

Australian/New Zealand Standard™

**Performance of household electrical
appliances—Refrigerating appliances**

**Part 1: Energy consumption and
performance**



AS/NZS 4474.1:2007

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee EL-015, Quality and Performance of Household Electrical Appliances. It was approved on behalf of the Council of Standards Australia on 5 July 2007 and on behalf of the Council of Standards New Zealand on 22 June 2007. This Standard was published on 15 August 2007.

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Australian Electrical and Electronic Manufacturers Association
Australian Greenhouse Office, Department of the Environment and Heritage
Australian Industry Group
Australian Retailers Association
Business New Zealand
Consumer Electronics Suppliers Association
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Australian/New Zealand Standard™

Performance of household electrical appliances—Refrigerating appliances

Part 1: Energy consumption and performance

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PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-015, Quality and Performance of Household Electrical Appliances to supersede AS/NZS 4474.1:1997 on publication.

This Standard incorporates Amendment No. 1 (October 2008) and No. 2 (March 2011). The changes required by the Amendment are indicated in the text by a marginal bar and amendment number against the clause, note, table, figure or part thereof affected.

The AS/NZS 4474 series is comprised of two parts as follows:

AS/NZS

- 4474 Performance of household electrical appliances—Refrigerating appliances
- 4474.1 Part 1: Energy consumption and performance (this Standard)
- 4474.2 Part 2: Energy labelling and minimum energy performance standard requirements

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Amendment 2 (2011) to this Standard includes a number of changed requirements regarding the operation of ice-makers during energy tests and an additional requirement for adaptive defrost systems. It also deals with the testing of products that contain automatic anti-condensation heaters where the power is varied in response to changes in ambient conditions (e.g. humidity and/or temperature). It now requires the declaration of any controls that may alter the operation of the refrigerating appliance under specific operating conditions. Amendment 2 (2011) no longer permits products with circumvention devices to comply with the requirements of this Standard.

Amendment 2 forms part of this Standard on publication. AS/NZS 4474.2 sets out transition provisions for the use of this Standard (excluding Amendment 2) for registration purposes.

The Parts of AS/NZS 4474 are defined as follows:

- (a) Part 1 includes all test conditions, requirements for temperature performance and the method for determination of energy consumption.
- (b) Part 2 includes algorithms for the calculation of the energy efficiency rating, star rating and comparative energy consumption, performance requirements, details of the energy label and requirements for the valid application thereof. It also contains the minimum energy performance standards (MEPS) for refrigerators and freezers. It has been structured to be suitable for reference in regulatory legislation and to be used in conjunction with Part 1.

The objective of this series of Standards is to promote high levels of quality, performance and efficiency in household refrigerating appliances.

The objective of this Standard is to provide test laboratories with test methods and minimum performance requirements so that the performance, including energy consumption, of household refrigerating appliances can be measured, compared and evaluated.

While this Standard is generally aligned with ISO 15502:2005 in some areas it follows the ANSI/AHAM approach. A summary of differences between this edition and ISO 15502 and the ANSI/AHAM standard is included in the Foreword.

This Standard incorporates the following significant changes from the previous editions of this Standard:

- (i) The defined terms have been bolded wherever they are used through this Standard. The defined terms could be grouped under appropriate headings, and users seeing a bolded defined term, should also look within the headings and not just look for the specified term in alphabetical order.

- (ii) Revised group definition—The definitions of a chest type have been amended to include rules about combination configurations that have now appeared on the market. There are also revised rules to cover appliances with frozen food compartments with different defrost types.
- (iii) The definition of the start of the defrost control cycle has been altered to include any sequence of events that occur prior to the initiation of the defrost heating.
- (iv) The text defining thermal equilibrium and the test period for temperature operation performance tests and energy consumption has been refined to make its application clearer and now defines stability requirements for tests which include test packages.
- (v) Reference to testing at 240 V has been deleted as this ceased to be an option with the introduction of MEPS 2005.
- (vi) The definition of adaptive defrost systems has been refined further in this edition. The time between defrosts for an adaptive defrost system is still limited to 24 h for the determination of energy consumption. In the future, experience with adaptive defrost systems may result in appropriate amendments to this approach.
- (vii) New rules have been introduced regarding the placement of sensors in small, wide/short and very tall compartments.
- (viii) Many figures have been added or re-drawn, including those showing sensor placement and locations of test packages. The objectives of this have been to update the illustrations to show newer typical cabinet configurations, correct errors and to accommodate the changes in (vii).
- (ix) Although this Standard is not intended to cover wine storage cabinets, a definition covering them has been introduced to clarify the demarcation between cabinets specifically designed for wine storage and those covered by this Standard.
- (x) With the advent of microprocessors and electronic controls, refrigerating appliances have emerged with various unusual operating patterns. These are patterns that were not displayed by appliances managed by electromechanical controls. The emergence of these patterns has necessitated the tightening of test specifications to detect and deal with those patterns that would consequently provide poor food care. It has also been necessary to deal with patterns that give abnormally low energy consumption in an energy test by modifying or eliminating functions that are otherwise operational in normal use such as anti-sweat heaters. Notice is served that should products appear in the marketplace that meet the letter but not the intent of this Standard, then this Standard will be amended accordingly.
- (xi) Another consequence of electronic controls is that adjustments are often made in steps rather than continuously. The Standard has been amended to preclude interpolation to target temperatures where the nearest achievable temperatures are too far from the target values.
- (xii) With the emergence of electronic controls on appliances and the now universal use of electronic data logging for testing, the opportunity has been taken to include all the defrost and recovery temperature profile in the total of the average temperature for energy determination. Analysis of available data has shown that this will have a minimal effect on reported temperatures for normal well managed appliances.

It is envisaged that the MEPS checking criteria used by government will be changed to make it clear that all the population of a model rather than just the mean of that population must have a lower energy test consumption than MEPS. MEPS values in Part 2 will be adjusted to compensate for that tightening. If the above change in temperature measurement is demonstrated to measurably increase

measured energy consumption, any extra MEPS adjustment deemed necessary will be incorporated simultaneously.

- (xiii) The way of dealing with cabinets containing multiple convenience features has been clarified.
- (xiv) Integration over time is the only method now allowed for determining average temperatures.
- (xv) The automatic ice-making section has been re-written to align it much more closely with the US test procedure. The testing is now done without test packs in the compartment.
- (xvi) Electronically controlled systems are often such that it is not possible to disable defrost heaters without the system detecting that as a fault and responding. To overcome this problem the temperature performance test has been modified to also take into account defrost that can neither be disabled nor avoided during testing. A test procedure and pass criteria for each alternative is now included.
- (xvii) Tests for thermal stability have been modified to reduce testing time when it is clear that performance is adequate. It has also been modified to cope with some of the less regular cycling that is a characteristic of some electronic control systems.
- (xviii) Methods for the determination of energy consumption where there are multiple cooling systems has been modified to also apply to cabinets with multiple independent defrost systems. It is envisaged that, with future revisions of this Standard, the two-part method may be required for selected tests.
- (xix) Intermediate freezer test pack sizes have been added to align with ISO 15502.
- (xx) Appendix Q introduces a 2 part energy test procedure. Based on the US DOE test method, this sets out a procedure for the calculation of average energy consumption from two (or more) components of energy consumption of a frost free refrigerating appliance. It combines the rate of use during normal running with the rate during an automatic defrost cycle. This allows an accurate estimate of the total energy consumption to be calculated for any elapsed time between defrosts.

For this edition of the Standard this method has been provided to give users experience with its application with real test data and appliances. Apart from some of the cases where there are two or more defrost systems in operation, at this stage it is informative only. It is envisaged that in future editions of the Standard this procedure may become mandatory for other energy testing.

Measured values and calculated values determined under this Standard should not be rounded, except where specified for the purposes of rating or inclusion in a test report.

Statements expressed in mandatory terms in notes to tables and figures are deemed to be requirements to this Standard.

The terms 'normative' and 'informative' have been used in this Standard to define the application of the Appendix to which they apply. A 'normative' Appendix is an integral part of a Standard, whereas an 'informative' Appendix is only for information and guidance.

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FOREWORD

In considering the performance of refrigerating appliances available in Australia and New Zealand, it is often necessary to consider the methods of testing used in Europe (i.e. ISO) and in North America.

The scope of this Standard is covered by ISO 15502, Household refrigerating appliances—Characteristics and test methods.

In North America, most energy consumption testing is carried out under US Department of Energy Code of Federal Regulations (10 CFR Part 430, Subpart B, Appendices A1 and B1). This test method references AHAM HRF-1-1979; the revised AHAM HRF-1-2004 includes most of the requirements of the Code of Federal Regulations.

Where possible, this Standard harmonizes with the ISO Standards, however there are many differences, three of the fundamental differences are as follows:

- (a) The ISO Standard provides for a choice of climate classes, each of which is considered to be too narrow for Australia and New Zealand, where, because of factors such as wide diurnal temperature ranges, the methods of house construction, and a diversity of climates, the ability to operate over a wide temperature range, i.e. 10°C to 43°C, is considered essential. Under AS/NZS 4474.1, the energy consumption test is performed at an ambient temperature of 32°C which is classified as tropical by ISO. (See (c) below and the table following for a brief summary of the ISO test and the differences between it and this Standard).
- (b) The ISO ‘star’ (snowflake) marking scheme, the purpose of which is to indicate the freezing capability of the freezer compartment(s), is not used in Australia or New Zealand. It should be noted the ISO ‘star’ scheme is unrelated to the energy labelling scheme in Australasia which uses ‘star’ as a measure of the relative energy efficiency of the appliance. It is also unrelated to the ENERGY STAR scheme originating from the US EPA. Under that scheme ENERGY STAR labels are awarded to the most efficient segment of a product range.
- (c) The ISO test method attempts to combine the operation temperature test with the energy consumption test – in this case any frozen food compartments are fully loaded with freezer test packages which must be in contact with the freezer walls. In AS/NZS 4474.1 the energy test is performed separately with unloaded frozen food compartments. This has been found to provide more consistent results. In the AS/NZS 4474.1 operation temperature test, freezer test packages are spaced away from the freezer walls to allow air circulation in frost-free systems.

Because of the many significant differences between test conditions in this Standard and those of ISO or North America, direct comparison of results obtained under any two of the test regimes are generally not possible. Some of the main differences are set out in the following table and accompanying notes, however it should be noted that this is not a complete comparison.

Variable	AS/NZS 4474.1	ANSI/AHAM ¹	ISO ²
Energy consumption ambient temperature	32 ±0.5°C	32.3 ±0.6°C	25 ±0.5°C ³
Energy consumption fresh food temperature	3°C	3.3/7.22°C ⁴	5°C
Energy consumption freezer temperature ⁵	–15°C	–15/–17.8°C ⁶	–18°C
Freezer for energy consumption	unloaded	unloaded ⁷	loaded
Operation test ambient temperatures ⁸	10/32/43°C	21.1/32.2/43.3°C ⁹	16/32°C ¹⁰
Operation test fresh food temperatures ¹¹	0.5°C to 6°C	1.1°C to 5°C	0°C to 4°C ¹²
Operation test freezer temperatures ¹³	≤–15°C	≤–15/–17.8°C ⁶	≤–18°C ¹⁴
Pull down test	Y	Y	N
Freezing capacity test	N	N	Y
Ice-making capacity	Y	Y	Y
Temperature rise time	N	N	Y
Other performance tests	N	Y ¹⁵	Y ¹⁶
Gross volume ¹⁷	compartment (including sub-compartment)	Not specified	total only (Not specified at sub-compartment level)
Storage volume ¹⁸	all levels	all levels	all levels
Volume used for MEPS and energy labelling	gross	storage	storage
Freezer adjustment factor (adjusted volume)	1.6	1.63	2.15
Separate freezer energy adjustment	N	0.7/0.85 ¹⁹	N
Energy sources and refrigeration systems covered	mains powered electric vapour compression ²⁰	all electric a.c. single phase systems ²¹	any
Humidity	not specified	not specified ²²	45% to 75%
Anti-sweat heaters during energy consumption tests	on	average on and off	only when needed

FOOTNOTES:

- The current AHAM refrigerator Standard is AHAM HRF-1—2004 . However, most energy consumption data in the U.S.A. is determined under the U.S. Department of Energy Code of Federal Regulations (C.F.R. Part 430 Subpart B Appendices A1 and B1) which draws in parts on the AHAM Standard but also modifies some parts. DOE regulations have precedence regarding all mandatory U.S. Government requirements for energy labelling and MEPS. Note that DOE regulations cite AHAM HRF-1-1979 and not the current version.
- The ISO Standard for refrigerator performance and energy consumption is ISO 15502:2005: Household refrigerating appliances—Characteristics and test methods.
- Ambient test temperature for energy consumption under ISO is 25°C for all climate classes except Tropical, which is 32°C.
- AHAM and DOE regulations only specify a fresh food compartment temperature of 3.3°C for ‘all refrigerators’ (i.e. fresh food compartments with either no freezer or a small ice-making sub-compartment of less than 14.2 L). For tests on refrigerator/freezers, the fresh food temperature has only to be below 7.22°C.
- Freezer compartments in this Table refer to compartments intended for the long term storage of frozen food. There are numerous other frozen and unfrozen compartment types not covered by this Table. AS/NZS 4474.1 freezer compartment temperature is determined from the average of the warmest 4 of the 5 air temperature sensors. ISO report compartment temperatures as the warmest test package position at the warmest part of the cycle for all tests (AS/NZS 4474.1 also uses this method for loaded operation tests). ANSI/DOE compartment temperatures are the average of all temperature points taken at ≤4 min intervals over the test period (excluding defrost cycles).
- A freezer temperature of –15°C applies to refrigerator-freezers while –17.8°C applies to separate freezers.

