International Standard 7371

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

Performance of household refrigerating appliances — Refrigerators with or without low temperature compartment

Fonctionnement des appareils de réfrigération — Réfrigérateurs avec ou sans compartiment basse température

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Foreword

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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. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7371 was prepared by Technical Committee ISO/TC 86, *Refrigeration*. It cancels and replaces ISO Recommendations R 824 and R 825, of which it constitutes a technical revision.

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Contents

Performance of household refrigerating appliances — Refrigerators with or without low temperature compartment

1 Scope and field of application

This International Standard specifies the essential characteristics of household refrigerators with or without chiller, ice-making or frozen food storage compartments which are wholly factory assembled, and lays down the methods of test for the checking of these characteristics.

It does not apply to food freezers or combined refrigerator/freezers, which will be covered in separate documents.

It does not include refrigerating performance characteristics and tests or particular definitions for refrigerators cooled by internal forced air circulation.

The tests described in this International Standard are type tests. When it is desired to verify the performance of a refrigerator of a given type in relation to this International Standard, all the tests described should be in principle applied to one and the same unit.

These tests can also be made individually for the study of a particular characteristic.

Where no test method is specified, the particular requirement concerned shall be considered as a recommendation.

The safety requirements applicable to the electrical equipment of household refrigerators are covered by IEC publications IEC 335-2-24 and IEC 335-2-34.

The safety requirements applicable to refrigerating systems of household refrigerators are under consideration.

The safety requirements applicable to gaseous and liquid fuel heating equipment of absorption type household refrigerating systems will be covered by a separate International Standard.

2 References

ISO 534, *Paper and board — Determination of the thickness of single sheets (and method of calculation of the apparent density of board).*

ISO 817, *Organic refrigerants — Number designation.* [1)]

ISO 3055, *Kitchen equipment — Co-ordinating sizes.*

ISO 5731, *Kitchen equipment — Limit of size.*

ISO 5732, *Kitchen equipment — Sizes of openings for built-in appliances.*

IEC Publication 335-1, *Safety of household and similar electrical appliances — Part 1: General requirements.*

IEC Publication 335-2-24, *Safety of household and similar electrical appliances — Part 2: Particular requirements for refrigerators and food freezers.*

IEC Publication 335-2-34, *Safety of household and similar electrical appliances — Part 2: Particular requirements for motor-compressors.*

3 Definitions

3.1 household refrigerator (hereinafter referred to as "refrigerator"): Insulated cabinet of suitable volume and equipment for household use, cooled by one or more energy consuming means and having one or more compartments intended for the preservation of food, one at least of which is suitable for the storage of fresh food.

NOTE — From the point of view of installation, there are various types of household refrigerators, for example, free-standing, wall-mounted, built-in etc.

3.2 Storage compartments

3.2.1 fresh food storage compartment: Compartment intended for the storage of unfrozen food which may be itself divided into sub-compartments, and in which the temperatures can be maintained in accordance with 6.2.1.

3.2.2 chiller compartment: Compartment intended for the storage of particular foods or beverages at a temperature warmer than that of the fresh food storage compartment.

NOTE — Requirements for chiller compartments are under consideration.

1) At present at the stage of draft. (Revision of ISO 817-1974.)

3.2.3 low temperature compartment: Compartment which may be either:

- an ice-making compartment, or
- a frozen food storage compartment.

A household refrigerator may have one or several low temperature compartments. Alternatively, it may have no low temperature compartment.

3.2.4 ice-making compartment: Compartment intended specifically for the freezing and storage of water ice-cubes.

3.2.5 frozen food storage compartments: Compartments intended specifically for the storage of frozen food. They are classified according to their storage temperature, as follows.

3.2.5.1 "one-star" compartment: Compartment in which the storage temperature (see 3.4.3.2), measured as described in clause 13, is not warmer than -6 °C.

3.2.5.2 "two-star" compartment: Compartment in which the storage temperature (see 3.4.3.2), measured as described in clause 13, is not warmer than -12 °C.

3.2.5.3 "three-star" compartment: Compartment in which the storage temperature (see 3.4.3.2), measured as described in clause 13, is not warmer than -18 °C.

3.3 General definitions

3.3.1 top-opening type: Refrigerator the compartment(s) of which is (are) accessible from the top.

3.3.2 upright type: Refrigerator the compartment(s) of which is (are) accessible from the front.

