International Standard ISO 5708

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Refrigerated bulk milk tanks

Refroidisseurs de lait en vrac

First edition — 1983-03-15

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Descriptors : tanks (containers), storage tanks, refrigerating, milk, specification, definitions, construction, inspection, performance evaluation, performance tests.

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up 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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 5708 was developed by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, and was circulated to the member bodies in March 1981.

It has been approved by the member bodies of the following countries :

Austria	Ireland	South Africa, Rep. of
Belgium	Italy	Spain
Denmark	Korea, Rep. of	Sweden
Egypt, Arab Rep. of	Netherlands	United Kingdom
Finland	New Zealand	USSR
India	Portugal	
Iran	Romania	

The member bodies of the following countries expressed disapproval of the document on technical grounds :

Australia
Czechoslovakia
France
Germany, F. R.

Printed in Switzerland

Contents

Refrigerated bulk milk tanks

Section one : General

1 Scope

This International Standard specifies certain requirements for design, construction and performance of refrigerated bulk milk tanks and the related methods of test.

NOTE — Electrical safety regulations are not dealt with this International Standard.

2 Field of application

This International Standard applies to refrigerated bulk milk tanks with automatic control intended for fixed or mobile installation in farms or at milk collecting points. It only applies to tanks for two milkings (24 h) and four milkings (48 h).

3 References

ISO/R 468, *Surface roughness.*

ISO 683/13, *Heat-treated steels, alloy steels and freecutting steels — Part 13 : Wrought stainless steels.*

ISO/R 1662, *Refrigerating plants — Safety requirements.*

ISO 1992/2, *Commercial refrigerated cabinets — Methods of test — Part 2 : General test conditions.*

Code of principles concerning milk and milk products, International Standards and standard methods of sampling and analysis for milk products; Seventh edition 1973, Joint FAO/WHO Food Standards Programme, Codex Alimentarius Commission.

International Standard for drinking-water, Third edition 1971, World Health Organization, Geneva.

4 Definitions

For the purpose of this International Standard, the following definitions apply :

4.1 refrigerated bulk milk tank : Equipment for bulk refrigeration and bulk storage of refrigerated fresh raw milk.

4.2 automatic control : Arrangement by which the equipment functions, under normal operating conditions, without requiring action by the operator.

4.3 atmospheric tank : Tank of which the inner vessel is designed to operate at atmospheric pressure.

4.4 vacuum tank : Tank of which the inner vessel is designed to operate at a pressure below atmospheric pressure.

4.5 agitator : Device to mix the milk to promote heat transfer and to ensure uniform distribution of butterfat.

4.6 reference position : The position specified by the manufacturer for correct installation and operation of the tank.

4.7 maximum volume : Volume to which the inner vessel in its reference position and without agitation can be filled without overflowing.

4.8 rated volume : Volume of the maximum permissible filling of the tank stated by the manufacturer.

4.9 direct cooling system : Cooling system in which the evaporator of the refrigerating system is in direct thermal contact with the milk or the inner vessel.

4.10 indirect cooling system : Cooling system in which the heat is transferred from the milk to the refrigerant through a cooling medium.

4.11 ice bank tank : Tank with an indirect cooling system in which the cooling medium is water and ice is built on the evaporator.

4.12 milking : Quantity of milk which at one milking operation is added to the tank.

4.13 tank for two milkings : Tank intended to be emptied for milk collection each day and designed for cooling and storing its rated volume every 24 h.

4.14 tank for four milkings : Tank intended to be emptied for milk collection every two days and designed for cooling and storing its rated volume every 48 h.

4.15 normal operating conditions : State during which the tank is in use for the cooling and storage of milk in accordance with its design requirements and all accessories are functioning effectively.

4.16 ambient atmosphere : Atmosphere surrounding the tank and in front of the air-cooled condenser of the refrigerating plant.

4.17 ambient temperature : Mean temperature of the ambient atmosphere. [See 15.1.]

4.18 performance temperature (PT) : Ambient temperature to be used when measuring the milk cooling time.

4.19 safe operating temperature (SOT) : Higher limit of the range of ambient temperatures at which the equipment is required to function effectively.

4.20 initial temperature : Mean temperature of the milk to be cooled at the time of its entry into the tank.

4.21 storage temperature : Mean temperature to which the milk to be cooled is reduced for storage.

4.22 cooling time : Time required to cool a milking from the initial temperature to the storage temperature, including the period of entry into the tank.

4.23 cooling cycle : Period between two successive milk collections. For tanks for two milkings the cooling cycle is 24 h. For tanks for four milkings the cooling cycle is 48 h.

4.24 specific energy consumption : Energy consumption in watt hours per litre cooled milk, measured as the mean consumption of all components (excluding cleaning) during a cooling cycle under the test conditions appropriate to the performance class.

For the purpose of the methods of test, the following additional definitions also apply :

4.25 milk : Normal bovine mammary secretion obtained from one or more milkings without either addition thereto or extraction therefrom, untreated and not standardized, complying with *Code of principles concerning milk and milk products, international standards and standard methods of sampling and analysis for milk products*, of the Joint FAO/WHO Food Standards Programme.

4.26 water : Water, suitable for human consumption, meeting the requirements specified in *International standards for drinking-water* of the World Health Organization.

4.27 "milk" : Water used for test purpose in place of milk (the cooling time for water is nearly the same as that for milk).

4.28 "milking" : Volume of "milk" measured at a temperature of 4 °C which is fed into the tank in place of a milking.

4.29 filling : Volume of the milk (or "milk") in the tank measured at a temperature of 4 °C.

4.30 temperature of the milk (or "milk") : Mean temperature of the milk (or "milk") at a particular moment. [See 15.5.]

4.31 hot point of the milk (or "milk") : Maximum temperature of the milk (or "milk") at a given point during storage.

Section two : Requirements

5 Materials

The inner vessel and all attachments which are in, or may come into, contact with milk shall be manufactured from austenitic stainless steel or from a material approved by an appropriate official authority.

The grade of steel shall be of a quality at least equivalent to that of steel 11 in Part 13 of ISO 683, especially in regard to suitability for welding and resistance to corrosion. All joints shall be welded and ground and shall have a strength and corrosion resistance not less than that of the parent metal.

Stainless steel surfaces shall have a surface roughness $R_a \leq 1{,}0$ µm, where R_a is as defined in ISO/R 468.

Materials used for seals shall be fat-resistant, non-toxic, resistant to cleaning and disinfecting agents in normal conditions of dosage and temperature and shall not impart a taint to milk.

6 Construction

6.1 General

The tank and associated equipment shall be designed to provide sufficient mechanical strength to allow its transportation and handling and to give satisfactory and safe operation under normal conditions. It shall be so constructed as to prevent any contamination of the milk and any corrosion of the materials of construction and to enable cleaning, disinfection and inspection to be carried out without difficulty.

6.2 Inner vessel

The inner vessel shall be so designed that the rated volume is 90 to 95 % of the maximum volume (see clause 4).

All inside corners of the inner vessel which form an angle of less than 2,36 radians (135°) shall have radii not less than 25 mm (see figure 1). All other corners in the inner vessel shall have radii not less than 3 mm.

Every component which is permanently attached within the inner vessel shall be welded to it. The welds shall have radii not less than 6 mm and the angles shall be not less than 1,57 radians (90°). Any component not satisfying these requirements shall be capable of being removed.