- 7 Note that HRF-1-1979 specifies that for energy consumption tests all freezer compartments shall be loaded. However, the DOE CFR 430 test procedures specify that freezer packs are not to be used in the determination of energy consumption for automatic defrost (frost-free) refrigerator-freezers (the most common appliance type in the U.S.A.) and 'all refrigerators' with ice makers. In these cases, freezer compartment temperatures are measured with thermocouples inside metallic cylinders of 29 ± 6 mm (the metal is not specified, but if it were copper, this would equate to a thermal mass of between 8 g and 28 g water equivalent). All other appliance types under AHAM (including all separate freezers) are tested with the freezer compartment loaded. The freezer test packs used under AHAM are $130 \times 100 \times 40$ mm and contain sawdust or spinach. Under the AHAM Standard the freezer compartment is only loaded to 75% of its capacity. AHAM test packs are different from the test packs specified in ISO which are $200 \times 100 \times 50$ mm and contain oxyethylmethylcellulose. AS/NZS 4474.1 specifies test packs which are identical to ISO -1°C packs. Under ISO and AS/NZS the freezer compartments are fully loaded (except for specified air gaps). AS/NZS specifies 15 mm air gaps between test packs and the freezer walls, while ISO specifies that they should be in contact.
- 8 Temperature operation tests are conducted with freezer test packs for all three standards.
- 9 The 'simulated load test' under AHAM has only recommended levels of performance and is not a mandatory requirement for refrigerators in the U.S.A. under DOE regulations for labelling or MEPS.
- 10 This is the temperature range for ISO Temperate, which is the most common climate rating in Europe. Other ISO climate ratings include Extended Temperate ($10^\circ\text{C}/32^\circ\text{C}$), Sub-tropical ($16^\circ\text{C}/38^\circ\text{C}$) and Tropical ($16^\circ\text{C}/43^\circ\text{C}$).
- 11 Fresh food temperatures in all Standards are averages. AS/NZS 4474.1 specifies that thermocouples be placed inside copper or brass cylinders with a thermal mass of between 2.3 g and 20 g water equivalent, while ISO usually specifies cylinders which have 2.3 g water equivalent. AHAM allows thermocouples to be weighted or unweighted, but where weighted, the thermal mass must not be greater than 20 g of water equivalent.
- 12 ISO average fresh food compartment temperatures are to remain at less than 5°C , but this may rise to 7°C during defrosting in a frost-free appliance. In addition to this requirement, the temperature at each of the measuring points in the fresh food compartment (generally three points) must remain within the range 0°C to 10°C throughout the test (so a theoretical minimum average compartment temperature is 0°C , but in practice the actual minimum achievable would be higher).
- 13 Allowable freezer pack temperature ranges for an operation test are generally less than or equal to the target temperature for energy consumption.
- 14 Test pack temperatures are allowed to rise to -15°C during automatic frost-free defrosting cycles.
- 15 Other AHAM tests for performance are related to durability and include handling and storage test (for packaging), external surface condensation test, internal moisture accumulation test, environmental cracking resistance test and bottom breaker strip impact test. AHAM does not recommend minimum levels of performance for these tests.
- 16 Other ISO performance tests include door air tightness, door opening force, durability of hinges and doors and mechanical strength of shelves. ISO does specify minimum requirements for each of these performance tests.
- 17 Gross volumes for AS/NZS differ from ISO in a number of minor areas. However, the most significant difference is that the volume of air ducts (in a frost-free system) within the liner shape is counted as part of the gross volume in AS/NZS but this is not allowed under ISO.
- 18 The only volume specified in AHAM ('refrigerated volume') is essentially a storage volume equivalent under ISO and AS/NZS. However there are minor differences in the determination of storage volume under all of these Standards.
- 19 The U.S. DOE Code of Federal Regulations specifies that the measured energy consumption is adjusted by a factor of 0.7 for chest freezers and 0.85 for vertical freezers 'to adjust for average household usage'.
- 20 This is within the scope of AS/NZS 4474.2 which covers government requirements for energy labelling and MEPS. The scope of AS/NZS 4474.1 includes all electric powered units.
- 21 This is within the scope of the U.S. DOE Code of Federal Regulations for the purposes of energy labelling and MEPS. The AHAM Standard includes all electric units (but specifically excludes gas powered types).
- 22 Humidity is specified for some of the other performance tests such as external condensation and internal moisture accumulation (at $75 \pm 2\%$), but not for operation or energy consumption tests.

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard**Performance of household electrical appliances—Refrigerating appliances****Part 1: Energy consumption and performance**

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE

This Standard specifies the method for determining the performance characteristics of electric **refrigerating appliances** suitable for connection to mains power, whatever the cooling technology. It does not specify safety requirements, which appear in AS/NZS 3350.2.24 and AS/NZS 60335.2.24. Appliances covered by this Standard include **refrigerators, refrigerator/freezers and freezers**.

Appliances such as multi-fuel **refrigerating appliances** which do not have a mains power option, are not included in the scope of this Standard. This Standard does not apply to separate stand-alone ice-makers.

Refrigerating appliances that are not specifically designed for wine storage but that may be nevertheless used for this purpose are covered by this Standard. **Refrigerating appliances** that have a **wine storage compartment** combined with any other compartment type defined in this Standard (see Clause 1.3.12) are included within the scope. Separate **wine storage cabinets** (as defined – see Clause 1.3.18) are not within the scope of this Standard but may be tested using the methods herein as a cellar or special (unfrozen) compartment depending on the claimed temperature range but excluding any pull down requirement.

NOTE: Throughout this Standard, the term ‘**refrigerating appliance**’ is used to denote all appliances covered by this Standard. Refer to Clause 1.3.16.

1.2 REFERENCED DOCUMENTS

The following documents are referred to in this Standard:

AS/NZS	
3350	Safety of household and similar electrical appliances
3350.2.24	Part 2.24: Particular requirements for refrigerating appliances and ice-cream appliances and ice-makers
4474	Performance of household electrical appliances—Refrigerating appliances
4474.2	Part 2: Energy labelling and minimum energy performance standard requirements
60335	Household and similar electrical appliances—Safety
60335.1	Part 1: General requirements
60335.2.24	Part 2.24: Particular requirements for refrigerating appliances, ice-cream appliances and ice-makers
IEC	
60704	Household and similar electrical appliances—Test code for the determination of airborne acoustical noise
60704-1	Part 1: General requirements

ISO	
15502	Household refrigerating appliances—Characteristics and test methods
8960	Refrigerators, frozen-food storage cabinets and food freezers for household and similar use—Measurement of emission of airborne acoustical noise
ISO GUIDE	Guide to the Expression of Uncertainty in Measurement (ISBN 92-67-10188-9)
NATA	Assessment of Uncertainties of Measurement for Calibration and Testing Laboratories (ISBN 0-909307-46-6)

1.3 DEFINITIONS

For the purpose of this Standard, the following definitions apply.

NOTE: The following defined terms have been bolded wherever they are used throughout this Standard.

1.3.1 Automatic ice-maker

An **ice-making**, harvesting and storage device within a **refrigerator** or **freezer** which is fed from a water supply, and which, when ice is removed, automatically replenishes the stock without requiring any action by the user.

NOTE: Separate stand-alone icemakers are not within the scope of this Standard.

1.3.2 Baffle

A plate, wall or partition which is designed to perform one or more of the following functions:

- (a) Prevent food contact with refrigerated surfaces.
- (b) Prevent condensate from dripping on food.
- (c) Direct or regulate, or both, the circulation of refrigerated air.

1.3.3 Compartment and sub-compartment

These are defined as follows:

- (a) **Compartment**—An enclosed space within a **refrigerating appliance**, which is directly accessible through one or more external doors. A **compartment** may contain one or more **sub-compartments** and one or more **convenience features**.
- (b) **Sub-compartment**—A permanent enclosed space within a **compartment** or **sub-compartment** which is designated as being a different type of **food storage space**, (i.e. has a different operating temperature range) from the **compartment** or **sub-compartment** within which it is located.

Throughout this Standard, unless specified otherwise, the term ‘**compartment**’ shall be taken to mean ‘**compartment and sub-compartment**’, or ‘**compartment or sub-compartment**’, or ‘**compartment nor sub-compartment**’ as appropriate for the context. Refer also to Clause 1.3.4. **Compartment** types are defined in Clause 1.3.12 and can be further classified by defrost type in Clause 1.3.14.

1.3.4 Convenience feature

An enclosure, or a container (either fixed or removable by the user), in which suitable storage conditions are provided for designated types of food or beverages. These conditions may be different from those of the **compartment** in which it is located. Refer also to Clause 2.2.

Trays, bins or containers that have no specific intended position are not included during testing and **shall** not be considered as **convenience features** for the purposes of this Standard: Refer to Paragraph C2.5(c). A fixed **convenience feature** is one which is not intended to be removed and its removal is likely to require the use of tools.

1.3.5 Crisper

A **convenience feature** provided primarily to retard dehydration of fruits and vegetables. A **crisper** is usually considered as a removable **convenience feature** but is normally left in situ.

1.3.6 Cyclic defrost appliance

A household **refrigerating appliance** in which defrosting of all **unfrozen food compartments** is cyclic (Clause 1.3.7(c)) and the **frozen food storage compartments** (if any) are not cooled by a frost-free system (Clause 1.3.14).

Frozen food storage space in a **cyclic defrost** appliance may be **manually, semi-automatically** or **automatically defrosted**.

1.3.7 Defrost system

A means for removal of frozen atmospheric moisture from an **evaporator** and any refrigerated surfaces in a **compartment** and for disposal of the defrost water. Defined as follows:

- (a) **Automatic defrost**—Where no action is required of the user to initiate removal of frost accumulation, nor to restore normal operation. Also disposal of defrost water requires no action by the user.
- (b) **Adaptive defrost**—A form of **automatic defrosting system** where total energy consumed over time is optimized by an automatic process that adjusts the time between successive defrosts over a range of intervals in response to changes in **normal use** by using an operating condition variable (or variables) other than, or in addition to, elapsed time or compressor run time. It provides a defrosting frequency based more accurately on the defrosting need during **normal use**. An **adaptive defrost** system must operate during **normal use** and not just under test conditions.
- NOTE: Requirements to qualify as **adaptive defrost** are set out in Clause 3.8.
- (c) **Cyclic defrost**—A form of **automatic defrosting system** where the refrigerated surfaces which cool an **unfrozen food compartment** in an appliance are **automatically defrosted** with automatic disposal of defrost water and defrosting occurs during each cycle of the refrigeration system.
- (d) **Semi-automatic defrost**—Where an action is required of the user to initiate removal of frost accumulation and normal operation is restored automatically with defrost water disposal being either **manual**, requiring action by the user, or automatic, requiring no action by the user.

Also where no action is required of the user to initiate removal of frost accumulation, and normal operation is restored automatically but where defrost water disposal is **manual**, requiring action by the user.

- (e) **Manual defrost**—Where an action is required of the user to initiate removal of frost accumulation and further action is required to restore normal operation, whether defrost water disposal is **manual**, requiring action by the user, or automatic, requiring no action.

NOTE: Refer also to Clause 1.3.6 and Clause 1.3.14.

1.3.8 Designation

Refer to Clause 1.3.18, ‘**Refrigerating appliance designation**’.

1.3.9 Drip tray

An internal tray to collect defrost water from a **manually** or **semi-automatically defrosted evaporator**. It may also be intended as a chiller tray.

1.3.10 Evaporator

A heat exchanger in the refrigerant circuit, in which liquid refrigerant evaporates to cause cooling.

A box **evaporator** is an **evaporator** of any shape within an **unfrozen food compartment** where the **evaporator** is configured to provide a separate storage space (**sub-compartment**). Examples include **ice-making** (refer to Clause 1.3.12(b)(i)) and short term **frozen food** (refer to Clause 1.3.12(b)(ii)) **sub-compartments** within a **fresh food compartment**.

A plate **evaporator** is an **evaporator** adjacent to the wall or roof of a **compartment** where the **evaporator** is not configured to provide a separate **shelf**, storage space or **sub-compartment**.

Evaporators may also be configured as shelves or as walls, etc.

NOTE: Although an **evaporator** may form part or all of the enclosing walls of a freezing **compartment**, it is a misnomer to refer to such a space as an **evaporator**.

1.3.11 Foodstuffs

For the purposes of this Standard, '**foodstuffs**' means food, ingredients, beverages and/or other items primarily intended for consumption, and that require refrigeration at specified temperature conditions. To ensure safe storage of **foodstuffs**, all **compartments** **shall** be capable of maintaining temperatures at or below the relevant target values specified in Table 3.5 and Clause 3.7.2.

1.3.12 Food storage compartment type

A means of classification, whereby any **compartment** is defined by a combination of its purpose and an operating temperature range, within which it is capable of continuous operation. The types, divided into the three broad categories shown, are as follows:

- (a) **Unfrozen food storage**—For storage of **unfrozen food**, specifically—
 - (i) **cellar compartment**—intended for storage of particular foods or beverages requiring temperatures warmer than those of **fresh food space**, and complying with the relevant requirements of Clause 3.6;
 - (ii) **fresh food compartment**—intended for storage of **fresh food**, and complying with the relevant requirements of Clause 3.6;
 - (iii) **chill compartment**—intended specifically for the storage of highly perishable **food stuffs** and complying with the relevant requirements of Clause 3.6; and
 - (iv) **special (unfrozen food) compartment**—claimed by the manufacturer as being intended for storage of particular, **unfrozen foods** that require a specific temperature range which is different from that of Items (i), (ii) or (iii) above and complying with the relevant requirements of Clause 3.6. A **compartment** with a claimed warmest and coldest temperature range that lies wholly within the range specified for Item (i), (ii) or (iii) above, shall be categorized and tested as the relevant **compartment** type above (i.e. not as a **special compartment**).
- (b) **Frozen food storage**—For **ice-making**, **frozen food storage** or **freezing**, specifically—

- (i) **ice-making compartment**—intended solely for **freezing** and storage of water ice cubes and complying with the relevant requirements of Clause 3.6;
 - (ii) **short term frozen food storage compartment**—intended specifically for short term storage of **frozen food** and complying with the relevant requirements of Clause 3.6;
 - (iii) **freezer compartment**—intended for freezing **fresh food** and for long term storage of **frozen food** and complying with the relevant requirements of Clause 3.6; and
 - (iv) **special (frozen food) compartment**—claimed by the manufacturer as being intended for storage of particular, **frozen foods** that require a specific temperature range which is different from that of Items (i), (ii) or (iii) above, and complying with the relevant requirements of Clause 3.6.
- (c) **Multi-use compartment**—Intended for use as two or more of the **compartment** types defined in Items (a) and (b) above and capable of being set by a user to maintain continuously the operating temperature range applicable to each **compartment** type claimed. (Refer also to Clause 2.3.2.3.)

Where a feature shifts temperatures in a **compartment** to a different operating temperature range for a period of limited duration only (i.e. the feature does not maintain the alternative temperature range continuously, e.g. a fast freeze facility) that feature does not qualify the **compartment** as having a multi-use classification.

NOTE: Refer to Clause 2.3.2 for additional requirements to be met when applying these definitions.

Throughout this Standard, the terms ‘storage type’ and ‘**compartment** type’ shall be taken to refer to the **food storage compartment type**.

1.3.13 Freezer test packages

Objects used for simulating a food load during test. Some packages are equipped to measure temperature and are referred to as **M packages**. (Refer to Appendix B, Paragraph B6.1 for further details.)

1.3.14 Frost-free appliance

A household **refrigerating appliance** in which all **frozen food** storage space is cooled by a **frost-free** system. **Unfrozen food** storage space may or may not be cooled by a **frost-free** system but all storage space in the appliance whether for **frozen** or **unfrozen food** is **automatically defrosted** with automatic disposal of water.

In a **frost-free** system—

- (a) cooling is provided by forced air circulation;
- (b) the system is automatically operated to prevent permanent formation of frost on all refrigerated surfaces; and
- (c) no accumulation of ice nor frost forms on stored food.

1.3.15 Group

Refer to Clause 1.3.19, ‘**Refrigerating appliance group**’.

1.3.16 Refrigerating appliance

A self contained, factory produced, insulated cabinet of a design and **volume** which is suitable for general household use, cooled by energy consuming means and intended for preservation of **foodstuffs**, **frozen** or **unfrozen**. Each is further classified as being of a particular **configuration**, **designation** and **group**. (Clauses 1.3.17, 1.3.18 and 1.3.19 respectively.)

