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

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

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

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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 Beförderung gefährlicher Güter - Leitlinien und Empfehlungen für Befüllung, Beförderung und Entladung

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Foreword

This Technical Report (CEN/TR 15120:2005) has been prepared by Technical Committee CEN/TC 296 “Tanks for transport of dangerous goods”, the secretariat of which is held by AFNOR.

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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 goods (liquid petroleum fuels) which have a vapour pressure not exceeding 110 kPa, at 50 °C (including petrol), and which have no sub-classification as toxic or corrosive.

2 Normative references

The following referenced documents are indispensable for the application 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.

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

EN 14564:2004, *Tanks for transport of dangerous goods — Terminology*.

3 Terms and definitions

For the purposes of this Technical Report, the terms and definitions given in EN 14564:2004 and the following apply.

3.1
arctic region
region comprising Finland, Norway and Sweden

3.2
authorization to load
authorization 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 authorized 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 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 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 unauthorized 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 pipe work such that the accumulation of the electrostatic charge on the surface of the liquid does not exceed acceptable limits. Maximum loading rates ($vd < 0{,}5$) are given for design purposes; loading rates may be reduced for safety reasons depending upon specific circumstances. The reduced values given in brackets apply to non high speed loading tank trucks.

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.

[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].

NOTE 5 DN = $d \times 1\,000$.

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

NOTE 2 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 authorization 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 (for example 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.

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:

— have a nominal capacity < 2 000 litres, or

— have a nominal capacity ≥ 2 000 litres and ≤ 15 000 litres and be equipped with

a) at least one full height baffle or surge plate, or

b) 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

— have a nominal capacity > 15 000 litres.

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 ≤ 10 ohms.

If a cable or wire, the central conductor should:

— have a diameter ≥ 2 mm and ≤ 10 mm, or ≥ 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 ≥ 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.

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.

NOTE 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.