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Series 1 freight containers — Specification and testing —

Part 3: Tank containers for liquids, gases and pressurized dry bulk

Conteneurs de la série 1 — Spécifications et essais —

Partie 3: Conteneurs-citernes pour les liquides, les gaz et les produits solides en vrac pressurisés

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 104, *Freight containers*, Subcommittee SC 2, *Specific purpose containers*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

This fifth edition cancels and replaces the fourth edition (ISO 1496-3:1995) which has been technically revised. It also incorporates the Amendment ISO 1496-3:1995/Amd 1:2006. The main changes compared to the previous edition are as follows:

— the container type codes have been revised in accordance to ISO 6346;

— the ratings and stacking forces have been revised in accordance to ISO 668;

— the load transfer areas of base structure have been referenced to ISO 668;

— the stacking test no. 1 ratings have been revised in accordance with ISO 668;

— the insulation thermal test has been referenced to ISO 1496-2.

A list of all parts in the ISO 1496 series can be found on the ISO website.

Series 1 freight containers — Specification and testing —

Part 3: Tank containers for liquids, gases and pressurized dry bulk

1 Scope

This document specifies the basic specifications and testing requirements for ISO series 1 tank containers suitable for the carriage of gases, liquids and solid substances (dry bulk) which can be loaded or unloaded as liquids by gravity or pressure discharge, for international exchange and for conveyance by road, rail and sea, including interchange between these forms of transport.

Except where otherwise stated, the requirements of this document are minimum requirements.

The container types covered by this document are given in Table 1.

Table 1 — Container types (in accordance with ISO 6346:1995/Amd 3:2012, Table E1)

Code	Type designation	Type group code
K	Pressurized tank containers (liquids and gases)	KL
N	Pressurized and non-pressurized tank containers (dry)	NH NN NP

The marking requirements for these containers are given in ISO 6346.

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.

ISO 668, *Series 1 freight containers — Classification, dimensions and ratings*

ISO 830, *Freight containers — Vocabulary*

ISO 1161, *Series 1 freight containers — Corner fittings — Specification*

ISO 6346, *Freight containers — Coding, identification and marking*

ISO 6487, *Road vehicles — Measurement techniques in impact tests — Instrumentation*

EN 13374, *Temporary edge protection systems — Product specification — Test methods*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 830 apply.

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Dimensions and ratings

4.1 External dimensions

The overall external dimensions and tolerances of tank containers covered by this document shall be those established in ISO 668. If tank containers are of reduced height, they shall be designated 1AX, 1BX, 1CX and 1DX. No part of the tank container, its associated fittings and/or equipment shall project beyond these specified overall external dimensions.

4.2 Ratings

The values of the rating, *R*, being the gross mass of the container, shall be those specified in ISO 668.

5 Design requirements

5.1 General

5.1.1 All tank containers shall be capable of fulfilling the following requirements for the framework, the design and construction of the tank and any optional provisions.

5.1.2 The ability of the tank container to withstand the specified design loadings shall be established by calculation or test.

5.1.3 The strength requirements for tank containers are given in diagrammatic form in ISO 668 (these requirements are applicable to all tank containers as complete units except where otherwise stated).

5.1.4 The strength requirements for corner fittings (see also 5.2) are specified in ISO 1161.

5.1.5 The tank container shall be capable of withstanding the test loads and loadings specified in this document.

5.1.6 Each tank container shall be designed to withstand the effects of inertia of the tank contents resulting from transport motions. For design purposes, these effects may be taken to be equivalent to loadings of 2*Rg* longitudinally, *Rg* laterally and 2*Rg* vertically (see Note in 6.1.1). These loadings may be considered individually to be evenly distributed and to act through the geometric centre of the tank. Vertical loadings are total loadings including dynamic effects. It should be noted that the above loadings do not give rise to an increase in pressure in the vapour space. For design purposes, an equivalent pressure loading may be used.

5.1.7 Each tank container shall be capable of withstanding the requirements of 5.1.5 and the static head produced in the tank container while loaded to its rating, *R*. Due regard shall be given to the liquid/dry bulk of highest density that is to be carried and to any compartmentation of the tank.

5.1.8 As the effects of loads encountered under any dynamic operating condition should only approach, but not exceed, the effects of the corresponding test loads, it is implicit that the capabilities of tank containers indicated in ISO 668 and demonstrated by the tests described in this document shall not be exceeded in any mode of operation.

5.1.9 Any closure in a tank container, which if unsecured could lead to a dangerous situation, shall be provided with an adequate securing system having, so far as can be practicable, external indication of the positive securement of that closure in the appropriate operating position.

5.1.10 Fork-lift pockets shall not be provided in tank containers except, if required to container designation 1D, 1DX.

NOTE Fork-lift transport of tank containers is considered dangerous because of stability problems with loaded or partly-loaded tanks and the danger of impact damage from the forks of fork-lift trucks.