3.3.3 overall dimensions (doors or lids closed): Measurements of the rectangular parallelepiped, having a horizontal base, within which the refrigerator is inscribed, including the fittings but not the handle, the protrusion of which, if any, shall be specified separately.

3.3.4 overall space required in use (doors or lids open): Overall dimensions increased by the space necessary for free circulation of the cooling air when the appliance is in service, plus the space necessary to allow opening of the means of access up to that minimum angle at which all removable parts can be removed, such as containers and shelves, including the drip-tray with water if this has to be removed and emptied manually. (See figure 1.)

3.3.5 Volumes

3.3.5.1 gross volume: The total volume within the inside walls of the appliance, without internal fittings, doors or lids being closed.

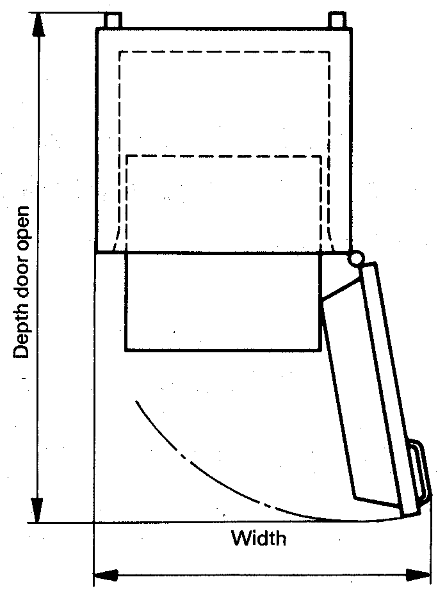

Figure 1 — Overall space required in use (upright type)

However, when cooling is provided by forced air, the gross volume is calculated by subtracting from the total volume the volume blocked by cold-air ducting, evaporator, fan and other associated accessories.

3.3.5.2 rated gross volume: The gross volume stated by the manufacturer.

3.3.5.3 total gross volume: The sum of the gross volumes of the fresh food storage compartment(s), low temperature compartment(s) and chiller compartment(s), even if their doors are independent.

3.3.5.4 storage volume: That part of the gross volume of any compartment which remains after deduction of the volume of components and spaces recognized as unusable for the storage of food, determined by the method in 7.2.

3.3.5.5 rated storage volume: The storage volume stated by the manufacturer.

3.3.5.6 total storage volume: The sum of the storage volumes of the fresh food storage compartment(s), low temperature compartment(s) and chiller compartment(s), even if their doors are independent.

3.3.5.7 rated total storage volume: The total storage volume stated by the manufacturer.

3.3.6 Storage surfaces

3.3.6.1 shelf: For the purpose of this International Standard, any horizontal surface (shelves, partitions, etc.) on which food can be placed.

It may be formed by one component or by components fitted side by side, which may be fixed or removable.

3.3.6.2 storage shelf area: The sum of the horizontal projections of the storage surfaces within the storage volume, including door shelves and the bottom of each compartment, determined in accordance with 7.3.

3.3.6.3 rated storage shelf area: The storage shelf area stated by the manufacturer.

3.3.7 load limit: The surface enveloping the frozen food storage volume.

3.3.8 load limit line(s): Permanent mark(s) indicating the limits of the frozen food storage volume.

3.4 Definitions relating to some performance characteristics

3.4.1 energy consumption: The consumption of a refrigerator over a period of 24 h, running under stable operating conditions at an ambient temperature of + 25 °C (in the case of class SN, class N and class ST refrigerators) or 32 °C (in the case of class T refrigerators) and measured under the conditions specified in clause 15.

3.4.2 rated energy consumption: The energy consumption stated by the manufacturer.

3.4.3 Storage temperatures

3.4.3.1 The fresh food storage temperature is t_m, where t_m is the average of the mean temperatures t_1, t_2 and t_3.

3.4.3.1.1 The temperatures t_1, t_2 and t_3 are the mean internal temperatures measured in cylinders[1] defined in 8.4 at given points as specified in 8.5, i.e the arithmetical average of the extreme values at these points during a complete control cycle (see 3.4.6).

3.4.3.2 frozen food storage temperature: The maximum temperature of the warmest "M" package of a load placed in storage.

3.4.4 Defrosting

The method of defrosting may be one of three types.

3.4.4.1 automatically defrosted: A compartment is automatically defrosted where no action is necessary by the user to initiate the removal of frost accumulation nor to restore normal operation, and where the disposal of the defrost water is automatic.