If the tank is fitted with automatic or semi-automatic cleaning equipment, care shall be taken to ensure that all internal surfaces of the inner vessel will be cleaned effectively when the equipment is used in accordance with the manufacturer's instructions.

If the tank is equipped with a device for measuring the volume of milk by reference to linear measurements in accordance with the regulations of the relevant authorities, the inner vessel shall be so constructed and supported that it is rigid and free from deformation under normal conditions of transport and use.

6.3 Outer casing

The outer casing shall be rigid, shall prevent the ingress of water and shall be free draining.

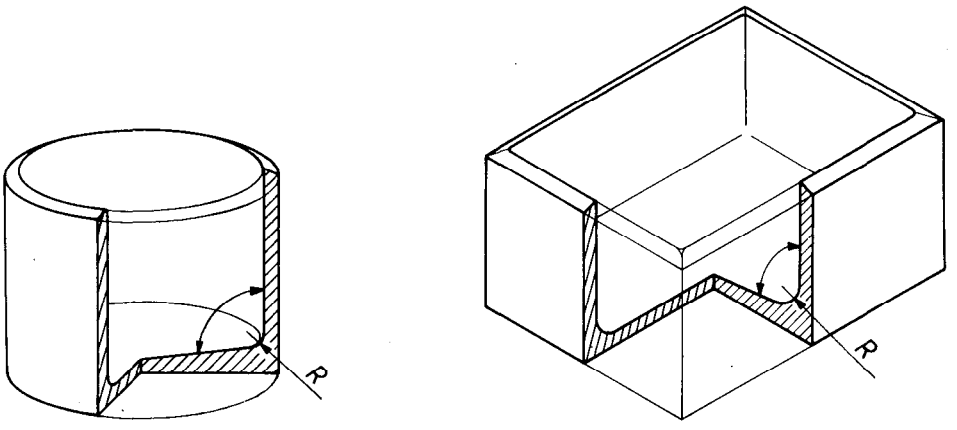

Figure 1 — Examples of inside corners less than 2,36 radians (135°) with radii R

6.4 Thermal insulation

The insulating medium shall be non-settling and shall not be liable to displacement during transportation or service.

Adequate provision shall be taken to ensure that the thermal insulation will comply permanently with the requirements of 11.4.

6.5 Supports

A tank which is not designed for mounting on a solid plinth shall be fitted with adjustable supports or feet to permit it to be placed in its reference position when installed on a floor with a gradient not greater than 1 in 50 in any direction so long as the fall of the floor between the supports is not greater than 50 mm.

If the tank is equipped with a device for measuring the volume of milk by reference to linear measurements in accordance with regulations of the relevant authorities, the supports or feet shall be so constructed that they can be sealed after the tank has been levelled.

The distance between the tank and the floor shall be such that the base of the tank (with the exception of the supports or feet and the outlet pipe) when installed on a horizontal floor shall be situated above two imaginary planes having a gradient of 1 in 10 to the horizontal, the line of intersection being horizontal and 100 mm above the floor (see figure 2). For the distance between the outlet and the floor, see 6.9.

If the tank is designed to be mounted on a solid plinth, the above requirements do not apply but precautions shall be taken to ensure that water cannot enter between the tank and the plinth.

These requirements do not apply to tanks intended for mobile installation.

6.6 Covers

A tank shall be provided with one or more close-fitting self-draining covers which overlap the opening(s) in the inner vessel and have downturned edges. Covers shall allow easy inspection and sampling of the milk.

The tank shall be so constructed that it can be filled without requiring removal of the above cover(s).

Any bridge or bracket required to be supported from the inner vessel shall be welded to it, shall be provided with upturned edges not less than 10 mm high and shall be sloped to drain clear of the inner vessel. Every component which is permanently attached to the bridge shall be welded to it.

All apertures in covers and/or bridges shall be provided with an upturned edge not less than 5 mm high for apertures up to 70 mm diameter or not less than 10 mm high for apertures over 70 mm diameter. For every aperture an overlapping cover or deflector shall be provided.

The covers for tanks designed to be cleaned manually shall be so constructed that they can be opened sufficiently to enable all parts to be cleaned easily by hand. Safe support shall be provided for hinged covers in the open position. Where appropriate, provision shall be made to ensure the safety of the operator during cleaning.

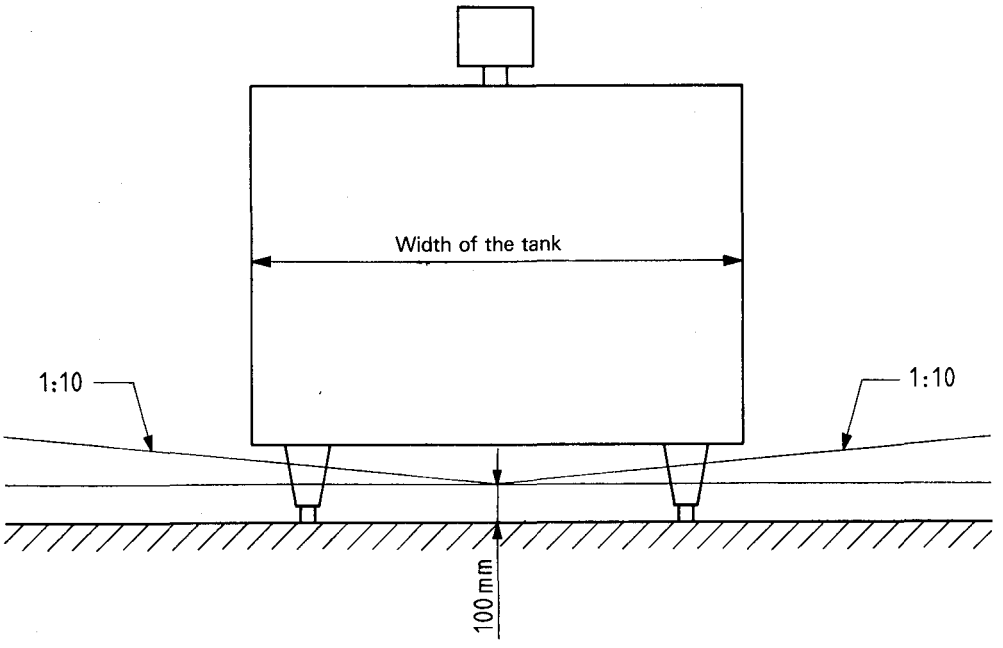

Figure 2 — Clearance between tank and floor

The covers for tanks designed to be cleaned by non-manual methods shall permit inspection of all parts which may come into contact with milk. These tanks shall have not less than one opening with dimensions at least equivalent to an ellipse 400 mm × 300 mm.

Small tanks where the greatest inside dimension of the inner vessel (including the diagonal) does not exceed 700 mm shall have not less than one opening with a diameter not less than 180 mm.

6.7 Agitator

The agitation device shall be so constructed that protection is provided against any contamination of the milk which could enter from outside.