1.3.17 Refrigerating appliance configuration

Defined as follows:

- (a) **Chest**—Where access is from the top. Also known as ‘top opening’ type.
- (b) **Upright**—Where access is from the front. Also known as ‘vertical’ type.
- (c) **Side by side**—An upright **refrigerator/freezer** where the largest **fresh food compartment** and the largest **freezer compartment** are side by side.

Where an appliance has both **chest** and **upright** configurations, it **shall** be classified as a **chest** where the **gross volume** of the **chest** component exceeds 50% of the total **gross volume**.

1.3.18 Refrigerating appliance designation

Defined as follows:

- (a) **Refrigerator**—An appliance for storage of **unfrozen food** in which at least half of the rated **gross volume** of the **unfrozen food compartments** is of the **fresh food** type. It may contain **compartments** of other **unfrozen** or **frozen food** storage types, but does not contain a **freezer compartment**.
- (b) **Refrigerator/freezer**—An appliance for storage of both **unfrozen** and **frozen food** and containing both **fresh food** and **freezer compartments**. It may contain **compartments** of other **food storage types** and—
 - (i) not less than half of the total **gross volume** available for storage of **unfrozen food** is of the **fresh food** type; and
 - (ii) not less than 80% of the total **gross volume** of **compartments** of the **frozen food** storage type is of the **freezer** type. In addition, the total **gross volume** of all **frozen food** storage **compartments** of types other than the **freezer** type does not exceed 30 litres*.
- (c) **Freezer**—An appliance for storage of **frozen food** and containing only, or mostly, **freezer** space. It may contain **compartments** of other **frozen food** storage types. However, not less than 80% of the total **gross volume** of **compartments** of the **frozen food** storage type is of the **freezer** type. In addition, the total **gross volume** of all **frozen food** storage **compartments** of types other than **freezer** type does not exceed 30 litres*.
- (d) **Cooled appliance**—An appliance which cannot be classified as either a **refrigerator**, **refrigerator/freezer** or **freezer**, as defined above. Refer also to Clause 2.3.4.
- (e) **Wine storage cabinet/compartment**—An appliance or a **compartment** within an appliance which is specifically designed exclusively for the storage and/or long term maturation of wine. Key characteristics of **wine storage cabinets/compartment** include constant temperature over time, specific humidity characteristics and low vibration. They may be designed to have stratified temperature zones. Typical characteristics include—
 - (i) the capability of maintaining continuously a nominated temperature (typically 14°C to 16°C) at an ambient temperature either, above or below the nominated temperature usually with heating as well as cooling;
 - (ii) the capability of maintaining temperatures within a variation over time of less than 0.5 K;

* Refer also to Clause 2.3.4.2 in relation to special compartments and Clause 2.3.4.3 in relation to multi-use compartments.

- (iii) control of the **compartment** humidity; and
- (iv) construction to reduce the transmission of vibration to the **compartment**, whether from the **refrigerator** compressor or from external source.

1.3.19 Refrigerating appliance group

Category into which a **refrigerating appliance** is classified for the purpose of applying Minimum Energy Performance Standards (MEPS) and energy labelling rules. Defined for any appliance by Table 1.1 and the accompanying notes.

Throughout this Standard, the word ‘**group**’ refers to ‘**refrigerating appliance group**’.

1.3.20 Liner

The formed component which creates the inner surface of a **compartment** or door.

1.3.21 M package

Refer to Clause 1.3.13, ‘**Freezer test packages**’.

1.3.22 Operating states

Defined as follows:

- (a) **Temperature control cycle**—Where there are definite repetitive swings in temperature caused by operation of a temperature control device (on/off or otherwise).

The period of a **temperature control cycle** is the time between a control event and its repetition on the next cycle.

- (b) **Control event**—**Control events** include but are not limited to—

- (i) starts, stops or speed step changes of compressors;
- (ii) changes of **baffle** position, fan operation, or other modulating control or device; and
- (iii) changes in operation of the refrigerant circuit.

Where the **control events** cannot be discerned, the period of a **temperature control cycle** is the time between two successive temperature warmest points or two successive temperature coldest points.

- (c) **Defrost control cycle**—The period commencing at the end of stable operation prior to the initiation of **automatic defrosting** and terminating at a like point prior to the next **automatic defrosting**. The commencement and finish points of the **defrosting control cycle** prior to **automatic defrosting** shall be—

- (i) for a refrigerating system with on/off cycles, the period commencing at the end of the last regular **temperature control cycle** (for example the end of last off period);
- (ii) for a refrigerating system without on/off cycles but with regular temperature cycles, at the last power/speed/cooling change that relates to a regular temperature maximum; and
- (iii) for a refrigerating system without on/off cycles and without regular temperature cycles, at the end of stable temperature operation.

Refer also to Clause 2.4 and Figure 3.1.

- (d) **Defrosting operation**—The period from the initiation of a **defrost control cycle** until the initiation of the refrigeration system cooling after defrosting.

- (e) **Defrost and recovery period**—The period from the initiation of a **defrost control cycle** until the temperatures in all compartments return to the temperatures that are equal to the temperatures just prior to the initiation of a **defrost control cycle** (within the allowable requirements for stability for average **compartment** temperatures). For products which perform poorly (for example that have a temperature that is continually decreasing after a defrosting operation), the **defrost and recovery period** could be equal to the **defrost control cycle**.
- (f) **Recovery period**—The period from the end of the **defrosting operation** until the end of the **defrost and recovery period**.
- (g) **Steady state operation**—Operation in a constant ambient temperature where the temperatures in all compartments and the total power consumption of the appliance over one or several **temperature control cycles** remains at a relatively constant value, and which would continue for an indefinite period in the absence of defrost events or user interactions.
- (h) **Normal use**—When the appliance is subjected to a range of different conditions that could occur during use, including operation in a range of indoor temperatures (including those defined in the operating temperature performance test, see Appendix J), a range of different humidity levels and a range of user-related actions, such as door openings (which may be frequent, infrequent, long, short or a mixture thereof) and the addition, general storage and removal of foodstuffs.

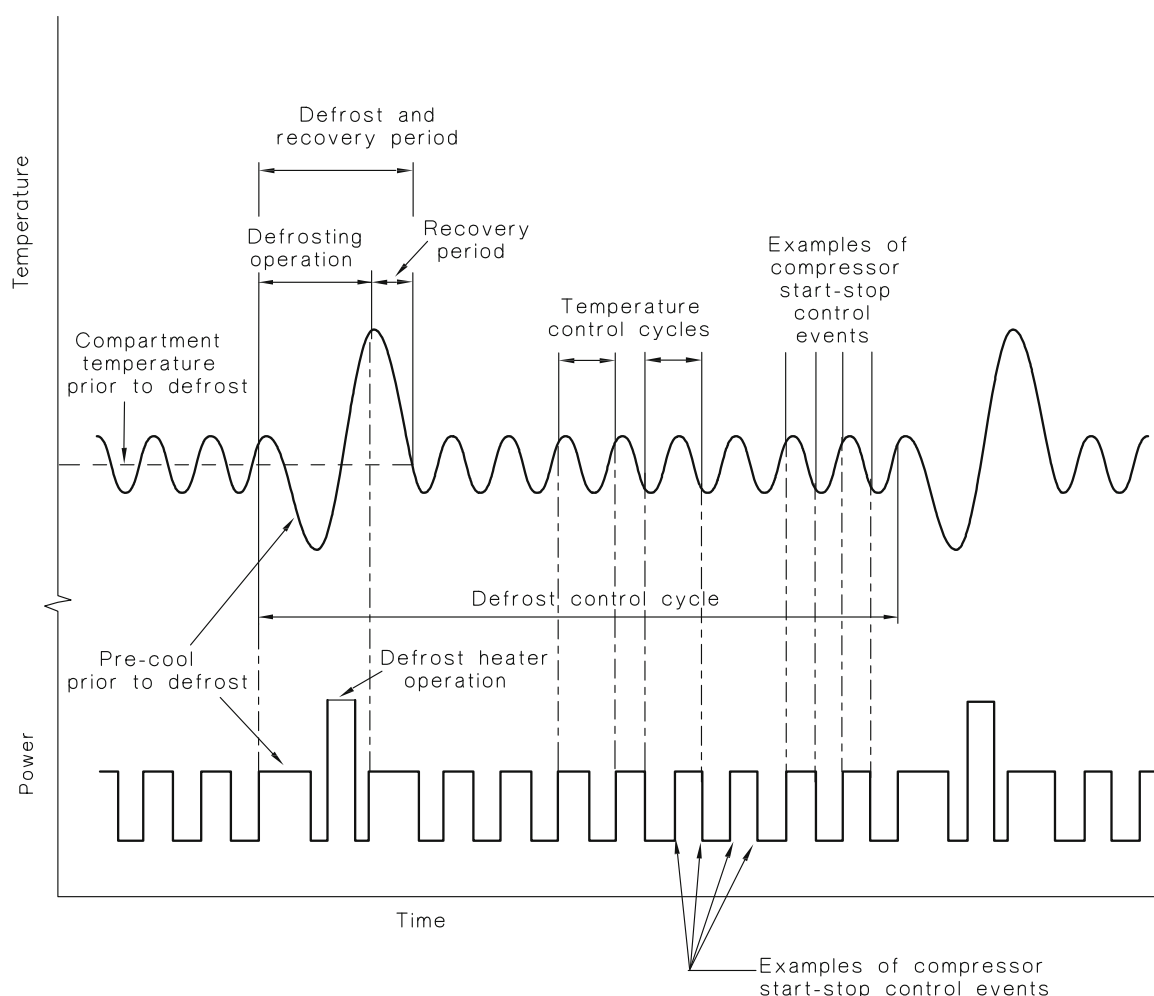


FIGURE 1.1 ILLUSTRATION OF DEFINITIONS AS DEFINED IN CLAUSE 1.1.22

1.3.23 Shelf

Any horizontal surface (**shelf**, partition or the like) on which food can be placed. **Shelf** areas are as follows: (Refer also to Appendix A.)

- (a) **Storage shelf area**—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 Appendix A.)
- (b) **Rated storage shelf area**—**Storage shelf area** claimed by the manufacturer. (Determined in accordance with Appendix A.)

1.3.24 Statements of intention

These indicate the following:

- (a) **Shall**—Indicates that a statement is mandatory.
- (b) **Should**—Indicates a recommendation.
- (c) **Normative**—Defines the application of an appendix. A normative appendix is an integral part of this Standard and compliance is mandatory.
- (d) **Informative**—Defines the application of an appendix. An informative appendix is only for information and guidance.

1.3.25 Target temperature (tt)

A **compartment** temperature which is used as a reference for determining energy consumption. (Refer to Table 3.5 and Clause 1.3.11).

1.3.26 Temperature control

A control which is intended for adjustment by the user for the purpose of varying the temperature within one or more **compartments** within a **refrigerating** appliance.

Unless otherwise stated, a two position (e.g. open or closed) control is not included within the meaning of a **temperature control**.

1.3.27 Temperature control cycle

Refer to Clause 1.3.22, 'Operating states'.

1.3.28 Tested energy consumption (E_t)

The average energy consumption of a **refrigerating appliance**, expressed as energy per 24 h, when tested in accordance with Clause 2.16.

1.3.29 Volume

The **volume** enclosed within a **refrigerating appliance** is categorized as follows:

- (a) Measured values—
 - (i) **Gross volume**—The measured volume enclosed within a **compartment**. (Determined in accordance with Appendix A.)
 - (ii) **Storage volume**—The **gross volume** of a **compartment**, minus the volumes of components and spaces recognized as being unusable for food storage. (Determined in accordance with Appendix A.)
 - (iii) **Total gross volume**—The sum of the **gross volumes** for all **compartments** in a **refrigerating** appliance. (Determined in accordance with Appendix A.)
 - (iv) **Total storage volume**—The sum of the **storage volumes** for all **compartments** in a **refrigerating** appliance. (Determined in accordance with Appendix A.)

- (b) **Rated values**—The **rated gross volume**, **rated storage volume**, **rated total gross volume** or **rated total storage volume** is in each case the value, which is claimed by the manufacturer.

A2

1.3.30 Circumvention device

Any undeclared control, control device, software, component or part that alters the operating characteristics during any test procedure, resulting in measurements that are unrepresentative of the appliance's true characteristics that may occur during **normal use** under comparable conditions. Generally, **circumvention devices** save energy during an energy test, but not during **normal use**.

Some examples of **circumvention devices** may include any variation to normal operation when the appliance is subjected to testing, and includes devices that—

- (a) alter compartment temperature set points during the test;
- (b) activate or de-activate heaters or other energy-consuming devices during the test;
- (c) manipulate compressor cycle time or other operating parameters during the test; or
- (d) manipulate the defrost interval.

NOTE: Control of a **refrigerating appliance** in response to home networks and smart grid requirements are under consideration.

A2

1.3.31 Declared automatic controls

Controls that operate automatically over a restricted, specific range of conditions and have a legitimate basis for their operation during **normal use** and under the test procedure for energy consumption.

NOTE: Requirements for **declared automatic controls** are set out in Clause 3.9.

The following controls and devices are not included in the scope of **declared automatic controls**—

- (a) automatic controls that are required for the maintenance of satisfactory food preservation temperatures within unfrozen compartments in a refrigerator-freezer when operating at low ambient temperatures (low ambient temperature compensation heaters);
- (b) **adaptive defrost** controls as defined in Clause 1.3.7(b) and that comply with the requirements of Clause 3.8; or
- (c) ambient controlled anti-condensation heaters (within the scope of Appendix S).

NOTE: Specific requirements regarding ambient controlled anti-condensation heaters are set out in Appendix S. Low ambient temperature compensation heaters are allowed to operate normally for energy tests. Additional controls that are outside the scope of declared automatic controls may be added by amendment to this Clause.

TABLE 1.1
HOUSEHOLD REFRIGERATING APPLIANCE GROUPS

Appliance designation	Food storage compartment types						Configuration requirements (Refer to Note 4)	Defrost system requirements (Refer to Note 5)	Group
	Unfrozen food storage			Frozen food storage					
	Cellar	Fresh food	Chill	Ice-making	Short term	Freezer			
Refrigerator	O	Y	O	N	N	N		Automatic defrost	1
Cooled appliance	L	L	L	N	N	N			
Refrigerator	O	Y	O	O	N	N			2
Cooled appliance	L	L	L	O	N	N			
Refrigerator	O	Y	O	O	Y	N			3
Cooled appliance	L	L	L	O	Y	N			
Refrigerator/freezer	O	Y	O	O	O	Y		Cyclic defrost (Refer to Note 6)	4
Cooled appliance	L	L	L	O	O	Y			
Refrigerator/freezer	O	Y	O	O	O	Y	Top freezer	Frost-free	5T
Cooled appliance	L	L	L	O	O	Y			
Refrigerator/freezer	O	Y	O	O	O	Y	Bottom freezer	Frost-free	5B
Refrigerator/freezer	O	Y	O	O	O	Y	Side by side	Frost-free	5S
Freezer	N	N	N	O	O	Y	Chest		6C
Cooled appliance	N	N	N	O	L	L			
Freezer	N	N	N	O	O	Y	Upright	Not frost-free	6U
Cooled appliance	N	N	N	O	L	L			
Freezer	N	N	N	O	O	Y	Upright	Frost-free	7
Cooled appliance	N	N	N	O	L	L			

NOTES: (Refer also to Clause 2.3.5.)