3.4.4.2 semi-automatically defrosted: A compartment is semi-automatically defrosted where an action is necessary by the user to initiate the removal of frost accumulation and normal operation is restored automatically, the defrost water being removed manually or removed and disposed of automatically.

A compartment is also semi-automatically defrosted where no action is necessary by the user to initiate the removal of frost accumulation nor to restore normal operation, but where the removal of the defrost water is manual.

3.4.4.3 manually defrosted: A compartment is manually defrosted where an action is necessary by the user to initiate the removal of frost accumulation and restoration to normal operation requires a further action by the user, the defrost water being removed manually or removed and disposed of automatically.

NOTE — When a refrigerator comprises two compartments or more, the method of defrosting shall be specified separately for each compartment.

The means of disposal of defrost water may be one of two types.

3.4.4.4 automatic disposal of defrost water: The disposal of defrost water is automatic where the removal and the evaporation of the defrost water does not require any action by the user.

3.4.4.5 manual removal of defrost water: The removal of defrost water is manual where an action is necessary by the user to remove the defrost water.

3.4.5 "M" package: A test package in accordance with 8.2, of dimensions 50 mm × 100 mm × 100 mm, fitted with a temperature-sensor at its geometric centre.

3.4.6 control cycle: The period between two successive starts, or two successive stops, of the refrigerating system when controlled by a temperature control device under stable operating conditions.

3.4.7 stable operating conditions: In the case of cyclic operation of the refrigerating system, including any automatic defrost periods, stable operating conditions are deemed to be reached when, for each of the "M" packages and copper or brass cylinders, the temperatures at all corresponding points during successive operating cycles agree within ± 0,5 K and there is no marked trend away from the mean temperature during a period of about 24 h.

In the case of continuous operation of the refrigerating system, stable operating conditions are deemed to be reached when, although there may be a certain variation in temperature, the increase or decrease in the temperature of all the "M" packages and copper or brass cylinders does not exceed 0,5 K during a period of 18 h.

1) The substitution of copper or brass cylinders by packages is under consideration in order to standardize with tests for refrigerator-freezers which will be covered by a separate International Standard and for which this problem is particularly important.

3.4.8 percentage running time (apparatus with on/off control for the refrigerating source): Percentage running time, under given conditions of ambient temperature and of mean internal temperature, is the ratio:

$$R = \frac{d}{D} \times 100$$

where

R is the percentage running time;

d is the duration of the refrigerating unit operation during a whole number of cycles;

D is the total duration of the cycles.

3.4.9 ice-making: The quantity of ice the refrigerator is capable of producing within 24 h or the time necessary for the freezing of the water in the ice-tray(s) supplied with the appliance.

3.4.10 ambient temperature: The temperature in the space surrounding the appliance under test. It is the arithmetical mean of the mean value of temperatures t_{a1}, t_{a2}, t_{a3}, measured at three points located 350 mm from the side walls and front walls of the appliance, on the normals passing through the geometrical centres of the surfaces of these walls.

3.5 Definitions relating to the refrigerating system

3.5.1 refrigerant: Fluid used for heat transfer in a refrigerating system, which absorbs heat at a low temperature and a low pressure of the fluid and rejects heat at a higher temperature and a higher pressure of the fluid, usually involving changes of state of the fluid.

3.5.2 cooling device: Device containing the evaporator or in thermal contact with the evaporator; it may be a device with fins or may be suitably shaped for the storage of frozen food or water ice-cubes.

3.6 Definitions relating to compression-type refrigerators

3.6.1 compression-type refrigerator: Refrigerator in which refrigeration is effected by the vaporization at low pressure in a heat exchanger (evaporator) of a liquid refrigerant, the vapour thus formed being restored to the liquid state by mechanical compression to a higher pressure and subsequent cooling in another heat exchanger (condenser).

3.6.2 hermetically-sealed motor-driven refrigerating compressor: Motor-compressor in which the compressor and the electric motor (or its moving parts at least) are enclosed in a shell rendered gastight by welding, brazing or other means such that dismantling is not normally possible after assembly. It does not include moving parts outside the shell.

3.6.3 hermetically-sealed compressor refrigerating system: Complete system, essentially comprising a hermetically-sealed motor-driven compressor, a condenser, a pressure reducing device, an evaporator and all other parts containing refrigerant permanently interconnected by the manufacturer by welding, brazing or other means.