The agitator shall be so guarded that operators cannot come in contact with moving parts. This protection may be provided as follows :

a) For agitators attached to the cover of refrigerated tanks and/or for immersion coolers with a circumferential force greater than 50 N and/or a circumferential speed greater than 1,8 m/s at the end of the blades, special equipment shall be provided to disconnect the agitator automatically when lifting the cover of the refrigerated tank. For equipment where the agitator is not disconnected automatically when the cover is raised, the cover shall be clearly and visibly marked to indicate that the agitator must be stopped before the cover is opened. This notice must be written in the language of the country in which the tank is installed.

b) No projecting parts shall be present on the agitator shaft with the exception of the agitator blades and accessories for the cleaning system. These parts shall be free from sharp edges.

The agitator shall be so designed that it can be cleaned effectively. If the tank is fitted with automatic or semi-automatic cleaning equipment care shall be taken to ensure that the agitator will be cleaned effectively when the equipment is used in accordance with the manufacturer's instructions.

The lowest point at which milk could enter a coupling on an agitator shall be at least 30 mm above the level of milk which corresponds to maximum volume.

Agitator shaft seals shall be of robust construction and shall be so designed that no condensed water vapour, oil or other substances liable to cause contamination can enter the inner vessel.

For performance requirements see 11.6.

6.8 Milk inlet

The tank shall be provided with not less than one inlet pipe or with not less than one inlet aperture or with both.

Where an inlet pipe is part of the tank it shall be so designed that the formation of froth is prevented as far as practicable.

Where an inlet aperture for pouring is provided it shall have a diameter of not less than 180 mm.

6.9 Outlet

The tank shall be provided with an outlet for wash water. The outlet orifice and the bottom of the inner vessel shall be designed so that all the wash water drains to the outlet.

When the outlet is designed to be used also as a milk outlet, the following requirements shall apply :

a) The highest point of the inside of the outer end of the outlet pipe (see figure 3), including outlet valve, shall be lower than the lowest part of the bottom of the inner vessel.

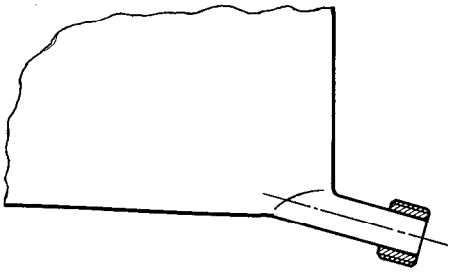

Figure 3 — Outlet position (broken lines horizontal)

b) The outlet pipe shall be constructed from stainless steel and shall have an inner diameter of 50 ± 3 mm. The outlet pipe shall have not more than one bend and one joint. The outlet valve or, if there is no valve, the outlet pipe, shall terminate with a male fitting which shall be provided with a cap. The total length of the outlet shall be as short as practicable.

c) The ground clearance under the outlet fitting shall not be less than 100 mm.

d) When a plug and rod device is used, it shall be so designed that the plug seals without the rod having to be clamped in position. The plug and rod device shall remain clear of the milk agitator in the open position and shall not interfere with the draining of the milk.

e) With the tank in its reference position and containing 40 l of milk, at least 39,8 l shall run out in 1 min by gravity.

f) In order to avoid excessive quantities of air being drawn in when a tank is designed for rapid transfer from the outlet it shall satisfy the dynamic drainage test in 16.9.2. This test will not be required if the tank complies with the following :

— with the tank in its reference position all parts shall drain to the outlet with a slope of not less than 1 in 20 for rectangular tanks or 1 in 15 across the diameter through the outlet for vertical cylindrical tanks;

— the tank shall have a circular or elliptical outlet well not less than 25 mm deep and of diameter not less than 100 mm nor more than 200 mm (see figure 4).

Dimensions in millimetres

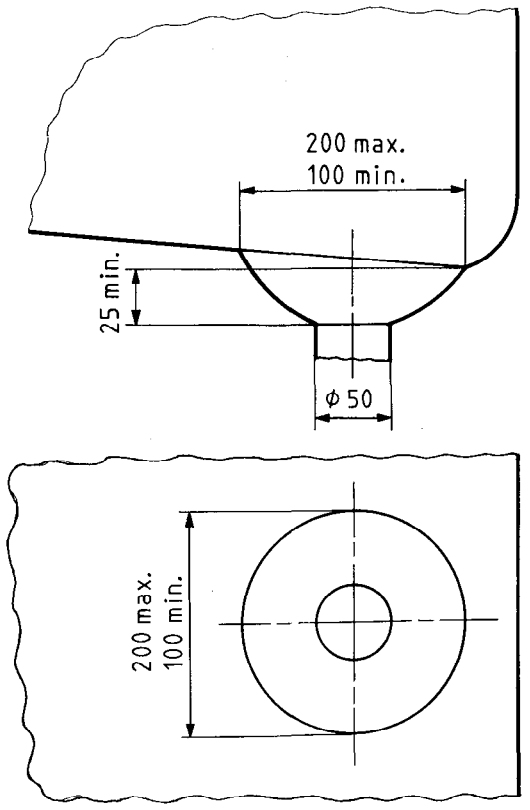

Figure 4 — Dimensional criteria for outlet well

6.10 Vacuum tank

A vacuum tank shall meet the performance requirements when subjected to an internal working vacuum up to 80 kPa (0,8 bar) i.e. an absolute pressure of approximately 20 kPa (0,2 bar).

The sealing of a vacuum tank shall be such that when the vacuum in the tank is 50 kPa (0,5 bar) and the agitator is either stationary or in operation the volume of air admitted is not greater than 5 l of free air per min.

6.11 Ice bank tank

An ice bank tank shall be designed so that in the event of a failure in the ice bank controller neither the inner vessel nor the outer casing shall suffer any damage.

The container for chilled water shall be of a size to ensure that the ice bank control and circulation system can operate satisfactorily and sufficient ice can be formed to cool 60 % of the rated volume of a tank for two milkings, or 30 % of the rated volume of a tank for four milkings, from 35 to 4 °C without further operation of the refrigerating system.

The equipment shall be designed to ensure that ice re-forms regularly over the whole evaporator surface.

Adequate provision shall be made to permit inspection of the ice bank.

The container for chilled water shall be designed so that the water can be changed without difficulty.

7 Controls

7.1 Milk temperature control

The equipment for the control of the milk temperature shall operate satisfactorily (see 11.4) with any volume of between 10 % and 100 % of the rated volume at milk temperatures from 0 to 35 °C.

It shall also be capable of withstanding, without loss in calibration, temperatures inside the inner vessel − 10 to + 70 °C and ambient temperatures from − 10 °C to the specified safe operating temperature (SOT).

Provision shall be made to ensure that cooling starts as soon as practicable after commencing to add the second and following milkings.

7.2 Control of ice bank

An ice bank tank shall be fitted with an independent control for the condensing unit which will automatically control the amount of ice and will operate satisfactorily in ambient temperatures from − 10 °C to the specified safe operating temperature (SOT), so that for any volume of milk between 10 % and 100 % of the rated volume the ice bank will be adequate to ensure compliance with the requirements of 11.2 and 11.3.

This control shall ensure that excessive ice cannot form in the chilled water container so as to prevent effective functioning of the equipment.

7.3 Switchgear

Not less than one duty selection switch incorporating a marked OFF position shall be provided.

Except where the milk agitator is designed to operate continuously during cooling and storage or where automatic delay is provided (see below), the milk agitator and the condensing unit of a direct cooling system, or the cooling medium circulation of an indirect system, shall normally operate together and shall be controlled automatically by the milk temperature controller. An over-riding manual switch shall also be provided.