- To define the group to which an appliance belongs, its designation (Clause 1.3.18), constituent compartment types (Clause 1.3.12), configuration (Clause 1.3.17), defrost system (Clause 1.3.7) and whether it is frost-free or not (Clause 1.3.14) must first be established. Each row of Table 1.1 is then considered until the applicable row, and hence the Group, is established.
- In defining the group of an appliance, Table 1.1 is applied to compartments. Convenience features are not considered.
- Requirements to be met by the appliance in question regarding food storage compartment types.
 'Y' — indicates 'yes'. i.e. the appliance shall have at least one compartment of each of the types marked Y.
 'N' — indicates 'no'. i.e. the appliance shall have no compartments of the types marked N.
 'L' — indicates 'at least one'. i.e. the appliance shall have at least one compartment from the types marked L within each of the food storage types (unfrozen or frozen, as applicable).
 'O' — indicates 'optional'. i.e. the appliance may or may not have any compartments from the types marked O.
- This column sets out the requirements to be met by the appliance in question regarding household refrigerating appliance configuration. A blank cell in this column indicates no particular requirements regarding configuration and therefore includes any configuration. A frost-free cooled appliance with a freezer and unfrozen food storage shall be classified as group 5T irrespective of configuration.
- This column sets out the system requirements to be met by the appliance in question regarding the prevention or removal of frost. A blank cell in this column indicates no particular system requirements. The entry 'not frost-free' indicates that the appliance shall have at least one frozen compartment that is any category of system except frost-free. The entry 'frost-free' indicates that all frozen compartments are frost-free. Refer to frost-free Clause 1.3.14.
- Any refrigerating appliance which is configured as a Group 4 appliance but does not meet the defrost type criteria shall be deemed to be a Group 3 appliance. This particular requirement applies even though the appliance contains a freezer compartment. Refer to in Clause 1.3.6.
- An appliance with both chest and upright frozen food configurations shall be classified as Group 6C only where the gross volume of the chest component exceeds 50% of the total gross volume. Otherwise it shall be classified in the appropriate upright group. Refer as for Clause 1.3.17.
- Refer to Clause 2.3.5.3 for different groups.
- If a product can be classified as a Group 1 and 2, it shall be Group 1.

SECTION 2 CLASSIFICATION, MEASUREMENT AND TEST REQUIREMENTS

2.1 SCOPE

This Section sets out the requirements for the classification, measurement and testing of a household **refrigerating appliance**, and the reporting of the test results. Clauses 2.5 to 2.22 also serve as a key to the intended use of the Appendices.

2.2 CONSIDERATION OF CONVENIENCE FEATURES

For the purposes of the tests in this Standard, a **convenience feature** is not subject to the temperature measurement requirements which apply to **sub-compartments**. However this is conditional upon the requirement that the sum of the gross **volumes** of—

- (a) fixed **convenience features** in a **compartment** shall not exceed 25% of the compartments **gross volume**; or
- (b) the sum of fixed and removable **convenience features** in a **compartment** shall not exceed 40% of the **compartments gross volume**.

Where the **volume** of fixed **convenience features** in any **compartment** exceeds these limits, a sufficient number of fixed **convenience features** shall be selected and deemed to be **sub-compartments** (and therefore classified and tested accordingly) until the above **volume** requirement on **convenience features** is met according to the following rules:

- (i) Firstly, those with separate **temperature controls** (including those with 2 position controls) in decreasing size order; then
- (ii) Those without separate **temperature controls** in decreasing size order;

Where the above rules give two or more **convenience features** an equal ranking, the first selected shall be the one farthest from the centre of the space in which **compartment** temperature sensors are located.

NOTES:

- 1 Details of **temperature control** setting for **convenience features** are set out in Paragraph C2.7.
- 2 Where a **compartment** consists wholly or mainly of drawers and/or bins, these generally would not be considered as all **convenience features** for the purpose of this clause and its requirements. Refer also to Appendix D.

2.3 CLASSIFICATION OF APPLIANCES

2.3.1 General

In order to test an appliance, each **compartment** shall first be classified according to its type (Clause 1.3.12), then the appliance configuration (Clause 1.3.17), **designation** (Clause 1.3.18) and **group** (Clause 1.3.19) established, as set out below.

2.3.2 Compartment type

2.3.2.1 General

Each **compartment** shall be classified into one of the nine types defined in Clause 1.3.12.

2.3.2.2 *Special compartments*

Compartments shall be classified as **special (unfrozen food) compartments** only if the intended storage use and operating temperature range are stated by the manufacturer, either on the appliance or in the accompanying product literature, and these comply with the definition, Clause 1.3.12 (a)(iv).

Compartments shall be classified as **special (frozen food) compartments** only if the intended storage use and warmest operating temperature are stated by the manufacturer, either on the appliance or in the accompanying product literature, and these comply with the definition, Clause 1.3.12 (b)(iv).

2.3.2.3 *Multi-use compartments*

Compartments shall be classified as **multi-use compartments** only if the intended uses are stated by the manufacturer, either on the appliance or in the accompanying product literature, and these comply with the relevant definition, Clause 1.3.12(c).

2.3.3 Refrigerating appliance configuration

The appliance **shall** be classified into one of the three configurations defined in Clause 1.3.17.

2.3.4 Refrigerating appliance designation

2.3.4.1 *General*

The appliance **shall** be designated as one of the four options defined in Clause 1.3.18.

An appliance **shall** only be designated as a **refrigerator**, **refrigerator/freezer** or **freezer** if it meets all of the requirements set out in Clause 1.3.18 (a), (b) or (c), as applicable and as further detailed below. If an appliance does not meet the requirements for one of these three **designations**, it **shall** be designated a cooled appliance.

Example 1: Consider an appliance which has two **compartments**, one of the **fresh food** type and one of the **cellar** type. If the gross **volume** of the **fresh food compartment** forms at least half of the **total gross volume** of the available **unfrozen food storage space**, (which in this case, is the **total gross volume** of the appliance), then the appliance is designated a **refrigerator**. Otherwise, this appliance is designated a **cooled** appliance.

Example 2: Consider an appliance which has a **freezer compartment** and two **unfrozen food storage compartments**. If at least half of the **gross volume** of the **unfrozen food storage space** is of the **fresh food type**, then the appliance is designated a **refrigerator/freezer**. Otherwise, this appliance is designated a **cooled** appliance.

2.3.4.2 *Special compartments*

When determining whether **freezer volume** requirements for designating an appliance as a **refrigerator/freezer** or as a **freezer** (refer to Clause 1.3.18) are met by an appliance that contains one or more **special (frozen food) compartments**, the **volume** of a **special (frozen food) compartment shall** be included in the total **freezer volume** of the appliance only if the claimed warmest operating temperature of that **special (frozen food) compartment** is not warmer than the warmest operating temperature specified for a **freezer compartment**. (Refer to Clause 3.6.).

2.3.4.3 *Multi-use compartments*

When determining the **designation** of an appliance which contains one or more multi-use **compartments**, each such **compartment shall** normally be treated as if it were of its coldest claimed type. Where that is a **special** type, the provisions of Clause 2.3.4.2 then apply to that **compartment**.

2.3.5 Refrigerating appliance group

2.3.5.1 General

The appliance **shall** be classified into one of the **groups** defined in Clause 1.3.19, including Table 1.1 and the accompanying notes. (Refer to Appendix P for examples).

2.3.5.2 Special compartments

When determining the **Group** of an appliance which contains one or more **special compartments**, each **special type compartment** **shall** be treated as though it were of one of the specified types described in Clauses 1.3.12 (a)(i), (ii) or (iii) or Clauses 1.3.12 (b)(i), (ii) or (iii). This type **shall** be determined by the claimed warmest of the **operating temperature range** for the **compartment** in accordance with the following table.

TABLE 2.1
SPECIFIED EQUIVALENTS FOR SPECIAL TYPE COMPARTMENTS WHEN
DETERMINING THE GROUP OF AN APPLIANCE

Claimed maximum of operating temperature range	Equivalent specified compartment type
Warmer than 6°C	Cellar
Warmer than 3°C but not warmer than 6°C	Fresh food*
Warmer than -2°C but not warmer than 3°C	Chill
Warmer than -9°C but not warmer than -2°C	Ice-making
Warmer than -15°C but not warmer than -9°C	Short term frozen food storage
-15°C or colder	Freezer

* A different rule, as specified in Clause 2.3.4.2, applies when determining appliance designations.

NOTE: Also see Clause 1.3.12 (a) (iv) and 1.3.12 (b) (iv) for definition of special compartments.

2.3.5.3 Multi-use compartments

For the purpose of determining the **Group** of an appliance which contains one or more **multi-use compartments**, each **compartment** **shall** be treated as if it were of its coldest claimed type. Where that is a **special** type, the provisions of Clause 2.3.5.2 apply to that **compartment**.

Where, however, the **group** of an appliance can be changed by selecting different modes for one or more **multi-use compartment** the supplier may choose to determine the compliance and energy consumption of the appliance for more than one **group**, and have it tested in this/these other **group** configuration(s) in addition to that with all **compartments** set to their coldest claimed type.

Where an appliance can be configured to more than one **group** and the manufacturer claims this, then the product **shall** be marked with each configurations/**designations** and **groups** clearly stated.

NOTE: Stars and ratings for other groups may be claimed on the appliance label in accordance with AS/NZS 4474.2.

2.4 DEFROST CONTROL CYCLE CHARACTERISTICS

2.4.1 General

The behaviour of each **compartment** of an appliance under test, with regard to the existence and duration of **defrost control cycles** (Clause 1.3.22(c)) **shall** be classified into one of the categories defined by Clause 2.4.2.

NOTE: Although in some cases the category can be predicted, it is usually necessary to begin testing in order to complete this classification.

2.4.2 Defrost system characteristics

Each test run on the appliance **shall** be classified into one of four categories as follows:

- (a) **Refrigerating appliances** without an **automatic defrost system** (whether there is no **automatic defrost system** or it has been disconnected for the test), and **cyclic defrost appliances**.
- (b) **Refrigerating appliances** with an **automatic defrost system** (excluding **cyclic defrost appliances**) where, during an energy consumption test, the **defrost control cycle** is of less than 6 h duration.
- (c) **Refrigerating appliances** with an **automatic defrost system** (excluding **cyclic defrost appliances**) where, during an **energy consumption test**,
 $6 \text{ h} \leq \text{duration of defrost control cycle} \leq 24 \text{ h}$.
- (d) **Refrigerating appliances** with an **automatic defrost system** (excluding **cyclic defrost appliances**) where, during an **energy consumption** or **automatic ice-making** test, the duration of the **defrost control cycle** is greater than 24 h. (Refer to Clause 1.3.7).

NOTE: A **defrost** period of greater than 24 h does not automatically qualify a product as 'adaptive defrost' under this Standard. (Refer to Clause 1.3.7(b)).

Where a **refrigerating appliance** contains more than one **defrost system** above, the appliance **shall** be classified in a way such that the classification used results in the most repeatable result for energy consumption and performance for that product, which would typically be based on the predominant **defrost system**. (Refer to Paragraph K6).

2.5 STORAGE SHELF AREA

Provision of the **storage shelf area** is optional. However if stated by the manufacturer it **shall** be determined in accordance with Appendix A.

2.6 GROSS AND STORAGE VOLUMES

The determination of the **measured values** of the **gross volume(s)** and **storage volume(s)** and the subsequent determination of the rated value(s) of each, if applicable, **shall** be in accordance with Appendix A.

NOTE: A new method of determining volume is under consideration. The objective is to better reflect true space available to the user and to provide measurement methods that are practicable.

2.7 TEST ROOM, INSTRUMENTATION AND MATERIALS

All tests **shall** be carried out using a test room, instrumentation and associated materials, as described in Appendix B, except where specifically varied by other appendices.

2.8 PREPARATION OF AN APPLIANCE FOR TESTING

Prior to carrying out any tests on an appliance, it **shall** be prepared as set out in Appendix C, except where specifically varied by other appendices.

2.9 DETERMINATION OF COMPARTMENT AIR TEMPERATURES

Where it is required to determine the air temperature within any **compartment**, this **shall** be determined in accordance with Appendix D.

2.10 SELECTION AND PLACEMENT OF FREEZER TEST PACKAGES

Where it is required to measure the temperature of a **compartment** using **freezer test packages**, these **shall** be selected and placed in accordance with Appendix E.

2.11 THERMAL EQUILIBRIUM (FOR PULL DOWN TESTS)

Prior to the commencement of a pull down performance test the appliance under test **shall** satisfy the conditions of thermal equilibrium set out in Appendix F.

2.12 PULL DOWN PERFORMANCE

The pull down performance **shall** be determined in accordance with Appendix G.

2.13 THERMAL STABILITY

Thermal stability conditions set out in Appendix H **shall** apply when performing **operating temperature**, energy consumption and **automatic ice-making** tests.

2.14 AUTOMATIC ICE-MAKING PERFORMANCE

Where a **refrigerating appliance** has an **automatic ice-maker**, and the **ice-making** performance is required or stated, it **shall** be determined in accordance with Appendix I.

2.15 OPERATING TEMPERATURE PERFORMANCE

The operating temperature performance **shall** be determined in accordance with Appendix J.

2.16 DETERMINATION OF TESTED ENERGY CONSUMPTION (E_t)

The **tested energy consumption** **shall** be determined in accordance with Appendix K.

2.17 METHOD OF INTERPOLATION WHERE A SINGLE-CONTROL IS ADJUSTED

Where the **energy consumption** at the **target temperature** of one or more **compartments** is to be determined by interpolation by adjusting one **temperature control** of an appliance, this interpolation **shall** be performed as set out in Appendix L.

2.18 METHOD OF INTERPOLATION WHERE TWO CONTROLS ARE ADJUSTED

Where the **energy consumption** at the **target temperature** of two or more **compartments** is to be determined by interpolation by adjusting two **temperature controls** of an appliance, this interpolation **shall** be performed as set out in Appendix M.

NOTE: Where a product has more than two **temperature controls**, only two of these can be adjusted between tests for interpolation (refer Appendix M).

2.19 FITTING A QUADRATIC EQUATION TO EXPERIMENTAL DATA

If it is required to determine the equation of a line passing through three points determined in accordance with Appendix L, the method as detailed in Appendix N is suitable.

2.20 CALCULATION OF E_t —WORKED EXAMPLES

Example calculations of **tested energy consumption** (E_t) are contained in Appendix O.

2.21 DETERMINATION OF APPLIANCE GROUP—WORKED EXAMPLES

Example determination of the household **refrigerating appliance group**, for a number of different appliances, are contained in Appendix P.

2.22 TWO PART ENERGY CONSUMPTION METHOD

Where required, the energy consumption **shall** be determined by the two part **energy consumption** method in accordance with Appendix Q.