3.6.4 refrigerant compressor: Mechanically operated component which withdraws refrigerant vapour from the evaporator and discharges it at a higher pressure to the condenser.

3.6.5 expansion device: Device in which the pressure of the refrigerant is reduced from that of the condensed liquid to that of the evaporator.

3.6.6 condenser: Heat exchanger in which, after compression, vaporized refrigerant is liquefied by rejecting heat to an external cooling medium.

3.6.7 evaporator: Heat exchanger in which after expansion the liquid refrigerant is vaporized by absorbing heat from the medium to be refrigerated.

3.6.8 thermostat: Device which automatically regulates the operation of a refrigerating system according to the temperature of an evaporator or of a compartment.

3.7 Definitions relating to absorption-type refrigerators

3.7.1 absorption-type refrigerator: Refrigerator in which refrigeration is effected by evaporation of a liquid refrigerant in an evaporator, the vapour thus formed being then absorbed by an absorbent medium from which it is subsequently expelled at a higher partial vapour pressure by heating and then liquefied by cooling in a condenser.

3.7.2 absorption refrigerating system: Complete system essentially comprising a boiler, a condenser, an evaporator, an absorber and all other parts containing refrigerant permanently interconnected by the manufacturer by welding, brazing or other means.

3.7.3 boiler: Heat exchanger in which the absorbed refrigerant is expelled from the absorbent medium by the application of heat.

3.7.4 absorber: Component in which the absorption of the refrigerant by an absorbent medium takes place, the heat emitted in the process being rejected to the environment.

3.7.5 condenser: Heat exchanger in which the vaporized refrigerant, after leaving the boiler, is liquefied by rejecting heat to an external cooling medium.

3.7.6 evaporator: Heat exchanger in which the liquid refrigerant, after a drop in its partial pressure, is vaporized by absorbing heat from the medium to be refrigerated.

3.7.7 thermostat: Same definition as for compressor-type refrigerators (see 3.6.8).

4 Classification

Regarding the ability of appliances to operate in extreme ambient temperatures, this International Standard provides for the four following classes:

— Extended temperate class (SN): appliances intended for use in ambient temperatures from 10 to 32 °C.

— Temperate class (N): appliances intended for use in ambient temperatures from 16 to 32 °C.

— Subtropical class (ST): appliances intended for use in ambient temperatures from 18 to 38 °C.

— Tropical class (T): appliances intended for use in ambient temperatures from 18 to 43 °C.

5 Materials, design and manufacture

5.1 General

Household refrigerators shall be constructed in such a manner as to ensure adequate performance and durability in use. Their performance in use is checked by applying a series of relevant tests.

This clause defines some characteristics which are not tested but to which the attention of manufacturers is drawn.

5.2 Materials and finishes

All materials used inside refrigerators shall not transmit odours. When tested in accordance with 17.1, the mean value of the individual results during each evaluation for odour or flavour shall not exceed mark 1.

All materials used inside refrigerators shall not contaminate food placed in contact with them nor transmit poisonous substances to food. They shall be resistant to the action of moisture and food acids.

All surface finishes shall, for the purpose intended, be resistant to impact, sufficiently hard, colour-fast, smooth, easily washable and resistant to damage by moisture and by food acids.

5.3 Thermal insulation and airtightness

The thermal insulation of the refrigerator should be efficient and permanently maintained. In particular, the insulating material should not be subject to shrinkage and should not allow under normal working conditions an excessive accumulation of moisture.

No running water shall appear externally when the refrigerator is subjected to the water vapour condensation test specified in clause 14.

When the door is closed, there shall be no abnormal ingress of air into the interior.

The strip of paper shall not slide freely when the door or lid seal is subjected to the airtightness test specified in clause 9.

5.4 Doors, lids and fittings

Hinges and handles shall be strong and resistant to corrosion.

External doors and lids shall withstand 100 000 openings and closings without deterioration which, in particular, may be prejudicial to the airtightness of the refrigerator, when subjected to the durability test of clause 11.

In the case of refrigerators with a low temperature compartment having a separate external access door or lid, the hinges and handles of the door or lid of that compartment shall withstand 10 000 openings and closings.

The fastening system shall be such as to enable the door to be easily closed and opened. It shall be efficient and capable of maintaining its proper function.