With indirect cooling systems, the operation of the condensing unit shall be controlled automatically by the ice bank controller or cooling medium thermostat. An over-riding manual switch shall also be provided.

Except where the tank is intended for direct pick-up without extra agitation before sampling, a time switch shall be provided to operate the milk agitator independently from other components for a period of not less than 2 min.

A milk temperature controller which automatically delays the start of the milk agitator during the first filling until the milk temperature is reduced to a predetermined value may be provided. It shall be designed so that when the agitator starts the control is re-set automatically to comply with the requirements of 11.4.

A periodic time switch may be fitted to operate the milk agitator for pre-set periods at pre-set intervals independently from other components.

Provision shall be made to operate the milk agitator during automatic cleaning.

8 Measuring equipment

8.1 Instrument for measuring milk temperature

Every tank shall be provided with an instrument to measure the temperature of the milk at any volume between 10 % and 100 % of the rated volume.

If detachable instruments are used they shall be suspended above the maximum level of the milk and shall be easily accessible.

Glass thermometers shall not be used unless they are fitted with a suitable protective casing to prevent milk coming into contact with the glass.

The instrument shall comply with the requirements of 6.1 and shall be suitably protected to ensure that neither dust nor liquid can enter it.

The instrument shall be capable of withstanding, without loss in calibration, temperatures inside the inner vessel from − 10 to + 70 °C and ambient temperatures from − 10 °C to the specified safe operating temperature (SOT).

The instrument shall not penetrate the inner vessel.

The instrument shall be fitted with a graduated scale which shall be easily legible and preferably fitted on the side from which the tank is emptied. The temperature scale shall be graduated in degrees Celsius with one division per degree Celsius up to 12 °C and shall be marked from at least 0 to 40 °C. In the range from 2 to 12 °C the scale length shall be not less than 20 mm. On instruments fitted with circular scales, the scale length is read along a circle described by the tip of the pointer or along a circle through the outer ends of the strokes of one division per degree Celsius whichever is the less. In the case of digital indication the height of the figures shall be not less than 6 mm.

In ambient temperatures from 5 °C to the specified performance temperature (PT), the error of the instrument shall not be greater than 1 °C between 2 and 12 °C, when the milk temperature is changing at a rate of not more than 10 °C/h.

8.2 Dipstick

If the tank is equipped with a dipstick for measuring the milk volume it shall comply with the requirements of clause 5 and 6.1.

The dipstick shall be graduated from 10 % or less to not less than 100 % of the rated volume. Each division on the dipstick shall represent a volume not greater than 0,5 % of the rated volume.

9 Refrigerating equipment

The refrigerating equipment shall be adequately protected against corrosion and shall comply with ISO/R 1662, taking into account possible differences in safety requirements of national legislation.

The condensing unit shall be selected so that the refrigerating system satisfies the requirements of 11.2 and it operates satisfactorily in ambient temperatures between 5 °C and the specified performance temperature (PT).

10 Electrical equipment

The electrical equipment shall be capable of ensuring continuous operation of the refrigerating equipment.

11 Performance

11.1 Performance classes

The performance of a tank shall be specified according to the following classification :

11.1.1 Number of milkings

The numeral "2" designating a tank for two milkings.

The numeral "4" designating a tank for four milkings.

11.1.2 Ambient temperature

Classification	Performance temperature (PT) °C	Safe operating temperature (SOT) °C
A	38	43
B	32	38
C	25	32

11.1.3 Milk cooling time

Classification	Cooling time in hours	
	All milkings 35 to 4 °C	Second milking 10 to 4 °C
I	2,5	0,8
II	3,0	1,5
III	3,5	1,75
IV	1)	1)

1) The performance and related conditions are to be given by the manufacturer, for example in the case of pre-cooling.

11.1.4 Fat content of the milk

The fat content of the milk to be used in milk mixing tests (see 21.6.2) is written as a percentage. If no such indication is made, the value is 4,0 %.

NOTE — The performance classes which will be applied nationally or regionally may be determined by the appropriate authority.

11.2 Daily capacity

The refrigerating system when operating in ambient temperatures between 5 °C and the specified performance temperature (PT) shall be of sufficient capacity to cool the rated volume of milk in a tank for two milkings, or 50 % of the rated volume in a tank for four milkings, every 24 h from 35 °C to 4 °C and to extract the heat gained by the tank from all other sources.

11.3 Milk cooling rate

If a tank for two milkings is either empty or contains 50 % of its rated volume of milk at 4 °C, and 50 % of the rated volume of milk at 35 °C is added in one batch, all of the milk shall be cooled to 4 °C in not more than the specified cooling time.

If a tank for four milkings is either empty or contains 25, 50 or 75 % of the rated volume of milk at 4 °C, and 25 % of the rated volume of milk at 35 °C is added in one batch, all of the milk shall be cooled to 4 °C in not more than the specified cooling time.

If a volume of milk corresponding to the second milking is added to the tank, the total volume of milk shall be cooled from 10 °C to 4 °C in not more than the specified cooling time.

The above requirements shall apply at ambient temperatures between 5 °C and the specified performance temperature (PT).

11.4 Storage of milk

Under normal operating conditions the mean temperature of the milk between cooling periods shall not be higher than 4 °C for tanks for four milkings and 5 °C for tanks for two milkings and none of the milk shall exceed 9 °C. This requirement shall apply at ambient temperatures between 5 °C and the specified performance temperature (PT).

The tank shall be provided with thermal insulation the efficiency of which shall be such that at the specified performance temperature (PT) the rate of rise of the mean temperature of the milk, initially at about 4 °C, shall not exceed 1 °C in 4 h when the rated volume is allowed to stand undisturbed.

11.5 Freezing of milk

When the tank is filled to between 10 % and 100 % of its rated volume and is used in ambient temperatures between 5 °C and the specified performance temperature (PT) ice shall not form in the milk under the milk level either during cooling or during storage.

11.6 Agitation of milk

Operating the agitator shall not cause milk to overflow when the tank contains any volume of milk up to 100 % of its rated volume.

Where a tank is intended for direct pick-up i.e. extra agitation is not required before sampling, the fat shall always be uniformly distributed throughout the milk so that the fat content of samples randomly selected from the tank at any time do not differ by more than 0,1 g of fat per 100 g of milk.

Where a tank is not intended for direct pick-up, the agitator shall be capable of producing a uniform distribution (see preceding paragraph) of fat in the milk in not more than 2 min. This requirement shall apply when the tank contains any volume of milk between 10 % and 100 % of its rated volume after cooling to 4 °C and allowed to stand for 6 h. In the case of a periodical agitation system the standing time shall be reduced to the time elapsing between two successive periods of agitation. In the case of a continuous agitation system no standing time is required.

These performance requirements shall be achieved without deterioration of the milk such as, for instance, those which could occur as a result of the formation of froth or butter.

12 Identification plate

In addition to serial plates provided on the individual components, the tank shall bear a clearly visible plate, firmly fixed to it, which shall state in indelible lettering at least the following :

a) The manufacturer's name or trade mark.

b) Type and serial number.

c) Rated volume expressed in cubic metres or in litres.

d) Relevant performance class(es) as specified in 11.1, i.e. with at least three successive symbols : first, the number of milkings; second, the classification of ambient temperature and third, the classification of cooling time. If applicable, the fat content to be used in milk mixing tests shall be added between brackets. For example 2 AI, 2 AI (4,5 %), 4 BII, 4 CIV, 4 CIV (7,0%).

e) Refrigerant identification if the evaporator forms part of the tank.