2.23 NOISE

Where a noise emission value is quoted for an appliance, this **shall** be determined in accordance with ISO 8960.

NOTE: ISO 8960 references IEC 60704 .1 for the measurement method.

2.24 REPORTING OF RESULTS

The results of each test relevant to registration and energy labelling **shall** be recorded for later presentation in a format similar to that shown in Appendix R.

SECTION 3 PERFORMANCE REQUIREMENTS

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3.1 GENERAL

A **refrigerating appliance** shall not contain a **circumvention device**. Any refrigerating appliance that is found to contain a **circumvention device** does not comply with the requirements of this Standard.

When tested in accordance with this Standard, the **refrigerating appliance** shall not behave in a manner that is different from the way that it would operate when set up and used by a consumer during **normal use** under comparable conditions. Where the operation of a **circumvention device** is suspected during a verification test, a laboratory **should** subject the appliance to measures such as door openings or other appropriate actions in an attempt to detect presence and operation of any such devices. Details of any such action and their effect **shall** be included in the test report. Where a **circumvention device** is suspected or detected during testing for registration, a laboratory **shall** report that information to the client.

Where a **circumvention device** is found to be present and operating during an energy test, where possible, the **circumvention device** shall be defeated in order to obtain an energy test value to assess the impact of the **circumvention device**. Where it is not possible to defeat the **circumvention device**, the energy impact of the device **shall** be quantified and this value used to adjust the measured energy consumption to give the expected value during **normal use** under comparable conditions for assessment purposes.

NOTE: For example, where any **circumvention device** affects the defrost interval (length of the **defrost control cycle**), the average defrost interval that does or would occur with the **circumvention device** defeated is used for energy consumption calculations.

A **refrigerating appliance** may contain a **declared automatic control** that alters the energy consumption during **normal use** or under other specific conditions. The requirements for such controls are set out in Clause 3.9.

A **refrigerating appliance** shall provide appropriate stable temperatures for the safe, convenient storage and preservation of **foodstuffs**. The intent is that temperatures and temperature characteristics as set, **shall** not vary significantly during **normal use** in unchanged external temperature conditions.

Any **automatic defrost** system (including an **adaptive defrost** system) **shall** meet all ongoing defrosting needs, without any user intervention, as may occur under a wide range of **normal use** conditions.

During **normal use** under any ambient condition or control setting, any abnormal occurrence such as any excess melting water from an **evaporator** or other refrigerated surface of the appliance **shall** be collected, evaporated or otherwise disposed of. Any pooling of water or water leaking from the appliance door **shall** be deemed as a failure of this requirement, even under heavy usage conditions.

To meet this objective **refrigerating appliances** shall comply with Clauses 3.6 and 3.7. Should new technology allow appliances to meet the specific test requirements of this Standard but not the intent, as noted above, this Standard will be amended accordingly.

3.2 STORAGE SHELF AREA

The measured storage **shelf** area for any unit under test **shall** be not less than the rated value of that unit, when determined in accordance with Clause 2.5.

3.3 GROSS AND STORAGE VOLUMES

The relationships between the **measured** and **rated gross** and **storage volumes** of any unit under test, when determined in accordance with Clause 2.6, **shall** satisfy the following requirements:

- (a) **Gross volume or storage volume of a compartment**—The **rated value** shall satisfy either of the following inequalities:
 - (i) **rated value** $\leq 1.03 \times$ measured value; and/or
 - (ii) **rated value** $\leq 1 +$ measured value (in litres).
- (b) **Total gross volume or total storage volume of an appliance**—The **rated value** shall satisfy either of the following inequalities:
 - (i) **rated value** $\leq 1.03 \times$ measured value; and/or
 - (ii) **rated value** $\leq 5 +$ measured value (in litres).

NOTE: These are tolerances to verify rated values claimed by manufacturers. Determination of rated volumes values is specified in Paragraph A8.

3.4 PULL DOWN

When tested in accordance with Clause 2.12, the average air temperature in all **compartments shall** be at or below the applicable values specified in Table 3.1 within 6 h. This requirement is to ensure that the appliance has adequate reserve refrigerating capacity. This performance requirement does not apply to stand-alone **wine storage cabinets** or **wine storage compartments** within the **refrigerating appliance**.

TABLE 3.1
PULL DOWN TEMPERATURES FOR COMPARTMENTS

Compartment type	Average air temperature, °C
UNFROZEN FOOD TYPES	
Cellar	16
Fresh food	8
Chill	5
Special (unfrozen)	2°C warmer than claimed max.
FROZEN FOOD TYPES	
Ice-making	No test requirement
Short term storage	−8
Freezer	−13
Special (frozen)	2°C warmer than claimed max.

3.5 AUTOMATIC ICE-MAKING

Where an **automatic ice-making** capacity is claimed, the facility **shall** be capable of providing the stated mass of ice in 24 h when tested in accordance with Clause 2.14.

Where an appliance includes an automatic ice-making feature that produces and stores ice, the space that the ice storage bin occupies **shall** conform to all requirements of the **frozen food storage compartment** within which it is located, unless it, or its ice storage bin, is specifically registered as a separate **sub-compartment**.

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If the automatic ice-maker or its associated storage bin is located in an **unfrozen food storage compartment**, it **shall** be declared as a **sub-compartment** and **shall** conform to the temperature requirements of a **compartment** of an ice-making or colder type **compartment**; whether it is producing ice or not; and **shall** meet the requirements of Clauses 3.6 and 3.7.

If an automatic ice-making bin is operated as a **sub-compartment** (refer to Clause 1.3.3(b)) it **shall** be declared under 'Compartment Details' in the Regulatory Test Report (refer to Appendix R, Paragraph R2).

NOTES:

- 1 Appendix C, Paragraph C2.5(b) sets out requirements for setting up and testing of products with automatic ice-makers. Specific setup requirements for energy consumption testing are set out in Appendix C, Paragraph C2.8.
- 2 The adjusted volume for the ice storage bin is based on the compartment or sub-compartment type used for performance and energy assessments.

3.6 OPERATING TEMPERATURE PERFORMANCE

When tested in accordance with Clause 2.15, there **shall** be at each test ambient (10°C, 32°C and 43°C) at least one setting of the controls at which all **compartments** and **sub-compartments** are within the **temperature limits** shown in Tables 3.2, 3.3 and 3.4.

NOTE: It is not intended that **refrigerating appliances** comply with the applicable temperature performance requirements of Tables 3.2, 3.3 and 3.4 at every thermostat setting in every ambient temperature.

3.6.1 Multi-use compartments

Where an appliance has one or more **multi-use compartments** then, when testing at 10°C and 43°C, each **shall** be treated as being of the coldest type claimed by the manufacturer, except where the only claimed **fresh food storage space** in the appliance is in one or more **multi-use compartments**, then the appliance **shall** also be tested at 10°C and 43°C with the largest of those **multi-use compartments** set for **fresh food storage**.

When testing at 32°C, sufficient tests **shall** be conducted to demonstrate that the appliance complies when the multi-use **compartments** are set on each of their claimed functions.

3.6.2 Ice-making compartments

Where one or more **M packages** have been accommodated, the temperature **shall** be measured and the temperature requirements of Tables 3.3 and 3.4 **shall** be met.

Where no **M packages** could be accommodated and ice cube trays were inserted in the **compartment**, on completion of a test run, all of the water in any ice cube trays **shall** be **frozen** when all other **compartments** have met their relevant requirements.

3.6.3 Group 1 to 5 appliances with no fresh food space

In the case of an appliance in **Groups 1 to 5** with no **fresh food space**, the largest **unfrozen food storage space** **shall** be tested and **shall** comply at all three test ambient temperatures.

TABLE 3.2
ALLOWABLE OPERATING TEMPERATURE RANGES FOR UNFROZEN FOOD COMPARTMENTS

Compartment type	Ambient temperatures at which conditions are to be met °C			Allowable range of average compartment air temperature °C	
				Min.	Max.
Cellar†	—	32	—	8	14
Fresh food space	10	32	43	0.5	6
Chill†	—	32	—	−2	3
Special (unfrozen food)†	—	32	—	Within claimed range*	

* The claimed coldest average temperatures of any special (unfrozen food) **compartment** shall be warmer than −2°C and the difference between its claimed warmest and its claimed coldest shall not exceed 6 K. A multi-use type **compartment** may have several user selectable food storage **compartment** type options each of which has a temperature range not exceeding 6 K.

† Refer to Clause 3.6.3 for particular circumstances in which a cellar, chill or special (unfrozen food) type **compartment** of an appliance is to be tested at 10°C and 43°C as well as 32°C.

TABLE 3.3
MAXIMUM ALLOWABLE OPERATING TEMPERATURES FOR FROZEN FOOD COMPARTMENTS IN GROUP 2 TO 5S APPLIANCES

Compartment type	Ambient temperatures °C			Maximum allowable temperature of warmest test package °C
Ice-making	10	32	43	−2
Short term frozen food storage	10	32	43	−9
Freezer	10	32	43	−15
Special (frozen)	10	32	43	Claimed maximum temperature*

* The claimed maximum shall not be warmer than −2°C.

TABLE 3.4
MAXIMUM ALLOWABLE TEMPERATURES FOR COMPARTMENTS IN
GROUP 6C, 6U AND 7 APPLIANCES

Compartment type	Ambient temperatures at which conditions are to be met °C			Maximum allowable value of average compartment air temperature °C	Maximum allowable temperature of warmest test package °C
Ice-making	10	32	—	–2	N/A
	—	—	43	N/A	–2
Short term frozen food storage	10	32	—	–9	N/A
	—	—	43	N/A	–9
Freezer	10	32	—	–15	N/A
	—	—	43	N/A	–15
Special (frozen food)	10	32	—	Claimed maximum temperature*	N/A
	—	—	43	N/A	Claimed maximum temperature*

* The claimed maximum shall be not warmer than –2°C.

3.7 ENERGY TEST REQUIREMENTS

3.7.1 Tested energy consumption (E_T)

The **tested energy consumption** of an appliance is determined from measurements taken when tested as specified in Clause 2.16 in an ambient temperature of 32°C and with **compartment** temperatures at or below the **target temperatures** specified in Table 3.5.

Where heaters are operational during normal use, they are to remain operational and managed by the same control regime during the energy test. Such heaters include, without limitation, those used to prevent internal or external moisture build-up, to keep gaskets pliable, to keep water reservoirs or lines from freezing, or deemed as necessary for the normal operation and reliability of the product.

Any mode which reduces **energy consumption** under energy test conditions (including management of heaters) but which is not generally saving energy during normal use **shall** be defeated where possible for **energy consumption** testing. Where requested, the manufacturer **shall** provide instructions to the test laboratory to enable it to meet this requirement. Where such an energy reduction mode cannot be disabled for the duration of the energy consumption test, then the energy impact **shall** be quantified and this value used to adjust each measured energy consumption rate (as specified in Appendix K, Paragraph K8). These adjusted values are then used to determine the tested **energy consumption** (E_t).

NOTE: AS/NZS 4474.2 specifies how E_t is used to determine the **energy consumption** and efficiency figures to be presented on an energy label, the validity of this data on existing labels, and whether or not an appliance complies with Minimum Energy Performance Standards.

Where an energy reduction mode affects the **steady state operation** (including management of heaters), the additional power during **normal use** **shall** be included in energy consumption calculations as specified in Appendix K, Paragraph K8 (also refer to Appendix Q, Paragraph Q2). Where an energy reduction mode affects the characteristics of the **defrost and recovery period** or the length of the **defrost control cycle**, the average **defrost and recovery period** characteristics and the average length of the **defrost control**

- A2 **cycle** that does or would occur during **normal use shall** be used for energy consumption calculations as specified in Appendix K, Paragraph K8 (also refer to Appendix Q, Paragraph Q3).

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TABLE 3.5

**TARGET TEMPERATURES FOR MEASUREMENT OF
ENERGY CONSUMPTION FOR COMPARTMENTS**

Compartment type	Target average air temperature °C
UNFROZEN FOOD TYPES	
Cellar	12
Fresh food	3
Chill	0
Special (unfrozen)	Midpoint of claimed range
FROZEN FOOD TYPES	
Ice-making*	No target temperature
Short-term frozen food	−9
Freezer	−15
Special (frozen)	Claimed maximum operating temperature

* Where an automatic ice-making storage bin sub-compartment is claimed as an ice-making compartment type, then the target average air temperature for energy consumption determination **shall** be −2°C.

3.7.2 Control settings for energy consumption test

The appliance **shall** have at least one setting of the controls at which the average temperatures of all **compartments** are concurrently at or below the **target temperatures** for measurement of **energy consumption** that are specified in Table 3.5 where tested for energy in accordance with Clause 2.16. The data points used for **energy consumption** determination **should** demonstrate that the product is capable of meeting this requirement but this specific point need not be measured directly.

3.7.3 Temperature variations during energy tests

The intent of this Clause is to ensure that the **refrigerating appliance** limits the duration and extent of any **defrost** temperature excursion and **recovery period** and operates in a consistent manner to ensure that food safety and quality is maintained during normal operation.

Where a product has a **defrost control cycle**, the appliance **shall** comply with the following requirements as shown in Figure 3.1:

- During the **defrosting** operation in an energy consumption test the maximum temperature of any **freezer compartment** measuring point shall not exceed 0°C for a period of more than 20 min. Refer to Figures 3.1(a) and 3.1(b). For verification tests, the test run selected shall be valid for energy determination (refer Appendix K) and the freezer **compartment** average temperature shall be at or below the **target temperature**.
- During the **defrost** and **recovery period**, the period in which the average temperature in each **compartment** is more than 2 K above the average **compartment** temperature for the **temperature determination period** (refer to Paragraph D4.3) shall not exceed 2 h or 20% of the **defrost control cycle**, whichever is the shorter. Refer to Figure 3.2.

For an appliance that is not cycling, compliance with the above requirement shall be determined directly using the instantaneous average compartment temperature. Refer also D3.