For refrigerators having any compartment with a volume equal to or greater than 60 l, it shall be possible to open the door or lid of that compartment from the inside with a force not exceeding 70 N when subjected to the test of clause 10. The volume is determined when all detachable shelves have been removed. However, if the door or lid is provided with a mechanical latch which can be locked by a removable key, and the door or lid cannot be closed with the key turned to the locked position, this requirement applies only when the latch is unlocked, provided that the refrigerator is accompanied by an instruction stating that the key shall be put out of children's reach and not in the vicinity of the appliance.

5.5 Shelves and containers

Shelves, containers and similar components shall have adequate mechanical strength. Those used for storing food shall withstand the loading test specified in clause 12 without showing such distortion that they could no longer fulfil their intended function. In particular, sliding components shall be capable of their full movement when loaded.

Shelves, containers and similar components which are intended to be removable should be easily removable.

5.6 Disposal of defrost water

Means shall be provided for completely collecting the defrost water either in a removable internal drip-tray or in an external receptacle in which the defrost water is evaporated or by other means.

The drip-tray or other defrost water receptacle should have adequate volume and, additionally, external drip-trays should have adequate evaporating means.

The volume of drip-trays (either internal or external) of evaporators which are semi-automatically or manually defrosted shall be at least equal to the volume calculated in multiplying by 1 mm the total external and internal area of the related evaporator(s).

Any drainage system shall be designed to ensure its proper function. It shall be easily accessible for the clearing of any blockage and shall be designed so as to prevent any undue ingress of air into the food storage compartment(s).

5.7 Refrigerating system

5.7.1 The mechanical operation of the refrigerator should not give rise to undue noise or vibration.

5.7.2 The design of the condenser should be such as to minimize the accumulation of dust.

5.7.3 The evaporator should be so designed or protected that it will not suffer any damage during normal use of the appliance.

The heat exchange surfaces should be made of corrosion-resistant material or finished with a corrosion-proof non-poisonous coating resistant to temperature changes and alternating frosting and defrosting.

5.7.4 The means of adjustment of temperature control devices, if intended to be adjusted by the user, should be readily accessible and their function shall be such as to enable the refrigerator to meet the requirements of the performance tests as defined in clause 13.

5.7.5 Pipes and connections to moving or resiliently-mounted parts should be arranged so as not to generate noise, not to touch nor to transmit vibrations to other parts and should be so designed as to prevent failure due to fatigue. All other pipes and connections should be securely anchored. Where necessary, pipes and valves should be properly insulated.

5.7.6 Suitable means should be provided to prevent water condensed on cold parts from affecting the operation of the unit or its controls or from causing any other damage to the refrigerator and its surroundings.

5.7.7 The strength of pressure parts will be dealt with in a future International Standard.

6 Required characteristics

6.1 Dimensional characteristics

6.1.1 Rated gross volume

The rated gross volume shall not be greater than the measured gross volume by more than 3 % of the latter or one litre, whichever is the greater value.

6.1.2 Rated storage volume

The rated storage volume shall not be greater than the measured storage volume by more than 3 % of the latter or one litre, whichever is the greater value.

6.1.3 Rated storage shelf area

The rated storage shelf area shall not be greater than the measured storage shelf area by more than 3 % of the latter.

6.2 Performance characteristics

6.2.1 Storage temperatures

Under the conditions specified in clause 13, the appliance shall be capable of maintaining the required storage temperatures in the fresh food storage compartment as shown in table 1 for the appropriate climate class.

Refrigerators having a star-marked frozen food storage compartment shall comply simultaneously both with the conditions specified in table 1 for the appropriate climate class and with the relevant classification temperature specified in 3.2.5.

6.2.2 Energy consumption

If the energy consumption is stated by the manufacturer, the value measured in accordance with clause 15 on the first appliance shall not be greater than the rated energy consumption by more than 15 % of the latter.

If the result of the test carried out on the first appliance is greater than the declared value plus 15 %, the test shall be carried out on three further appliances.

If the arithmetic mean of the energy consumption values of these three appliances is equal to or less than the declared value plus 10 %, the declared value is confirmed. If not, the requirements of this International Standard are not met.

6.2.3 Ice-making

If the ice-making capacity is stated by the manufacturer, the value measured in accordance with clause 16 shall not be less than 90 % of the claimed value.