13 Instructions for installation and periodical service

A tank shall be provided with instructions for installation and periodical service which shall include the following information :

a) The number of this International Standard i.e. ISO 5708.

b) Supply voltage, frequency and if single or three phase.

c) Rated electrical power, in kilowatts.

d) Energy consumption in watt hours per litre of milk cooled under normal operating conditions and

— for air-cooled condensing units at the specified performance temperature (PT);

— for water-cooled condensing units at a condensing temperature of 40 °C.

e) Cooling capacity of the condensing unit at an evaporating temperature[1] specified by the tank manufacturer :

— for air-cooled condensing units at the specified performance temperature (PT);

— for water-cooled condensing units at a condensing temperature of 40 °C.

14 Instructions for use

A tank shall be supplied with simple and clear instructions for safe operation and effective cleaning in the language of the country in which the tank is to be used. These instructions shall include the following :

a) If applicable (see 6.7), a warning that it is essential to stop the agitator before the cover is opened.

b) Maximum permissible cleaning temperature.

c) Complete explanation of the meaning of the specified performance class(es). (See 11.1 and 12).

1) The evaporating temperature is the integral mean temperature of the saturated vapour at the end of the evaporator; for direct cooling systems this means the integral mean temperature during cooling of the milking with the lowest integral mean evaporating temperature; for indirect cooling systems (ice bank tanks) this means the integral mean temperature during the formation of the ice bank.

Section three : Methods of test

15 Fundamentals

15.1 Ambient temperature

Measure the ambient temperature with a precision of ± 0,5 °C using equipment complying with ISO 1992/2. Protect temperature sensors from radiation by insertion in metal shields with highly reflective surfaces, each having a thermal mass equivalent to 25 g of copper, for example a copper cylinder having a mass of 25 g and minimum external area.

15.1.1 Mean of the temperatures

The temperature at each point measured shall remain constant within ± 2 °C throughout the period of the test. The mean of the temperatures measured shall remain equal to specified ambient temperature within ± 1 °C throughout the test.

The mean temperature shall include all temperatures measured at points round the tank and in front of the condenser(s).

15.1.2 Location of measuring points

Halfway up the outer casing, at a distance of 100 ± 10 mm from the tank walls evenly spaced out over the tank periphery.

At a distance of 100 ± 10 mm in front of the air cooled condenser and evenly spaced out over its intake surface area.

15.1.3 Number of measuring points

When the greatest external dimension of the tank is less than or equal to :

a) at least one measuring point for each side wall; or,

b) at least four measuring points equally distributed around cylindrical tanks.

When the greatest external dimension of the tank is between 2 m and 3 m :

a) at least one measuring point for each of the smaller walls; or,

b) at least two measuring points about a metre apart for each of the larger walls.

When the greatest external dimension of the tank is greater than 3 m :

a) at least one measuring point for each of the smaller walls; and,

b) at least three measuring points about a metre apart from one another for each of the larger walls.

15.1.4 Vertical temperature gradient

2 °C/m. max.

15.2 Air movement

The tank and condensing unit shall be sited within the test area so that the velocity of air through the condensing unit shall not be influenced by external factors.

The velocity of air touching the outer wall of the tank, the condensing unit being inoperative, shall not exceed 0,5 m/s.

15.3 Electricity supply

The supply voltage shall be within ± 5 % of that stated in the instructions for use or on the identification plate of the tank.

The frequency shall be the nominal frequency within ± 1 %.

15.4 Precision of measurement of volume

Measure the volume of each "milking" with a precision of ± 0,5 %.

15.5 Temperature of the milk (or "milk")

15.5.1 During cooling and mixing after storage measure the milk temperature at one or more points situated at least 20 mm from the walls, bottom and surface level and not less than 100 mm from the cooling surface.

15.5.2 During storage and before mixing measure the temperature at a point within 5 mm of the surface and also within 40 mm of the outlet and at other points deemed necessary by the testing station.

15.6 Frequency of measurement

If a continuous recorder is not used make the following measurements :

15.6.1 During cooling of a "milking" :

— Frequency : at least once every 10 min with a minimum of eight observations during the cooling of one "milking".

— Quantities to be measured : ambient temperature (see 15.1), "milk" temperature and reading of the kilowatt hour meter.

15.6.2 In the interval between cooling of successive "milkings" :

— Frequency : not less than once every 30 min.

— Quantities to be measured : ambient temperature (see 15.1) and "milk" temperature.

16 Materials construction and finish

16.1 General

Check the tank against the requirements for materials, construction and finish specified in section two of this International Standard. The results of the examinations described below may be supplemented by reliable data supplied by the manufacturer or applicant for the test. Special attention shall be given to the recommendations in ISO/R 1662.

The finish and operating characteristics shall be assessed by at least two representatives of the testing station, one of whom shall be the person who has had the major share in operating the tank during the testing. Special attention shall be paid to the tank's suitability for operation, for inspection of the amount of ice, for sampling and for cleaning.

Additional tests may be carried out on mobile tanks to check the suitability of their special features.

The suitability of the construction and support of the inner vessel, relative to measurement of the volume of milk by reference to linear measurements may be assessed by the relevant authority.

16.2 Quality of the welds

Examine the quality of the welds visually or by other suitable means.

16.3 Surface finish

Assess surface finishes by means of a surface roughness measuring device or by using comparison plates.

16.4 Radii

Check the radius of the corners using suitable gauges.

16.5 Cleanability

If a tank is fitted with automatic or semi-automatic cleaning equipment check the effectiveness of cleaning by means of either a field test or a laboratory test or both. Check at least that when the equipment is used in accordance with the manufacturer's instructions all surfaces inside the inner vessel are wetted by the cleaning solution. The testing method shall be described in full detail in the test report. The use of internationally accepted methods for the examination of samples is recommended.

16.6 Dimensions

Check the following dimensions :

a) distance between the tank and the floor (see 6.5);

b) distance between the outlet fitting and the floor (see 6.9);

c) size of the covers (see 6.6);

d) distance between the agitator coupling and the maximum milk level (see 6.7);

e) diameter of milk inlet aperture (see 6.8);

f) diameter of milk outlet (see 6.9);

g) length of the thermometer scale (see 8.1);

h) height of the figures if the thermometer has digital indication (see 8.1).

16.7 Protection by outer casing and covers against ingress of water

First check compliance with the requirements stated in 6.1, 6.6 and 6.7 then carry out the tests described in clause 8.1 of IEC publication 529, using an empty, dry tank with covers closed. It is essential that no water enters the tank.

16.8 Agitator — Measurement of circumferential force

Measure this force at the top of the blade with a precision of ± 5 % using a suitable spring balance.

16.9 Discharge of milk

16.9.1 Static drainage test

Test in triplicate.