For an appliance that is cycling, the temperature at the compliance time (2 h or 20% of the **defrost control cycle**) to verify the above requirement shall be determined as follows:

$$\begin{aligned}
 T_a &= \frac{T_{a1} + T_{a2}}{2} \\
 T_b &= \frac{T_{b1} + T_{b2}}{2} \\
 t_a &= \frac{t_{a1} + t_{a2}}{2} \\
 t_b &= \frac{t_{b1} + t_{b2}}{2} \\
 t_{\text{compliance}} &= t_a + (t_b - t_a) \times \left(\frac{x - T_a}{T_b - T_a} \right) \dots 3(1)
 \end{aligned}$$

where

- x = 2 h or 20% of the **defrost control cycle**, whichever is shorter. Units: hours
- T_{a1} = is the time of the last compressor off just prior to x hours since the temperature compartment temperature exceeded the average compartment temperature +2 K. Units: hours
- T_{a2} = is the time of the last compressor on just prior to x hours since the temperature compartment temperature exceeded the average compartment temperature +2 K. Units: hours
- T_{b1} = the time of the first compressor off just after x hours since the temperature compartment temperature exceeded the average compartment temperature + 2 K. Units: hours
- T_{b2} = the time of the first compressor on just after x hours since the temperature compartment temperature exceeded the average compartment temperature +2 K. Units: hours

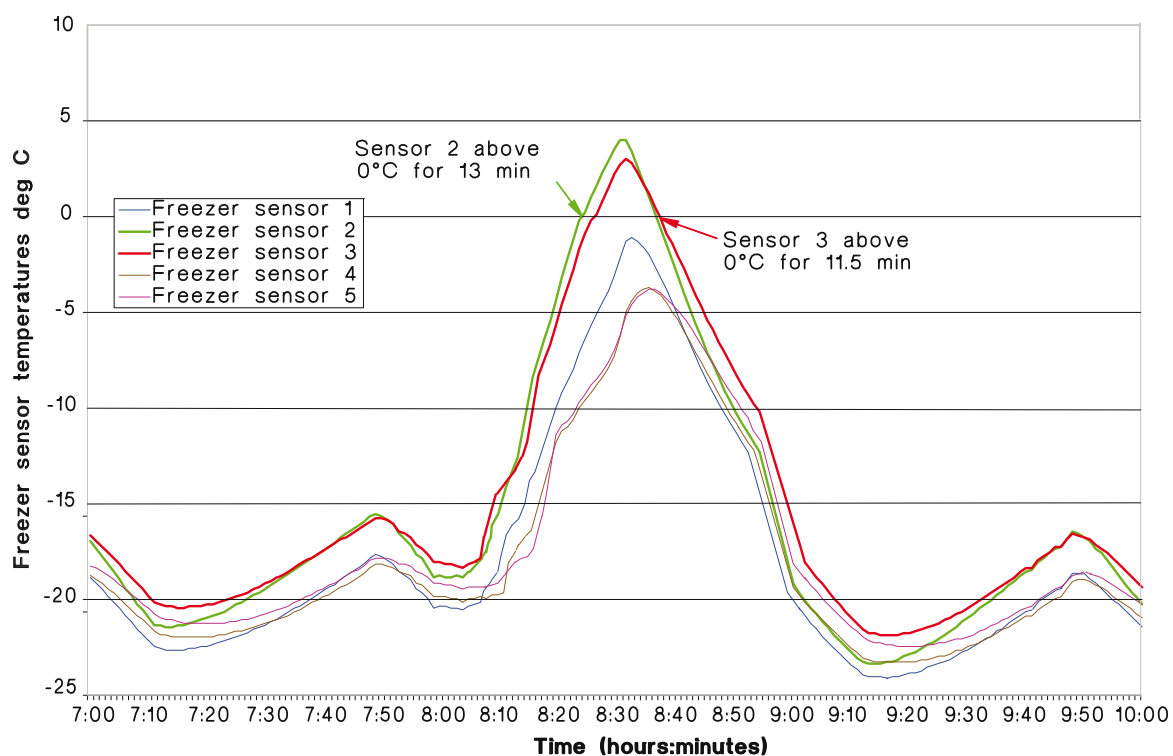
Temperatures t_{a1} , t_{a2} , t_{b1} and t_{b2} correspond to the instantaneous average compartment temperatures of all relevant sensors at times T_{a1} , T_{a2} , T_{b1} and T_{b2} (noting that the coldest sensor is excluded for **frozen food storage compartments**).

Compliance is demonstrated if the temperature at the compliance time x ($t_{\text{compliance}}$) is less than +2K above the average compartment temperature determination period.

Alternatively, a graphical representation of the defrost and recovery may be used to show compliance only where it can be demonstrated with certainty that the requirement has been met. If there is any doubt about the compliance, the Equation 3(1) shall take precedence.

- (c) During normal operation, and in the case of **frost free** appliances, after the allowed time in (b) above (i.e. 2 h or 20% of the **defrost control cycle**, whichever is the shorter) the average temperature of each **control cycle** (or 30 min period where there are no temperature **control cycles**) in each **compartment** shall be not more than 2 K above the average **compartment** temperature for the temperature determination period (Refer Paragraph D4.3) or 2 K above the **compartment target temperature** whichever is warmer. Refer to Figure 3.3.

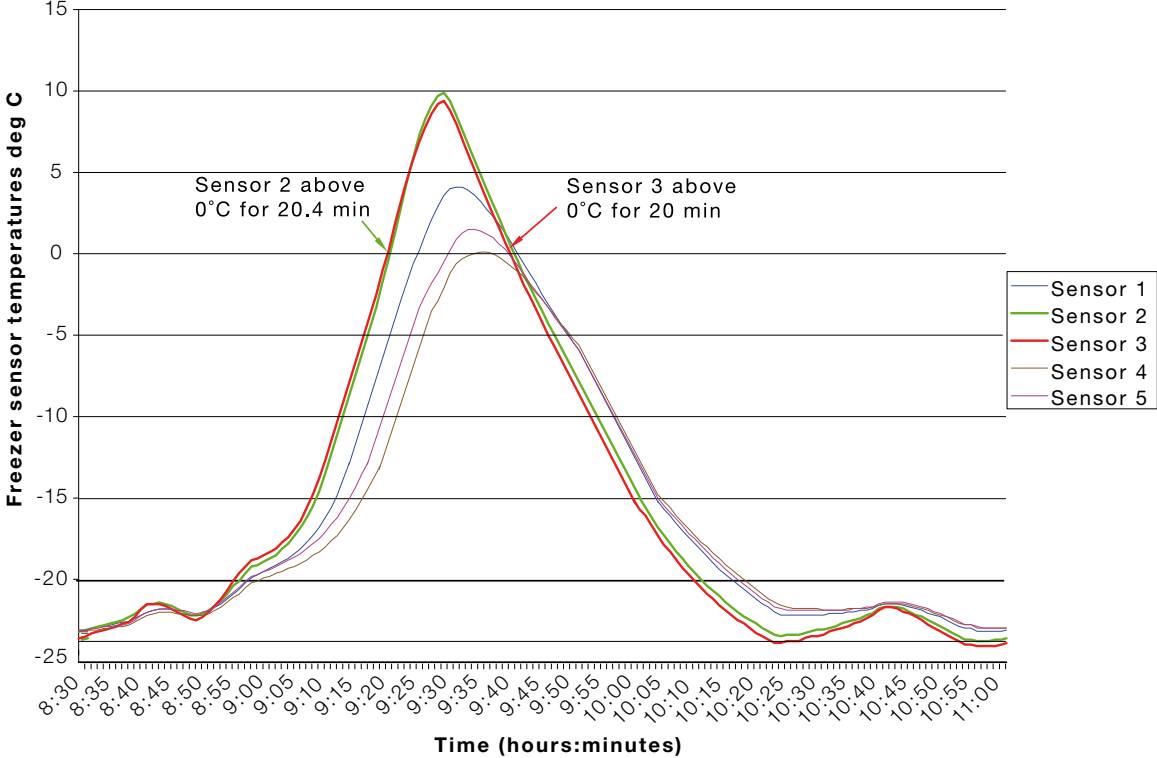
NOTE: The value of 20 min, 2 h or 2 K values are based on the assessment of a wide range of tested products.



NOTE: This figure is a schematic representation of requirement as defined in Clause 3.7.3(a) and it passes the performance requirement of Clause 3.7.3(a).

FIGURE 3.1(a) ILLUSTRATION OF REQUIREMENT AS DEFINED IN CLAUSE 3.7.3(a)

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NOTE: This Figure is a schematic representation of requirement as defined in Clause 3.7.3(a), but Sensor 2 just fails the performance requirement of Clause 3.7.3(a).

FIGURE 3.1(b) ILLUSTRATION OF REQUIREMENT AS DEFINED IN CLAUSE 3.7.3(a)

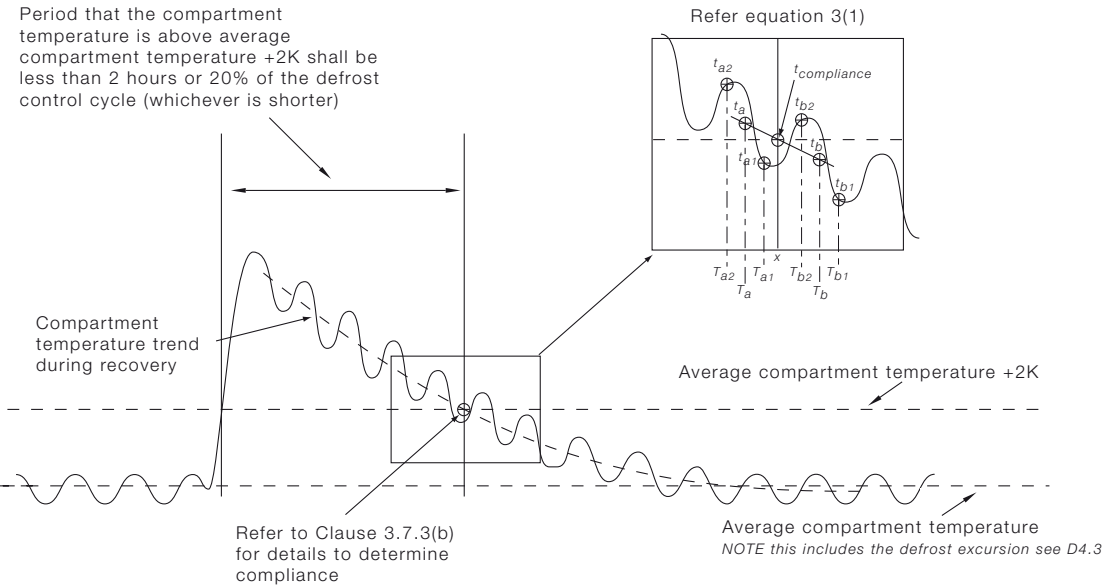
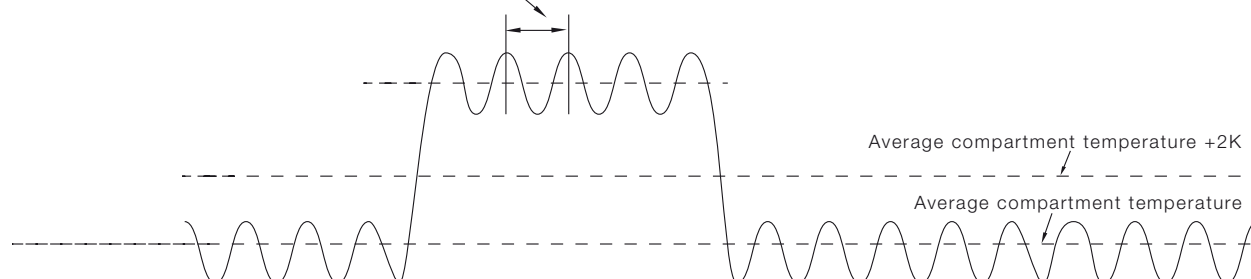


FIGURE 3.2 ILLUSTRATION OF REQUIREMENT AS DEFINED IN CLAUSE 3.7.3(b)

Average temperature of any control cycle after defrost and recovery shall not exceed the average compartment or target temperature by 2K, whichever is the warmer (see note).



NOTE: The example depicted shows some temperature control cycles greater than 2 K above the average, which if also above the compartment target temperature +2 K, would fail the requirements.

FIGURE 3.3 ILLUSTRATION OF REQUIREMENT AS DEFINED IN CLAUSE 3.7.3(c)

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Refer to Table 3.6 for compliance summary by group during energy consumption tests.

TABLE 3.6
COMPLIANCE SUMMARY BY GROUP DURING
ENERGY CONSUMPTION TESTS

Group	Compliance requirement		
	Clause 3.7.3(a)	Clause 3.7.3(b)	Clause 3.7.3(c)
1	X	✓*	✓
2	X	X	✓
3	X	X	✓
4	X	X	✓
5T	✓	✓	✓
5B	✓	✓	✓
5S	✓	✓	✓
6U	X	X	✓
6C	X†	X†	✓
7	✓	✓	✓

✓ indicates that compliance is required.

X indicates that compliance is not required.

* A product that has a cyclic defrost system is deemed to pass this requirement.

† Must comply with (a) and (b) if automatic defrost (frost free).

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3.8 ADAPTIVE DEFROST

The unit is only considered to have an adaptive defrost system if it complies with the definition in Clause 1.3.7 and it meets the following performance requirements:

- (a) The duration of defrost control cycles is greater than 24 h under the AS/NZS 4474.1 energy consumption test for all test runs regardless of temperature setting.
- (b) The appliance is capable of having a defrost control cycle duration greater than 36 h when it is operated in energy test conditions where defrosting need is low as usually occurs when there are no door openings. On request this **shall** be demonstrated in an energy determination test at target temperatures or colder, and if applicable, after any defrost control cycle duration 'learning' period.
- (c) The duration of a defrost control cycle with 'light' normal use is greater than 24 hours while operating in the ambient temperature range of 15°C to 25°C while maintaining internal temperatures at close to **target temperatures** or colder.
- (d) There **shall** be either continuous variability or a significant number of specific time steps, appropriately proportioned, between the longest and shortest possible duration of a **defrost control cycle** in response to changes in the defrosting need, and the duration of the **defrost control cycle shall** not be in proportion to compressor run time alone.

NOTE: For verification tests under (b) above, **compartment** temperatures **should** be as close as practicable to **target temperatures**. The ratio of the longest (light normal use) to the shortest (heavy normal use) duration of **defrost control cycle** under (d) **should** exceed 3.0 under a given ambient operating condition. As a guide, ten steps or more would be considered as clearly satisfying the requirement specified in (d). Step spacings can be linear (approximately evenly spaced from shortest to longest) or geometric (as a percentage increase in time per step).

Where the manufacturer elects to claim **adaptive defrost** for registration purposes (refer to AS/NZS 4474.2), then the following information **shall** be provided with the registration:

- (i) The main parameters that are used by the control system to vary the time between defrosts and how this would operate under **normal use**.
- (ii) A declaration that the system is **adaptive defrost** and complies with the above requirement and will provide on request, information on how this can be demonstrated.

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3.9 DECLARED AUTOMATIC CONTROLS

When a **refrigerating appliance** contains a **declared automatic control**, it **shall** be declared in the product registration. Information on the purpose and operation of the control **shall** be provided by the supplier in the product registration.

When a **declared automatic control** is present, the **refrigerating appliance shall** meet all the relevant performance requirements of Section 3, with and without the **declared automatic control** operating.

Declared automatic controls are to be set up and configured to operate during energy tests as they would under **normal use** conditions. Information on whether these controls operate during **normal use**, whether they are likely to operate during energy tests (in the absence of **normal use** activities) and how to correctly configure these controls for energy testing (in order to minimize the impact on the energy measurement), **shall** be provided by the supplier.

NOTE: A **declared automatic control** could include, for example, a 'holiday' mode that defers defrosting when there are no door openings for an extended period. This type of control is permitted but has to be defeated during energy tests because it does not operate during **normal use**.

A2

Any **declared automatic control** that may activate during an energy test **shall** be noted in the product registration and this information **shall** be in the public domain for verification testing. The test laboratory may undertake appropriate (minimal) actions, where applicable, to ensure that such controls do not operate as per **normal use** during an energy test.

Where a low ambient temperature compensation heater is present, it **shall** be noted in the product registration.