Throughout the ice-making test all the internal temperatures t_1, t_2, t_3 (see 3.4.3.1.1) shall be in accordance with table 1.

Should the ice-making capacity obtained from the first test be less than 90 % of the claimed value, two further tests shall be made and the result of each of these additional tests shall not be less than 90 % of the claimed value.

7 Determination of linear dimensions, volumes and areas

The measurements shall be carried out on the appliance as delivered and not operating.

Table 1 — Fresh food storage compartment temperatures

Climate class	Ambient temperature	t_1, t_2, t_3	t_m, max.
SN	from + 10 °C to + 32 °C	$-1\ °C \leqslant t_1, t_2, t_3 \leqslant +10\ °C$	+ 7 °C
N	from + 16 °C to + 32 °C	$0\ °C \leqslant t_1, t_2, t_3 \leqslant +10\ °C$	+ 5 °C
ST	from + 18 °C to + 38 °C	$0\ °C \leqslant t_1, t_2, t_3 \leqslant +12\ °C$	+ 7 °C
T	from + 18 °C to + 43 °C	$0\ °C \leqslant t_1, t_2, t_3 \leqslant +12\ °C$	+ 7 °C

7.1 Determination of linear dimensions

Linear dimensions shall be measured to the nearest millimetre.

7.2 Determination of volumes

Volumes shall be expressed in cubic decimetres or in litres.

7.2.1 Determination of gross volume

The gross volume shall be calculated by dividing the total volume into convenient units of volume of geometric shape which can easily be measured.

When the gross volume is determined, internal fittings such as shelves, partitions, containers, evaporators, thermostats and interior light housings shall be considered as not being in place. However, the gross volume shall take into account the exact shapes of the walls if they contain depressions or projections (for examples see figure 12).

If cooling is effected by forced air, any volume which is inaccessible because of air ducts, fans, evaporator and other associated accessories shall also be deducted.

7.2.2 Determination of the total storage volume

The total storage volume of the refrigerator shall be the sum of the storage volumes of the fresh food storage compartment(s), chiller compartment(s), ice-making compartment(s) and frozen food storage compartment(s).

For the determination of storage volumes, the total volume of devices and of spaces considered unusable for the storage of food shall be deducted from the gross volume calculated in accordance with 7.2.1 (see 7.2.3 for fresh food storage compartments and 7.2.4 and 7.2.5 for low temperature compartments).

7.2.3 Storage volume of fresh food storage compartment

The storage volume of the fresh food storage compartment shall be its gross volume minus

— the volume of the evaporator space (see 7.2.3.1);

— the volume of any housings (such as those which may be provided for interior lights, thermostats and other control devices);

— the volume of shelves, partitions, retainers and other accessories the wall thickness of which is greater than 13 mm (see 7.2.3.2).

7.2.3.1 Volume of the evaporator space (see figure 13)

The volume of the evaporator space shall be the product of the depth, the width and height, as defined below.

7.2.3.1.1 Depth

The depth of the evaporator space shall be the mean horizontal distance between the front and rear surfaces of the enclosed space of the cabinet, measured at the level of the evaporator, unless there is a space provided in front of the evaporator for food storage.

Where a storage space is located in front of the evaporator, the depth of the evaporator space shall be taken as the mean horizontal distance from the inner surface of the rear of the enclosed space of the cabinet to the foremost part of the evaporator or of the evaporator door, if fitted.

7.2.3.1.2 Width

The width of the evaporator space shall be the overall horizontal width of the evaporator itself (neglecting suction headers near the top of the evaporator) or, if side ribs are used, the overall width including the ribs.

If there is less than 70 mm horizontal distance between the evaporator or the ribs and an inside wall of the enclosed space of the cabinet, such space shall be computed as part of the evaporator space.

7.2.3.1.3 Height

The height of the evaporator space shall be the mean vertical distance between the lower limit of the evaporator and the upper partition of the food storage compartment.

If the free space between the upper surface or top of the evaporator and the upper partition of the food storage compartment exceeds 40 mm, it shall be added to the storage volume of the fresh food storage compartment.

The evaporator height shall include any internal drip-tray and/or drip collector, except in the case when the storage height of the drip-tray is greater than 40 mm and a definite manual operation is also needed to initiate defrosting.

7.2.3.2 Volumes of shelves and partitions (see figure 14)

7.2.3.2.1 Thickness

The thickness of a shelf or partition shall be the mean distance between its outer surfaces.