Measure indirectly the volume of "milk" which drains in 1 min by determining the balance of "milk" remaining in the tank. Proceed as follows :

16.9.1.1 Ensure that the tank is mounted in its reference position.

16.9.1.2 Wet the interior walls of the tank with 40 ± 0,5 l of "milk" at a temperature of 2 to 20 °C.

16.9.1.3 Allow the outlet to remain open for 5 ± 0,5 min and then close it.

16.9.1.4 Measure 40,0 l of "milk" with a precision of 0,1 l and at a temperature of 2 to 20 °C and add to the tank.

16.9.1.5 Allow the outlet to remain open for 1,0 ± 0,02 min and then close it.

16.9.1.6 Measure with a precision of ± 0,005 l the volume of "milk" which discharges from the tank in 5 ± 0,5 min when the outlet is again opened. This volume should not be greater than 0,2 l [see 6.9 e)].

16.9.2 Dynamic drainage test

Test in duplicate or more if observations differ by more than 50 %.

Determine the suitability of tanks intended for vacuum transfer from the outlet by measuring the rate of milk discharge as follows :

16.9.2.1 Level the tank to its reference position.

16.9.2.2 To establish the 20 litre dynamic starting point, place 20 l of "milk" in the inner vessel and mark a point at the surface. Add a further 5 l of "milk" and make a 25 litre mark. Place approximately 100 l in the inner vessel and then transfer at a flow rate of 8 ± 0,8 l/s. When the level has fallen to the 25 litre mark, stop the flow at the tank outlet.

Measure the volume of "milk" remaining in the inner vessel and estimate a mark which will give a residue of 20 l. Repeat the test until repeatable results are obtained at 20 ± 4 l. This is the 20 litre dynamic starting point.

16.9.2.3 Place a total of 100 l of "milk" in the inner vessel or more if necessary to ensure that the agitator blades are just covered. Run the agitator for not less than 2 min.

16.9.2.4 Transfer the liquid at a flow rate of 8 ± 0,8 l/s using either a positive displacement pump or vacuum.

16.9.2.5 Interrupt the flow from the tank 7 s from the moment the 20 litre dynamic starting point is passed and stop the pump or vacuum.

16.9.2.6 Measure the volume of the liquid discharged from the inner vessel in the following 5 ± 0,5 min when the outlet is again opened. If this volume is less than 0,2 l or 0,05 % of the rated volume the tank is suitable for use with vacuum transfer.

16.10 Vacuum tank

If the speed of rotation of the agitator is affected by the level of the vacuum in the tank carry out the performance tests at the agitator speed corresponding to the lowest agitator speed in the vacuum range 0-80 kPa.

Create a vacuum of 50 ± 0,1 kPa (0,5 ± 0,001 bar) in the empty tank. Start the agitator and after 30 ± 0,5 min measure the vacuum in the tank with a precision of 0,1 kPa (0,001 bar). Repeat the test with the agitator motionless.

16.11 Failure of ice bank controller

To check that the chilled water reservoir in an ice-bank tank (see 6.11) will withstand prolonged freezing of its water content, which might occur if the ice-bank controller fails, proceed as follows :

16.11.1 Establish an ambient temperature of 5 °C and ensure that the inner vessel is empty.

16.11.2 Connect together the contacts of the ice bank controller.

16.11.3 Start the refrigeration unit and allow it to remain in operation for 2 days or until all the chilled water is frozen or until operation of the refrigeration unit is stopped by any ancillary safety device normally in circuit, whichever is the sooner.

17 Controls

17.1 Milk temperature control

Check the correct operation of the thermostat, for example the temperature differential and the consistency of cut-out and cut-in. This may conveniently be done during the cooling and storage tests (see clause 21).

17.2 Control of ice bank

Determine the maximum and minimum quantities of ice corresponding with the ice bank control cut-out and cut-in. The operation of the ice bank control when stopping and starting the condensing unit may conveniently be observed during the cooling and storage tests (see clause 21).

18 Measuring equipment

Check that the instrument for measuring milk temperature (see 8.1) is operating correctly. This may conveniently be carried out during the cooling and storage tests (see clause 21).

19 Refrigerating equipment

19.1 General

Check that the refrigerating equipment complies with ISO/R 1662 and, if appropriate, with any differing safety requirements of national legislation.

19.2 Type of refrigerant

Either accept the manufacturer's assurance that the refrigerant used in the refrigerating system during the tests will be identical with that in each unit to be installed on farms or check the type of refrigerant in the unit(s) by measuring at the same point both the temperature and the absolute pressure simultaneously at not less than one point in the saturated vapour phase of the refrigerating system when vapour and liquid are in equilibrium.

Measure the refrigerant temperature on the outer surface of the pipe with a precision of ± 0,5 °C whilst ensuring that the measuring point is adequately insulated from the ambient atmosphere. Measure the pressure with a precision of ± 10 kPa (0,1 bar) by connecting a manometer to a suitable connection to be provided by the manufacturer.

20 Electrical equipment

Inspect the electrical equipment generally to ensure that no obvious faults are present.

21 Performance tests

21.1 Cooling tests

21.1.1 General

21.1.1.1 Locate the milk tank and the condensing unit in a room in which the ambient temperature (see 15.1) is maintained continuously at the specified performance temperature (PT).

21.1.1.2 Carry out all tests in duplicate.

21.1.1.3 Liquid to be cooled : "milk" (see 4.27).

21.1.1.4 Filling : measure the daily refrigerating capacity and cooling rate using a test which represents the daily operation. The test for tanks for four milkings differs from the test for tanks for two milkings only in the quantities of "milk" which are cooled (25 ± 0,5 % and 50 ± 0,5 % of the rated volume respectively).

21.1.1.5 Filling time : maximum 10 min.

21.1.1.6 Temperature of the "milking" to be added : 35 ± 0,1 °C.

21.1.1.7 As soon as the temperature of the "milk" has been reduced to 4 ± 0,1 °C switch off the refrigerating plant.

21.1.1.8 Before draining the "milk" cool it to a temperature which is the mean of the milk thermostat cut-in and -out temperatures at 100 % filling. It will therefore be necessary to measure these temperatures (see 17.1) during or before the cooling tests.

21.1.1.9 Measure the consumption of electricity using a kWh meter during the first and the duplicate cycles.

21.1.1.10 If the operation of the equipment is not satisfactory, additional measurements may be made in order to locate the source of trouble e.g. refrigerant pressures, chilled water temperature around the inner vessel by measuring inlet and outlet temperatures. The manufacturer shall be responsible for the correction of faults.

NOTE — For periodical measurements see 15.6.

21.1.2 Indirect cooling systems

The test procedure for tanks with indirect cooling systems takes into account any change in residual cooling capacity of the cooling medium. An arbitrary heating load to represent the effect of tank cleaning may be included in this test (see 21.1.2.9). Proceed as follows :

21.1.2.1 Start without an ice bank and with the chilled water reservoir filled to the specified level.

21.1.2.2 Scheme for tests according to table below.

Stage		Tank for two milkings		Tank for four milkings	
		time h	"milking" number	time h	"milking" number
Preparatory procedures	Condensing unit started	−36		−36	
	Add "milking"	−12	0	−12	0
	Drain tank and measure thermal capacity of cooling system (see 21.1.2.5)	− 2	0	− 2	0
First cycle	Add "milking"	0	1	0	1
	Add "milking"	12	2	12	2
	Add "milking"	—	—	24	3
	Add "milking"	—	—	36	4
	Drain tank and measure thermal capacity of cooling system, (see 21.1.2.5)	22	1 and 2	46	1 ... 4
Duplicate cycle	Add "milking and continue as above	24	1	48	1

21.1.2.3 At −36 h (36 h before adding the first "milking" to the tank) switch on condensing unit and leave running on automatic control during all the cooling tests. Record the operating period with a precision of ± 2 %.