Declared automatic controls are generally not treated as **circumvention devices**.

SECTION 4 MARKING REQUIREMENTS

4.1 GENERAL

Refrigerating appliances shall comply with Clauses 4.2 to 4.7.

4.2 REFRIGERATING APPLIANCE GROUP

The **refrigerating appliance group** relevant to a model shall be durably and legibly marked on an appliance model in the following format:

GROUP: < insert **group designation** >

Where an appliance can be configured to more than one **group** and this is claimed then the marking shall include each **group designation** and generic description.

For each configuration:

GROUP: < insert **group designations** and descriptions >

Example:

GROUPS: 1/5T/5B/7 (refrigerator/refrigerator freezer/freezer).

NOTE: Refer to AS/NZS 60335.1 for guidance on requirements for legible and durable marking.

4.3 FOOD STORAGE COMPARTMENT TYPE

The **food storage compartment type** (Clause 1.3.12) and storage **volume** for each **compartment** shall be marked on the appliance or stated in the accompanying product literature (i.e. operating manual or user instructions).

4.4 MODEL IDENTIFICATIONS

Any model identification marks which appear either on the appliance or in the product literature and which may be interpreted as indicating a rated **volume** shall not be numerically greater than the **rated total gross volume**.

4.5 RATED GROSS AND STORAGE VOLUMES

The **rated total gross volume** and **rated total storage volume** relevant to a model shall both be durably and legibly marked on the appliance in the following format:

total gross volume < insert value > litres

total storage volume < insert value > litres.

NOTE: Refer to AS/NZS 60335.1 for guidance on requirements for legible and durable marking.

4.6 INTENDED USE MARKINGS

The marking on the appliance specified in this Section and all other indications of intended use including **compartment** type and appliances **designation**, appearing either on the appliance or in the product literature shall not be inconsistent with the classification of the appliance in accordance with Clause 2.3.

4.7 MARKING LOCATION

Markings of brand, model, **group** (refer to Clause 4.2) and **rated volumes** (refer to Clause 4.5) shall be visible when the appliance is installed as in normal use.

APPENDIX A

DETERMINATION OF VOLUME AND AREAS

(Normative)

A1 SCOPE

This Appendix sets out the method for determining the measured **storage shelf** areas, the **measured gross volumes** and **total gross volume**, and the **measured storage volumes** and **total storage volume**. It also sets out the means by which a manufacturer **shall** determine the **rated value** of each of the above quantities.

A2 DETERMINATION OF MEASURED STORAGE SHELF AREA

A2.1 Method of determination

Where a **storage shelf** area is quoted, it **shall** be the sum of the areas specified in Paragraphs A2.2 to A2.10.

A2.2 Full shelves composed of a single part

In the case of a full **shelf** composed of a single part, the area **shall** be the product of the width and depth. These two dimensions **shall** be determined as follows:

- (a) *Width*—Mean distance measured parallel to the surface of the shelf between the inner surfaces of the side walls of the enclosed space of the cabinet, where this dimension does not exceed the real width of the shelf by more than 20 mm (see Figure A1(a)).
- (b) *Depth*—Mean distance measured parallel to the surface of the shelf or bottom of the appliance between the inner surfaces of the front and rear walls of the enclosed space of the cabinet, where this dimension does not exceed the actual depth of the shelf by more than 20 mm (see Figure A1(b)). When the door of an upright-type appliance is provided with shelves, this distance shall be determined by analogy (see Figure A1(c) and A1(d)).

A2.3 Fractional shelves

For the purpose of calculating the area of fractional shelves, the width and depth **shall** be measured parallel to the surface of the shelves in a similar way to that for full shelves (see Paragraph A2.2) but taking into account Figure A1(e).

A2.4 Cut-away shelves

When a **shelf** is cut away, the area of the portion cut out **shall** be deducted when determining the storage **shelf** area.

A2.5 Juxtaposed shelves

In the case of juxtaposed shelves, the depth **shall** be determined in accordance with Figure A1(d).

A2.6 Door shelves

The **shelf** area **shall** be the product of the width by the depth. These two dimensions **shall** be determined by analogy with Paragraph A2.2 as follows:

- (a) *Width*—Mean distance between the inner surfaces of the side walls of the door **compartment** or between the side edges of the retainer bar.
- (b) *Depth*—Mean distance between the surface of the door wall and the vertical plane tangential to the inner front surface of the shelf or retainer bar (see Figure A1(c)).

A2.7 Baskets

The area **shall** be the product of the two mean horizontal dimensions (see Figure A2).

A2.8 Particular cases

A2.8.1 General

The bottom of the enclosed space of the cabinet **shall** be considered as a **shelf**.

Where an inner wall is not vertical, the dimension of the **shelf shall** be measured at the mid-height between the **shelf** under consideration and the **shelf** or horizontal surface immediately above.

A2.8.2 Unfrozen food storage compartments

Any part of full shelves or baskets or of the bottom of the appliance having less than 100 mm vertical clearance above, when all the shelves and baskets are in position, **shall** be excluded when calculating the storage area. However, it is admissible that for not more than one full **shelf** or basket, the vertical clearance may be reduced to not less than 80 mm (see Figure A2(b)).

A2.8.3 Frozen food storage compartments

Except for an **ice-making compartment**, any part of full shelves, baskets, or the bottom of a **frozen food compartment** having less than 52 mm vertical clearance when all the baskets and shelves are in position **shall** be excluded when calculating **shelf** storage area. In the case of an **ice-making compartment**, any part with less than 40 mm clearance **shall** be excluded.

A2.9 Drip tray

Where the space occupied by the **drip tray** is included in the storage **volume**, the part of the **shelf** supporting the **drip tray** or the bottom of the **drip tray shall** be considered as a part of the storage **shelf** area, provided that a definite **manual** operation is needed to initiate **defrosting**.

A2.10 Suspended containers

A2.10.1 Fresh food storage compartment and cellar compartment, if any

The area of the interior surface of the bottom of a suspended container and the area of the **shelf** immediately below **shall** not both be counted unless the vertical clearance between this **shelf** and the exterior surface of the bottom of the container is not less than 100 mm.

However, in the case of one container only, this clearance may be reduced to 80 mm if the clearance reduction detailed in Paragraph A2.8.2 has not been applied.

If the minimum vertical clearance within a suspended container as measured between the interior surface of the bottom and the cover, or to the **shelf** immediately above, is less than 40 mm, the bottom area of the container **shall** not be added.

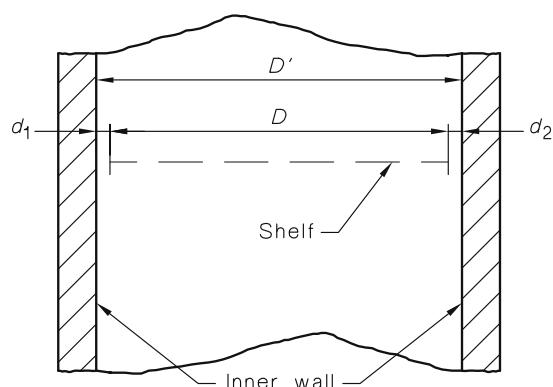
A2.10.2 Frozen food storage compartments

For a **frozen food storage compartment** the dimension of the minimum vertical clearances specified in Paragraph A2.10.1 is 52 mm in all cases.

For an **ice-making compartment**, the minimum vertical clearance dimension is 40 mm in all cases.

A3 DETERMINATION OF RATED STORAGE SHELF AREA

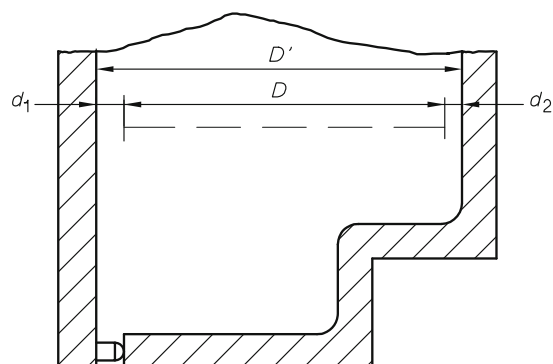
Where it is required to determine the **rated storage shelf** area for a design, this **shall** be not greater than the value determined in accordance with Paragraphs A2.1 to A2.10, rounded to the nearest 0.01 m².



(a) Determination of width

If $d_1 + d_2 \leq 20$ mm:
dimension of the shelf = D'

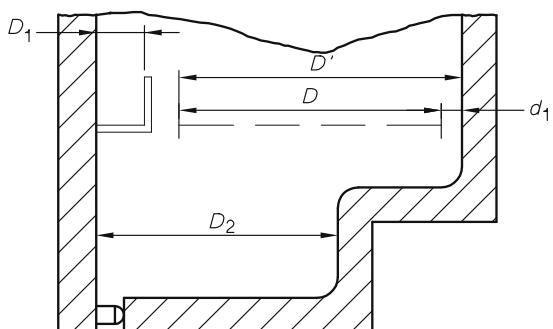
If $d_1 + d_2 > 20$ mm:
dimension of the shelf = D



(b) Determination of depth—
Upright-type appliance without storage
in the door

If $d_1 + d_2 \leq 20$ mm:
dimension of the shelf = D'

If $d_1 + d_2 > 20$ mm:
dimension of the shelf = D



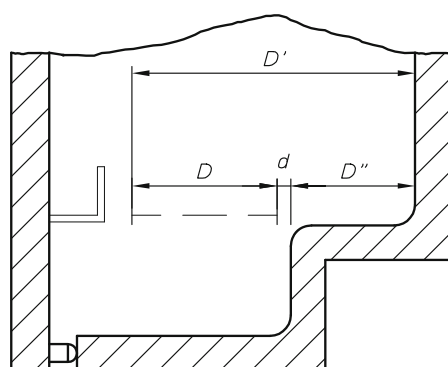
(c) Determination of depth—
Upright-type appliance with storage
in the door

If $d_1 \leq 20$ mm:
dimension of the shelf = D'

If $d_1 > 20$ mm:
dimension of the shelf = D

Dimension of the door shelf = D_1

Dimension of the bottom of the appliance = D_2

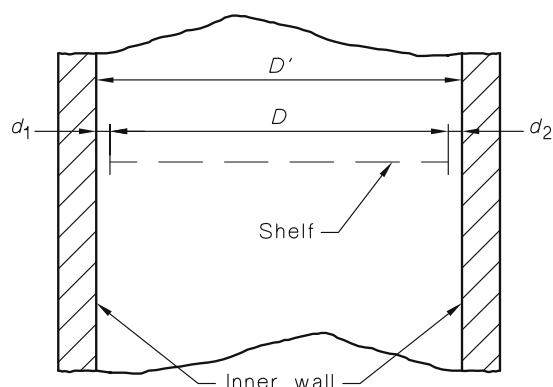


(d) Determination of depth—
Shelf with juxtaposed parts

If $d \leq 20$ mm:
dimension of the shelf = D'

If $d > 20$ mm:
two shelves of dimension D and D''

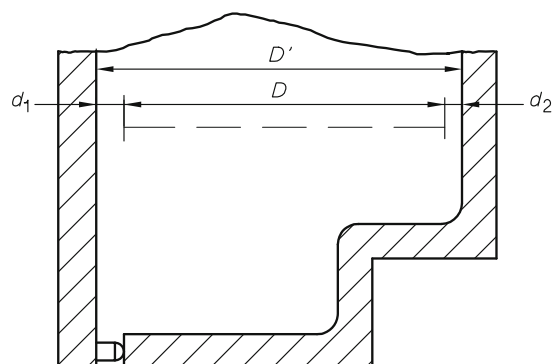
FIGURE A1 (in part) EXAMPLES OF DETERMINATION OF THE DIMENSIONS FOR CALCULATING THE AREA OF A SHELF



(a) Determination of width

If $d_1 + d_2 \leq 20$ mm:
dimension of the shelf = D'

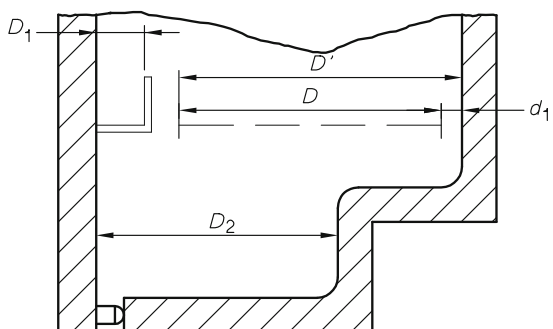
If $d_1 + d_2 > 20$ mm:
dimension of the shelf = D



(b) Determination of depth—
Upright-type appliance without storage
in the door

If $d_1 + d_2 \leq 20$ mm:
dimension of the shelf = D'

If $d_1 + d_2 > 20$ mm:
dimension of the shelf = D



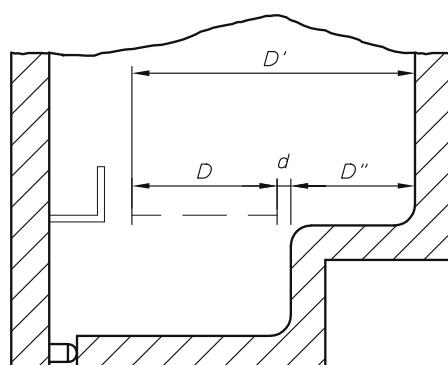
(c) Determination of depth—
Upright-type appliance with storage
in the door

If $d_1 \leq 20$ mm:
dimension of the shelf = D'

If $d_1 > 20$ mm:
dimension of the shelf = D

Dimension of the door shelf = D_1

Dimension of the bottom of the appliance = D_2

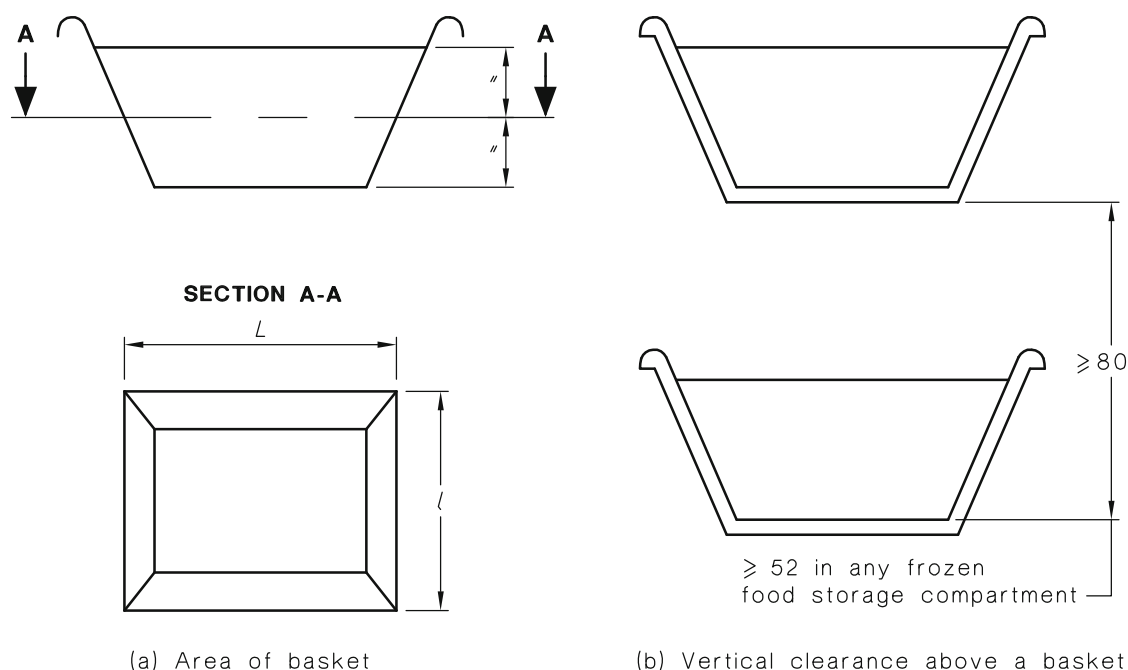


(d) Determination of depth—
Shelf with juxtaposed parts

If $d \leq 20$ mm:
dimension of the shelf = D'

If $d > 20$ mm:
two shelves of dimension D and D''

FIGURE A1 (in part) EXAMPLES FOR DETERMINATION OF THE DIMENSIONS FOR CALCULATING THE AREA OF A SHELF



DIMENSIONS IN MILLIMETRES

FIGURE A2 EXAMPLES FOR DETERMINATION OF MEAN DIMENSIONS FOR CALCULATING THE AREA OF A BASKET

A4 DETERMINATION OF MEASURED GROSS VOLUME

The **gross volume** of a **compartment** may be calculated by dividing the total **volume** contained within the **liner** into convenient units of **volumes** of geometric shapes which can easily be measured, although other methods are acceptable.