5.1.11 The tank container and its service equipment materials shall be suitable for, or adequately protected from, the cargo and the environment in which the tank container can be operated. Due regard should be given to the problems of variation in ambient temperature, corrosive atmospheres, the possibility of uncontrolled cargo release in fire, etc.

5.1.12 The design of tank containers designated 1AAA and 1BBB shall take into special account the problems of the dynamic instability of these containers, compared with 1AA and 1BB tank containers, when operating in the road/rail environment in a partially laden condition.

5.2 Corner fittings

5.2.1 General

All tank containers shall be equipped with top and bottom corner fittings. The requirements and positioning of the corner fittings are given in ISO 1161 and ISO 668. The upper faces of the top corner fittings shall protrude above the top of all other components of the tank container by a minimum of 6 mm (see 5.3.5).

5.2.2 Doubler plates

Whenever reinforced zones or doubler plates are provided to afford protection in the vicinity of the top corner fittings, such plates and their securements shall not protrude above the upper faces of the top corner fittings. These plates shall not extend more than 750 mm from either end of the container but may extend the full width.

5.3 Base structure

5.3.1 All tank containers shall be capable of being supported by their bottom corner fittings only.

5.3.2 All tank containers, other than 1CC, 1C, 1CX, 1D and 1DX, shall be capable of being supported only by load-transfer areas in their base structure. 1CC, 1C and 1CX tank containers can have intermediate load-transfer areas as an optional feature. If so, these tank containers shall meet the requirements in 5.3.3, 5.3.4 and ISO 668.

5.3.3 Consequently, these tank containers shall have end transverse members and sufficient intermediate load-transfer areas (or a flat underside) of sufficient strength to permit vertical load transfer to or from the longitudinal members of a carrying vehicle, which are assumed to lie within the two 350 mm wide zones defined by ISO 668.

Special consideration shall be given in the base structure design to the risk of failure from fatigue.

5.3.4 The lower faces of the load-transfer areas in the container base structure, including those of the end transverse members, shall lie in one plane located $12{,}5^{+5}_{-1{,}5}$ mm above the plane of the lower faces of the bottom corner fittings of the tank container (base plane). Apart from the bottom corner fittings and bottom side rails, no part of the container shall project below this plane. However, doubler plates may be provided in the vicinity of the bottom corner fitting to afford protection to the under-structure. Such plates shall not extend more than 550 mm from the outer end and not more than 470 mm from the side faces of the bottom corner fittings, and their lower faces shall be at least 5 mm above the lower faces of the base plane of the container.

5.3.5 The transfer of load between the underside of any bottom side rails which may be fitted and carrying vehicles is not envisaged.

5.3.6 Load-transfer area requirements are given in Annex B.

5.3.7 For 1D and 1DX tank containers, the level of the underside of the base structure is not specified, except insofar as it is implied in 5.3.4 and 5.3.5.

5.3.8 When the tank container is loaded to its rating, *R*, no part of the tank or its associated shell fittings shall project downwards below a plane situated 25 mm above the base plane (bottom faces of the bottom corner fittings).

5.3.9 For tank containers under dynamic conditions, or the static equivalent thereof, with the tank container loaded in such a way that the combined mass of the tank container and test load is equal to 1,8*R*, no part of the base of the tank container shall deflect more than 6 mm below the base plane (bottom faces of the bottom corner fittings).

5.4 End structure

For tank containers other than 1D and 1DX, the sideways deflection of the top of the tank container with respect to the bottom of the tank container at the time it is under full transverse rigidity test conditions (see 6.8) shall not cause the sum of the changes in length of the two diagonals to exceed 60 mm.

5.5 Side structure

For tank containers other than 1D and 1DX, the longitudinal deflection of the top of the tank container with respect to the bottom of the tank container at the time it is under full longitudinal rigidity test conditions (see 6.9) shall not exceed 25 mm.

5.6 Tank

5.6.1 Design and construction

5.6.1.1 Each tank or compartment thereof shall be designed and constructed to good technical practice.

5.6.1.2 Each tank or tanks shall be firmly secured to structural elements of the tank framework. The tank or tanks shall be capable of being filled and emptied without removal from the framework.

5.6.1.3 Tanks or tank compartments without vacuum relief devices shall be designed to withstand an external pressure of at least 40 kPa above the internal pressure.

Tanks equipped with vacuum relief devices shall be designed to withstand an external overpressure of 21 kPa or greater.

5.6.2 Corrosion allowance

In addition to the requirements of 5.1.10, an allowance for corrosion shall be taken into consideration where necessary.

5.6.3 Tank openings

5.6.3.1 All tank openings except those fitted with pressure relief devices shall be provided with adequate closures to prevent accidental escape of the contents.

5.6.3.2 Tank nozzles and outlet fittings shall be substantially made and attached to the tank in such a way as to minimize the risk of breakage. Protective covers or housings shall be used wherever necessary to comply with this requirement.