21.1.2.4 At −12 h add a "preliminary milking" ("milking" 0) to the tank and cool with automatic control of the milk cooling system. At −2 h drain off this "milking" and stop the milk cooling system.

21.1.2.5 At −2 h and again at 22 h or 46 h determine the thermal capacity of the milk cooling system with a precision of ± 2 %. With an ice bank chilled-water system this may be done by draining off the chilled water and subtracting its volume from the combined volume of water and ice which has been previously determined. Measure with a precision of 0,1 °C the temperatures of the water drained off and the same water pumped back into the system and calculate the cold loss for which a correction to the thermal capacity is necessary.

21.1.2.6 At 0 h add the first "milking" and cool then proceed with further additions as listed in 21.1.2.2.

21.1.2.7 With the exception of "milking" 0 ("preliminary milking") record the times taken to reach temperatures of 10,0 ± 0,1 °C and 4,0 ± 0,1 °C. Switch off the milk cooling system immediately the temperature reaches 4,0 °C.

21.1.2.8 If after cooling to 4,0 °C, the temperature of a "milking" increases, reduce it to 4,0 ± 0,1 °C before adding the next "milking". Make certain that the temperature is never greater than 4,2 °C.

If the "milk" temperature falls below 4 °C, such as may occur for example in tanks where the inner vessel is in contact with the cooling medium, add the next "milking" without raising the temperature to 4 °C.

21.1.2.9 If the condensing unit has been operating for more than an average of 11,0 h per milking simulate a cleaning operation by first draining the tank and then "cleaning" it for 15 min with a volume of water at 45 ± 0,1 °C, which is equal to 3,0 ± 0,5 % of the rated volume. Calculate the extra running time of the condensing unit from the fall in temperature of the "cleaning" water and the stated capacity of the condensing unit.

21.1.2.10 In the duplicate test, cool the "milkings" similarly. If the first "milkings" have been added to the tank at 24 h (tank for two milkings) or 48 h (tank for four milkings) respectively, the preparatory procedures (see 21.1.2.2) need not be repeated.

21.1.2.11 When the tests at the performance temperature (PT) are complete, check the size of the ice-bank as soon as the final temperature has been determined. Measure the quantity of ice remaining by draining the residual chilled water and subtracting it from the quantity added at the beginning of the test (see 21.1.2.1). Compare with the requirements in 6.11.

21.1.2.12 If there are indications that excessive increase or reduction in the size of the ice bank may occur during a longer period of use, carry out an additional test with prolonged running.

21.1.2.13 In tanks with indirect cooling systems without an ice bank the preparatory procedures can be simplified.

21.1.3 Direct cooling systems

21.1.3.1 Before adding the first "milking" to the tank maintain the ambient temperature at the performance temperature (PT) for 24 h immediately prior to and throughout the period of the test.

21.1.3.2 Immediately prior to adding a new "milking" ensure that the temperature of the "milk" already in the tank is 4,0 °C.

21.1.3.3 In order to reduce labour costs by working "normal" hours the usual procedure of cooling successive "milkings" every 12 h may be changed. In such cases instead of directly measuring the total electricity consumption using a kWh meter this total may be derived by adding together the consumptions relating to the following periods :

21.1.3.3.1 Cooling times

Use a kilowatt hour meter to measure the power consumption of the complete installation during the cooling time for each "milking".

21.1.3.3.2 Periods between cooling times

Calculate the total of periods between cooling times by subtracting the total of cooling times from the cooling cycle. Calculate the temperature rise of the "milk" during this (total) period using the mean temperature rise during the thermal insulation test (see 21.3). Calculate the electricity consumption required to compensate 80 % of the above calculated temperature rise when cooling 100 % of the rated volume of "milk" using the cooling curve (see 21.1.1) and especially that part from 4 °C to the mean cut-in and cut-out temperature.

NOTE — The need for this usage of electricity results from the temperature rise following absorption of heat from the surroundings. The figure of 80 % is chosen because during the operating cycle the tank is not filled all the time to 100 % of its rated volume.

21.1.3.3.3 Cooling below 4 °C

Using the cooling curve (see 21.1.1) for the last "milking" only calculate the electricity consumption required to cool the appropriate filling from 4,0 °C to the mean of the thermostat cut-in and cut-out temperatures (see 17.1) when the tank is filled to 100 % of its rated volume. The mean temperature is the usual temperature of milk when delivered.

NOTE — The above applies only to the last "milking" because the energy consumed when cooling a previous "milking" to below 4 °C is compensated by cooling the next "milking".

21.1.3.3.4 Periodic agitation

Calculate the electricity consumed during periodic agitation from the power input of the agitator motor and the time that the motor is running excluding the cooling time.

21.2 Safe operating temperature (SOT)

To check that the equipment continues to function at the safe operating temperature (SOT) cool a first "milking" of 50 ± 0,5 % or 25 ± 0,5 % of rated volume as appropriate from 35 °C to 4 °C using automatic control.

In ice bank tanks allow ice formation to continue during the test.

21.3 Thermal insulation test

21.3.1 Locate the tank, and with indirect cooling systems all parts of the intermediate cooling system, in a room in which the ambient temperature (see 15.1) is maintained at the specified performance temperature (PT) ± 1,0 °C for a period of not less than 12 h before the test begins and throughout the test period.

21.3.2 Fill the inner vessel of the tank to its rated volume and, where applicable the intermediate cooling system to normal working level, with water at 4,0 ± 0,5 °C.

21.3.3 Bring the contents of the inner vessel, and if applicable the intermediate cooling system, to a uniform temperature of 4,0 ± 0,5 °C measured with a precision of ± 0,1 °C. Place all covers in position and leave the equipment undisturbed for 12 ± 0,1 h.

21.3.4 During this 12 h period, measure the hot point of the "milk" (see 4.31) at a position decided by the test station in the light of experience. Make not less than one measurement at a position which is less than 40 mm from the outlet.

21.3.5 At the end of the 12 h test period, bring the water in the tank to a uniform temperature measured with a precision not less than ± 0,1 °C and calculate the mean temperature rise of the water in the tank.

21.4 Storage of milk under normal conditions

If a hot point greater than 9 °C is observed during the thermal insulation test (see 21.3.4) check if it is still present under normal operating conditions at the specified performance temperature (PT).

21.5 Freezing of milk

21.5.1 This test may be omitted if it is known from the construction and/or operation of the tank that ice cannot form in the milk.

21.5.2 The test may be carried out using either water (see 21.5.2.1) or raw milk (see 21.5.2.2). The water test is included because it is both simpler and cheaper but it should be appreciated that if freezing occurs this will need to be checked by repeating the test using milk.

21.5.2.1 In an ambient temperature of 5 °C (see 15.1) fill the tank to 10 ± 2 % of its rated volume with "milk" at 35 ± 1 °C and commence cooling. As soon as cooling is stopped by the operation of the milk temperature control, drain the "milk" from the tank, and at the same time check for the presence of ice by means of a stick or by another method. Note the areas where ice has formed and then melt it off. Repeat the test if no ice forms.