When the **gross volume** is determined, internal fittings such as shelves, removable partitions, containers, **evaporators**, **temperature controls** 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, including all depressions and projections.

Any **volume** which is normally inaccessible because of air ducts, fans, **evaporator** and other associated accessories, **shall** be included if it is within the space bounded by the **liner**. Otherwise it **shall** be excluded.

The **gross volume** of any **sub-compartment shall** be deducted from the **gross volume** of the **compartment** in which it is located. The **volume** of any space located between a **sub-compartment** and the **compartment liner** or another barrier (e.g. a **drip tray** or **door shelf**) **shall** also be included in the **gross volume** of the **sub-compartment** and deducted from the **gross volume** of the **compartment** in certain cases as follows:

- (a) *Space above or below the sub-compartment*—If the height of the space is not greater than 40 mm, or the access to the space is not greater than 40 mm in height, the relevant volume shall be included in the **gross volume** of the **sub-compartment**.
- (b) *Space to the front, sides or rear of a sub-compartment*—If the horizontal clearance between the **compartment** and the nearest vertical barrier or door storage shelf is not greater than 70 mm, and the space is otherwise accessible, the relevant volume shall be included in the **gross volume** of the **sub-compartment**.

For detailed examples of the determination of the **gross volume** of a **compartment**, refer to Figures A3, A4 and A5.

A5 DETERMINATION OF MEASURED STORAGE VOLUME

For the determination of **storage volume**, the **volume** of devices and spaces considered unusable for the storage of food **shall** be deducted from the **gross volume** calculated in accordance with Paragraph A4. Items and spaces to be deducted from the **gross volume** of a **compartment** are as follows:

- (a) *Unfrozen food space comprising—*
- (i) the **volume** of the evaporator (refer to Paragraph A6);
 - (ii) the **volume** of any housings (such as those for interior lights, temperature controls and other devices);
 - (iii) the **volume** of shelves, partitions, retainers and other accessories, whose wall thickness is greater than 13 mm (refer to Paragraph A7);
 - (iv) the space between any door protrusion and the liner of the **compartment** also called throat gap (see Figure A6);
 - (v) the **volume** of spaces which are to be kept free for good performance of the refrigerating system; and
 - (vi) any **volume** which is normally inaccessible because of air ducts, fans, **evaporator** and other associated accessories but was included in the **gross volume**.

Where the **volumes** of any two compartments are adjustable relative to one another by the user, the **storage volumes** of these **compartments** shall be determined with each adjusted to its minimum and maximum **volumes**.

- (b) *Frozen food space, excluding ice-making compartments, comprising—*
- (i) the **volume** of spaces situated outside any load limits (natural or marked by the manufacturer);
 - (ii) the **volume** of any housings (such as those for interior lights, temperature controls and other devices);
 - (iii) the **volume** of spaces provided specifically for making and storing ice, except in the case of appliances fitted with **automatic ice-makers**, when the volume occupied by a removable storage bucket shall be included in the **storage volume** unless it is specified in the instructions for use that this volume is suitable for the storage of ice only;
 - (iv) the **volume** of spaces between the front stack(s) of the test package load and the inner vertical surface of the door or any projection from the door where the horizontal distance between the front face of the stack(s) and the inner door surface or projection exceeds 15 mm;
 - (v) the volume of all fixed components within the load limits;
 - (vi) the **volume** of spaces which are to be kept free for good performance of the refrigerating system and, where not previously deducted, any volume which is normally inaccessible because of air ducts, fans, evaporator and other associated accessories, shall be deducted if it is within the space bounded by the liner (refer to Paragraph A6 and A7);
 - (vii) the **volume** of all removable parts which are stated by the manufacturer as necessary for the proper functioning of the appliance, except shelves and partitions whose thickness is not greater than 13 mm (refer to Figure A9);

- (viii) the **volume** rendered unusable by the use of removable parts (for example, baskets, shelves) necessary for obtaining satisfactory thermal and mechanical characteristics;
- (ix) any **volume** where the vertical clearance is less than 52 mm; and
- (x) any **volume** where it is impossible to place an M package of nominal dimensions.

Where the **volumes** of any two **compartments** are adjustable relative to one another by the user, the **storage volumes** of these **compartments** shall be determined with each adjusted to its minimum and maximum volumes. (Refer to Appendix R, *Compartment details*, Note 3.)

For a detailed example of the determination of the **storage volume** of a **compartment**, refer to Figure A7.

NOTES:

- 1 The **volumes** occupied by the following are included as part of the **storage volume** of each compartment and should not be deducted:
 - (a) **Convenience features** such as crispers, meatkeepers, chillers, icetrays and can or package racks, dividers or dispensers and compartment fronts.
 - (b) Door-shelf fronts and bottoms, and doors of special feature compartments located within the door.
 - (c) Features such as trims and shelf, pan and basket rails, and aesthetic items which are removable without the aid of tools.
- 2 There is no equivalence between the value of the **storage volume** determined in accordance with the principles above and the **volume** of the packages loaded into the appliance for the storage and **freezing** tests. The free spaces specified in the test methods could be utilized in normal use and their **volume** should not be deducted from the **gross volume** when calculating the **storage volume**.

A2

A6 DETERMINATION OF THE VOLUME OF THE EVAPORATOR

A6.1 General

This Clause defines the **evaporator volume** to be subtracted from the **gross volume** of a **compartment** in the determination of the **storage volume**. The **evaporator volume** is the **volume** which is inaccessible or unusable due to the presence of the **evaporator** and shall be the product of the depth, width and height, defined in Paragraphs A6.2 to A6.4. (Also refer to Figure A8.) The **evaporator volume** does not include **evaporators** which form **sub-compartments**. (Refer to Paragraph A4).

A6.2 Depth

The depth of the **evaporator volume** shall be the mean horizontal distance between the front and rear surfaces of the enclosed space of the **compartment**, 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 volume** shall be taken as the mean horizontal distance from the inner surface of the rear of the **compartment** to the foremost part of the **evaporator**, or of its cover, if fitted.

A6.3 Width

The width of the **evaporator volume** shall be the overall horizontal external width of the **evaporator** itself (neglecting suction headers near the top of the **evaporator**) or, if side ribs are used, the overall external 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 **compartment**, such space **shall** be computed as part of the **evaporator volume**.

A6.4 Height

The height of the **evaporator volume** **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 **compartment** exceeds 40 mm, it **shall** be added to the storage **volume** of the **storage compartment**.

The **evaporator** height **shall** include any internal **drip tray** or drip collector or both.

A7 DETERMINATION OF THE VOLUMES OF SHELVES AND PARTITIONS

A7.1 Thickness

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

A7.2 Full shelves and partitions

The **volume** of a full **shelf** or partition **shall** be the product of its thickness and its depth, width or height, whichever two of these are applicable. The depth, width and height **shall** be those dimensions of the enclosed space of the cabinet which apply in the plane of the **shelf** or partition.

A7.3 Fractional shelves and partitions (if applicable)

The **volume** of a fractional **shelf** or partition **shall** be the product of its thickness and its depth, width or height, whichever two of these are applicable.

The depth, width or height **shall** be the distances from the adjacent surfaces of the enclosed space of the cabinet, and normal to these surfaces, to the further edges of the **shelf** or partition, or to the **evaporator** in cases where the fractional **shelf** or partition touches it, if applicable.

A horizontal **shelf** or partition, the edges of which are more than 70 mm from the surfaces of the enclosed space of the cabinet, **shall** be regarded as a fractional **shelf** or partition. A vertical partition, the edges of which are more than 100 mm from the surfaces of the enclosed space of the cabinet, **shall** be regarded as a fractional partition.

A8 DETERMINATION OF RATED GROSS AND STORAGE VOLUMES

A8.1 General

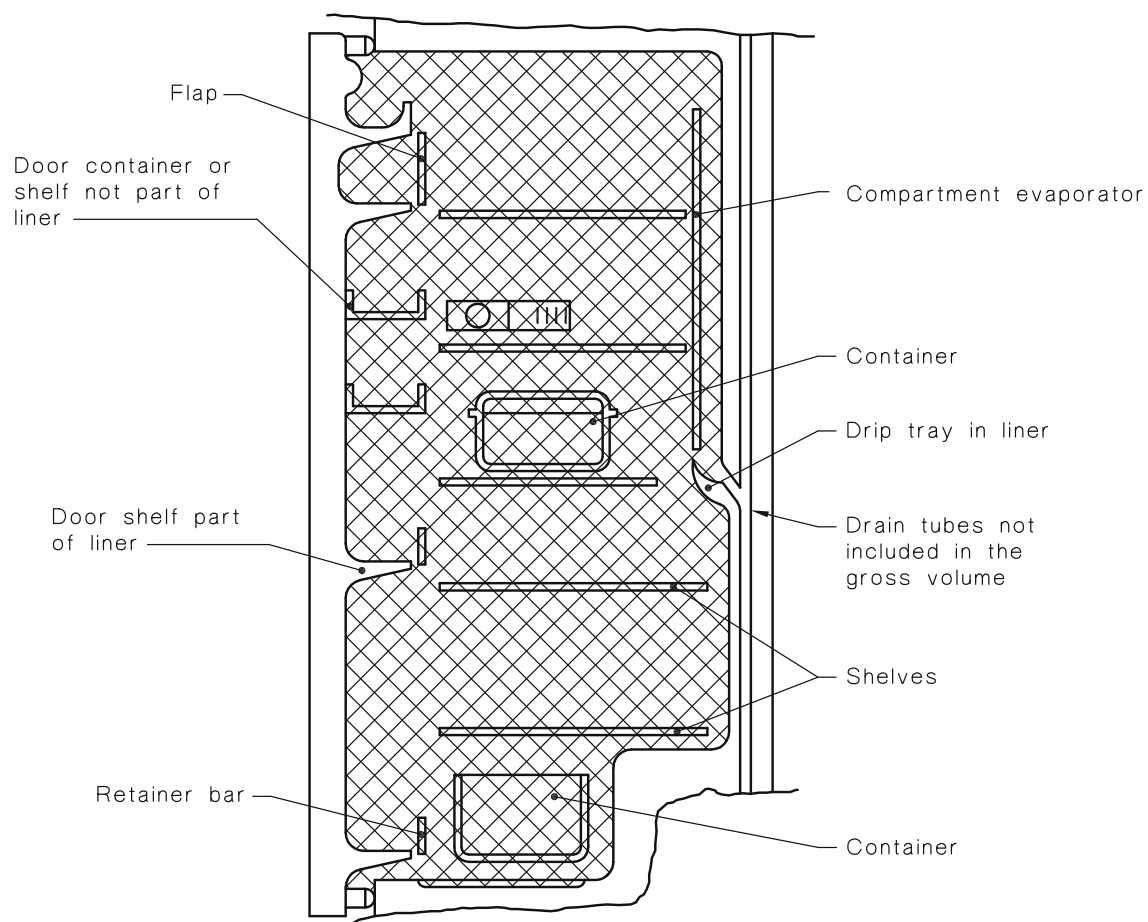
Where it is required to determine the rated value of **gross** or **storage volume** for a model, these **shall** be derived according to Paragraphs A8.2 and A8.3. Refer to Clause 3.3 for the requirements to be met when comparing the measured **volume** of a single appliance being tested for verification to the rated value for the model or design.

A8.2 Rated gross or storage volume of a compartment

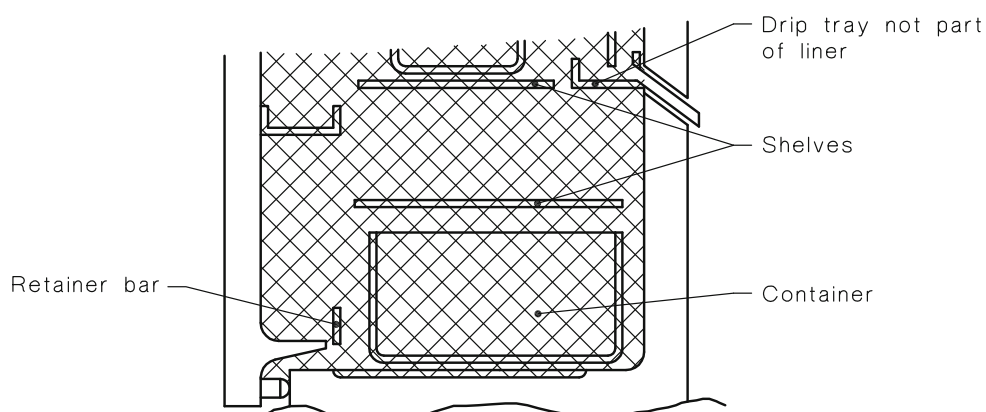
When determining the **rated gross** or **storage volume** of a **compartment**, the measured **volume**, determined in accordance with Paragraph A4 or A5 as applicable, rounded to the nearest litre, **shall** be the maximum value claimed.

A8.3 Rated total gross or storage volume

When determining the **rated total gross** or **total storage volume** of an appliance, the maximum value claimed **shall** be the unrounded measured **volumes** of the relevant **compartments**, summed and rounded to the nearest whole litre or alternatively to the nearest 10 litres.



(a) Compartment with compressor step and drip tray as part of the liner



(b) Partial view — compartment without compressor step and drip tray not part of the liner

NOTE: The cross-hatching shows the gross volume.

FIGURE A3 (in part) EXAMPLES FOR DETERMINATION OF THE GROSS VOLUME OF A COMPARTMENT WITHOUT AN ENCLOSED SUB-COMPARTMENT