition of each tank truck compartment prior to loading.
5.3.2	The adaptors for bottom loading are labelled in accordance with EN 13083 and located as described in Annex A.
5.3.3	The footvalves are labelled in accordance with EN 13308 or EN 13316.
	Before the footvalve in the tank compartment is opened, the vapour transfer valve is open. The control system ensures the footvalve is open before loading commences. The control system permits the footvalve to be closed before the loading or discharge connections are broken.
5.4.2	The vapour collection system is sealed to atmosphere when a vapour recovery coupler is connected. The vapour collection system is provided with a facility to detect the presence of liquid.
	"continued"

Table F.1 (2 of 2)

Clause/ subclause	Inspection requirements
5.4.3	The control system ensures that the vapour transfer valves are open before loading or discharge commences.
5.4.5	A flame arrester is fitted to all valves which might breathe directly to atmosphere.
5.4.6	The vapour collection adaptor is labelled in accordance with EN 13081, is operationally compatible with the coupler for vapour recovery, and is located within the tank connection envelope as described in Annex A.
5.4.7	Interlocks are provided on the tank truck to ensure that: — the vapour collection coupler is connected to the vapour collection adaptor before loading can commence; — the vapour transfer valve is open before loading of the relevant tank compartment can commence. The safety interlocks are linked into the level detection/secondary shut-off system such that the permissive signal is not obtained if these conditions are not met.
5.4.8	The maximum number of compartments that may be loaded simultaneously without vapour release is identified on a plate permanently attached to the tank truck as described in Annex C.
5.5.1	An overfill prevention sensor conforming to EN 13922 is fitted in each tank compartment and set in accordance with Annex D. The dimension from the sensor reference plane to the sensor trigger level is identified on a plate permanently attached adjacent to the tank manufacturer's identification plate.
5.7.2	Where footvalves and/or vapour transfer valves are pneumatically operated, a pressure switch that detects low air pressure is fitted to the operating system such that, if the air pressure is or falls below 110 % of the minimum operating pressure of the valves, its contacts open and the permissive signal to the level detection/secondary shut-off system is not obtained or is lost.
5.7.3	An interlock system is operational if it: — prevents any connection between the tank truck and the gantry being made until the tank truck is immobilised; — prevents unauthorised movement of the tank truck until all gantry connections to it have been removed.
6	Electrical equipment certified for use in a potentially explosive atmosphere and which may be energised during the loading and discharge operations is clearly labelled as suitable for the zone in which the equipment is to operate. Electrical equipment not certified for use in a potentially explosive atmosphere and which is isolated prior to loading and discharge is free from any obvious defect.

F.2 Tank truck identification

The following information identifies the tank truck covered by the safe loading pass and should be recorded on the safe loading pass documentation:

a) tank truck operator;

b) tank truck identity number;

c) tank manufacturer;

d) date of manufacture of tank truck;

e) number of tank compartments;

f) tank compartment capacities;

g) overfill prevention system – manufacturer, type (2 or 5 wire);

h) tank truck documents inspected.

The following documentation should be inspected for the purposes of the safe loading pass scheme:

a) certification of conformity of the overfill prevention system to EN 13922;

b) overfill prevention system probe setting dimensions;

c) certificate of maximum number of tank compartments that may be loaded simultaneously;

d) identification of tank truck type (type 1 or type 2);

e) pressure/vacuum breather vent settings (only for vapour collection system on type 1 tank);

f) type of footvalves fitted (pressure balanced or non pressure balanced);

g) leakproofness of vapour collection system;

h) identification of high speed loading or non high speed loading tank truck.

F.3 Inspection check list

Safe loading pass — Inspection form

Vehicle Registration Number/Fleet Number ……..... Operator ……..……

Clause/ subclause	Item	Check		Comments
5.2	Tank truck loading equipment			
5.2.1	Metal to metal connections	Electrical continuity of 10 ohms or less		
5.2.1	Non-metallic conductive components	Electrical continuity of 10^6 ohms or less		
5.2.2	High speed/non high speed loading tank truck	Correct information plate fitted		
5.2.2	Central conductor connection	Electrical continuity of 10 ohms or less with tank shell		
5.2.2	Central conductor security and location	Secure, within 0,8 m horizontally of adjacent conductor /conductive surface		
5.2.2	Overfill prevention or other probes	Not more than 0,5 m from a division, baffle, surge plate or central conductor		
5.2.1	Tank to wheel rim connection	Electrical continuity of 10 ohms or less		
5.3.1	Condition of compartment	Identification of empty/not-empty condition		
5.3.2	Bottom loading adaptor	Labelled to indicate conformity to EN 13083 and located within tank connection envelope as described in Annex A.		
5.3.3	Footvalves	Labelled to indicate conformity to EN 13308 or EN 13316 Vapour transfer valve opens first Provision of control(s) for opening before loading		
5.4.2	Vapour collection system	Sealed to atmosphere when vapour recovery coupler connected Provision of liquid detection facility		
5.4.3	Control system	Vapour transfer valves open before loading or discharge commences		
5.4.5	Flame arrester	Fitted to all valves breathing to atmosphere other than emergency pressure relief valves		
5.4.6	Vapour collection adaptor	Labelled to indicate conformity to EN 13081 Operationally compatible with the vapour coupler Located within tank connection envelope as described in Annex A.		
5.4.7	Interlocks	Vapour collection coupler connected before loading commences		
		Vapour transfer valve open before compartment loading can commence		
		Linked into level detection/secondary shut-off system such that the permissive signal is not obtained if these conditions are not met		
5.4.8	Plate for maximum number of tank compartments which may be loaded simultaneously	Number of tank compartments which may be loaded simultaneously identified on a permanently fitted plate		
5.5.1	Overfill prevention sensor	Fitted and set correctly Setting dimensions identified on permanent plate correctly located		
5.7.2	Pressure switch (if required)	Switch that detects low air pressure is fitted to the operating system		
5.7.3	Connection interlocks (where fitted) tank truck to gantry gantry connections removed	 Operational Operational		
6	Electrical equipment			
	Certified electrical equipment Uncertified electrical equipment	Labelled Free from obvious defect		

Inspected by …… Signed …….. Date ……..……

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