21.5.2.2 If ice forms during test 21.5.2.1, repeat the test using milk in place of "milk". Ice forms less readily in milk than in water.

21.5.2.3 If there are indications that ice may form at a higher ambient temperature and/or with more milk in the tank, repeat the test at this ambient temperature and/or filling. For example, if the equipment is fitted with a control designed to reduce cooling capacity at a certain ambient temperature repeat the test in an ambient temperature slightly above that at which the control is set to operate.

21.6 Agitation of milk

21.6.1 Visual examination of agitation

Observe the effect of agitation and note the minimum filling of the tank required to ensure liquid motion.

21.6.2 Milk mixing tests

21.6.2.1 Milk to be used

For the milk mixing tests use milk complying with the following :

a) A fat content such that the average fat content of the final mixture is as indicated on the identification plate, ± 0,2 % or, if no such indication is given, 4,0 ± 0,2 %.

b) Between 20 % and 30 % of the milk is not older than 5 h at the start of the 6 h storage period (see 21.6.2.2).

If this requirement cannot be satisfied check that a suitable "cream layer" can be formed as follows :

Fill a suitable cylinder with a representative sample of the milk to a height of 300 ± 50 mm and stand undisturbed for 6 h at 4 °C to allow the fat to separate. A suitable milk will have an upper layer fat content not less than three times that of the fat content of the mixed milk and a bottom layer fat content not greater than 65 % of the fat content of the mixed milk (see 21.6.2.3).

Cool the milk to 5 °C in a tank for 2 milkings or to 4 °C in a tank for 4 milkings (see 11.4).

21.6.2.2 Storage and agitation

21.6.2.2.1 In tanks intended for sampling without extra agitation and

a) equipped for continuous agitation, store the milk for a period of 6 h;

b) equipped for periodic agitation, store the milk for a period of 5 to 7 h and until not more than 5 min before agitation would normally recommence, in order to prevent the agitator from starting as a result of a rise in the milk temperature, switch off the milk temperature control.

Then sample (see 21.6.2.3).

21.6.2.2.2 In tanks equipped for continuous agitation but not intended for sampling without extra agitation, store the milk with continuous agitation for 6 h. Then agitate additionally for 120 ± 2,4 s and sample (see 21.6.2.3).

21.6.2.2.3 In tanks equipped for periodic agitation but not intended for sampling without extra agitation, switch off the milk temperature control and store the milk with periodic agitation for a period of 5 to 7 h and until not more than 5 min before agitation would normally recommence. Then agitate additionally for 120 ± 2,4 s and sample (see 21.6.2.3).

21.6.2.2.4 In tanks not equipped for periodic or continuous agitation between the cooling periods, store the milk without agitation for 6 h. Then agitate additionally for 120 ± 2,4 s and sample (see 21.6.2.3).

21.6.2.3 Sampling

At the end of the storage period, stop the agitator and immediately sample the milk as follows and in the given order :

a) Not less than two samples from different points of the upper layer of the milk. Not less than 90 % of each sample shall be taken from the top 20 mm layer of the milk or cream.

b) A sample from any observed local residues of a cream layer.

c) Not less than two samples from different points at the bottom of the tank. Not less than 90 % of each sample shall be taken from the milk present at not more than 50 mm from the bottom of the inner vessel.

Determine the fat content of the samples with a precision of ± 0,05 % fat.

21.6.2.4 Filling of the tank

Test at both 100 ± 0,2 % and 10 ± 0,2 % of the rated volume of the tank. If there are indications of incomplete mixing with a filling between 10 % and 100 % of the rated volume, also test the tank with this filling.

22 Test report

22.1 General

The test report shall include the following :

a) name and address of the applicant for the test (for example, manufacturer, buyer, agent, etc.);

b) manufacturer's name and trade name;

c) type and serial number;

d) performance class(es);

e) description of the model of the tank;

f) overall dimensions of the tank, including the agitator and the condensing unit if separate;

g) appropriate technical information and manufacturer's names or trade names for major component parts relating to materials, construction and dimensions, as well as means for identifying separate components;

h) type and charge of refrigerant used in the tests;

j) type and volume of intermediate coolant in litres (if applicable);

k) material and method of thermal insulation;

m) nominal information for each electric motor;

n) reference to the number of this International Standard, i.e. ISO 5708;

p) indication of any test methods used and not covered by this International Standard;

q) date and duration of the test;

r) results of the tests covered by this International Standard;

s) average cooling performance in kilojoules per hour or in kilowatts for each cooling cycle;

t) a list of conclusions when checking the tank against the requirements specified in section two of this International Standard;

u) a completed summary of test report according to annex A. This shall include an English text;

v) name(s) and address(es) of the testing station(s) which carried out the test.

22.2 Technical information

The list of technical information shall show the source of the information i.e. supplied by the manufacturer or applicant or obtained by measurement.

22.3 Publication

The test report shall state that : "No extract or abbreviated version of this report shall be published without the approval of the testing authority".

Annex

Summary of test report on a refrigerated bulk milk tank tested in accordance with ISO 5708

Manufacturer : .....

Trade name : .....

Type and serial number : .....

Rated volume : ..... litres

Maximum volume : ..... litres

Tank for ..... milkings

Direct/indirect cooling system : .....

Atmospheric/vacuum tank : .....

Technical data

Condensing unit

Manufacturer(s) or trade name(s) : .....

Type and serial number : .....

Capacity : .....

Position of condensing unit with regard to tank : .....

Type and charge of refrigerant : .....

Vessel

Manufacturer(s) or trade name(s) : .....

Model : .....

Material inner vessel : .....

Material outer casing : .....

Dimensions : — maximum length outside : ..... mm

— maximum width outside : ..... mm

— maximum height, lids opened : ..... mm

— height of upper edge inner vessel : ..... mm

Agitator(s)

Manufacturer(s) or trade name(s) : .....

Number and type : .....

Number of blades per agitator : .....

Length of blades : ..... mm

Speed ..... r/min

Continuous/periodic agitation : ..... min every ..... hour

Manufacturer's name or trade name and type of : .....

— Expansion valve : .....

— Milk temperature controller : .....

— Ice bank controller : .....

— Chilled water pump : .....

Type and amount of intermediate coolant in litres (if applicable) : .....

Cleaning by hand/automatic equipment : .....

Supply voltage : . . . V; frequency : . . . Hz; rated electrical input : . . . kVA

Results

Cooling times to 4 °C after filling with "milk" at 35 °C to rated volume :

Test number	Ambient temperature °C	"milkings"				
		1st h	2nd h	3rd h	4th h	1st + 2nd "milking" 10 °C to 4 °C h
1						
2						
3						
4						
5						
6						

Specific energy consumption : ..... Wh/l "milk"

Freezing of milk at a filling of 10 % of rated volume ..... did not/did occur

Rise in temperature of rated volume during insulation test for 12 h in ambient temperature of ..... °C was ..... ° C

Maximum temperature in the milk during storage (hot point) was above/below 9 °C.

Agitation :

— effective mixing of the milk was found with ..... % of rated volume

— mixing capacity was unsatisfactory with ..... % of rated volume

— further remarks on agitation : .....

.....

Results of cleaning tests (if applicable) : ..... satisfactory/unsatisfactory

Additional remarks : .....

.....

Name(s) and address(es) of testing station(s) : .....

.....

Name and address of the applicant for test : .....

.....