Wherever possible, hinged device should be fitted so that they open away from the likely vicinity of any personnel.

5.6.3.3 Any tank opening located below the normal level of the contents and fitted with a valve capable of being operated manually shall be provided with an additional means of closure on the outlet side of the valve. Such additional means of closure can be a contents-tight cap, bolted blank flange, or other suitable protection against accidental escape of the contents. All valves, whether fitted internally or externally, shall be located as close to the tank shell as practicable.

5.6.3.4 Stop valves with screwed spindles shall be closed by clockwise motion of the handwheel.

5.6.3.5 All tank connections, such as nozzles, outlet fittings and stop valves, shall be clearly marked to indicate their appropriate functions.

5.6.4 Pressure and vacuum relief devices

5.6.4.1 Each tank or compartment thereof intended to carry non-dangerous cargo shall be fitted with a pressure relief device set to be fully open at a pressure not greater than the tank's test pressure, to prevent excessive internal overpressure. Such devices shall be connected to the vapour space of the tank and located as near to the top of the tank and as near to the tank's (or tank compartment's) mid-length as practicable.

In cases where the tank container is used with both dangerous and non-dangerous cargo, the relief devices shall be set in accordance with 5.6.4.3.

5.6.4.2 Pressure relief devices, installed as required in 5.6.4.1, should have a minimum relief, capacity of 0,05 m^3/s of standard air (an absolute pressure of 100 kPa at 15 °C).

This may be considered as providing overpressure protection under non-emergency conditions, but should not be considered as adequate protection for a tank container, or compartment thereof, against excessive overpressure under full fire exposure conditions, dry bulk dust explosion or higher dry bulk pressurization.

5.6.4.3 Tanks, or a compartment thereof, intended for the carriage of dangerous goods shall be provided with appropriate pressure relief.

5.6.4.4 Each pressure relief device shall be plainly and permanently marked with the pressure at which it is set to operate.

5.6.4.5 A tank container, or a compartment thereof, with an external design pressure of less than 40 kPa shall be equipped with a vacuum relief device set to relieve at an absolute pressure of 79 kPa, except that a lower absolute setting may be used, provided that the external design pressure is not exceeded. The vacuum relief device shall have a minimum through area of 284 mm^2. The use of combination pressure/vacuum relief devices is allowed.

NOTE The above requirements are intended to protect against collapse of the tank or compartment thereof, during conditions of normal ambient temperature variations. They do not necessarily prevent collapse if a tank, or a compartment thereof, is, for example, closed tightly immediately after steam cleaning or discharged without adequate venting.

5.6.5 Inspection and maintenance openings

Tank containers shall be provided with openings to allow for complete internal inspection. The openings shall be fitted with pressure tight closures.

The size of openings shall be a minimum of 500 mm in diameter and shall be determined by the need for personnel and machines to enter the tank to inspect, maintain or repair the inside.

5.6.6 Gauging devices

Gauging devices which can be in direct communication with the contents of the tank shall be made of a material that is compatible with the tank and its contents.

5.6.7 Sealing (customs requirements)

Adequate provision shall be made for the sealing of the tank.

5.7 Optional features

5.7.1 Gooseneck tunnels

Gooseneck tunnels shall be provided as mandatory features in 1AAA tank containers and may be provided as optional features in 1AA, 1A and 1AX tank containers. The dimensional requirements are specified in ISO 668; all other parts of the base structure shall be as specified in 5.3.

5.7.2 Walkways

Where provided, walkways shall be designed to withstand a loading of not less than 3 kN uniformly distributed over an area of 600 mm × 300 mm. Longitudinal walkways shall have a minimum width of 460 mm.

Walkway guard rails are not recommended as an alternative to installed on-site working at height fall protection systems. If a guard rail is fitted to the tank container walkway, the guard rail, when not in use, shall be designed to be stored and adequately secured for transport, within the tank ISO dimensions and tested to applicable provisions of EN 13374 temporary edge protection systems.

5.7.3 Ladders

Where provided, ladders shall be designed to withstand a load of 200 kg on any rung. The ladder shall be constructed with two stiles and a minimum width of 300 mm. Rungs shall be uniformly spaced between 280 mm to 300 mm apart and the top surface shall be designed to be non-slip. A hand-hold shall be fitted adjacent to the top of the ladder to allow for easier transition from ladder to walkway and vice-versa.

5.7.4 Tank insulation

When thermal insulation is provided, the design and construction shall be such that the insulation does in no way impinge on the specified requirements nor interfere with the proper function of the tank fittings. Insulation, adhesives and fittings in contact with the tank shall be of compatible materials and designed not to cause any detrimental condition to the tank such as stress corrosion, corrosion pitting or electrolytic action.

Where required, a heat leakage test should be carried out to establish the heat leakage for the thermal tank container. The test should be in accordance with ISO 1496-2:2018, 8.3.

Due regard shall be given to the requirements of 5.1.11.

