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FROZEN FOOD RETAIL CABINETS

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Australian Retailers Association
Australian Institute of Refrigeration Air Conditioning and Heating (Incorporated)
Commercial Refrigeration Manufacturers Association of Australia
CSIRO, Division of Food Research
Council of Australian Food Technology Associations Incorporated
Health Commission of New South Wales
Metal Trades Industry Association of Australia
National Association of Retail Grocers of Australia
National Health and Medical Research Council
University of New South Wales

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PREFACE

This edition of this standard was prepared by the Association's Committee on Frozen Food Retail Cabinets to supersede AS 1731—1975, which had itself superseded the original AS B220—1966.

AS B220 had been published in response to a request by the Council of Australian Food Technology Associations, and had drawn largely upon BS 3053 and draft DIN 8954. Its major feature was a requirement that a retail cabinet hold a temperature of 0°F (−18°C). Since that time the whole subject of the essential keeping temperature of frozen food, and the technical capabilities of various types of refrigerators has been under constant debate. Late in 1970 Unisearch Limited (the consulting body of the University of New South Wales) assisted by CSIRO, Division of Food Research, under the auspices of Committee ME/8 conducted a field survey of actual store installations to establish the realities concerning conditions in and around cabinets, and other important aspects. The results of the survey cleared the way for a reappraisal of the performance requirements of AS B220, which appeared to be in line with developments under way for British and ISO standards, so the 1975 edition of AS 1731 was published.

The refrigerator development and testing program which ensued uncovered the fact that conventional refrigeration equipment if applied to the open bin type cabinet could not quite comply with the temperature requirements in the vulnerable upper layer packages, even with evaporator temperatures as low as −40°C. Such temperatures would lead to premature plant failure, and alternative plant designs capable of producing the specified temperatures were more costly by a very considerable factor.

The findings were put to the Food Standards Committee of the National Health and Medical Research Council which agreed late in 1980 that cost benefit considerations did not justify the requirements, and that the increase of the top layer temperatures by 2°C would be acceptable, bearing in mind the lower temperatures prevailing throughout the remainder of the cabinet, the rate of product turnover, and the way in which shoppers keep packages moving from layer to layer.

The major feature of this edition is to incorporate that change to upper layer temperatures. The more significant of the other adjustments are as follows:

1. The Foreword has been re-written to provide an up-dated description of the various changes of philosophy over the years which have led the standard to this point.
2. The requirements for a pressure range tapping point near the evaporator outlet has been deleted. The test point had reflected an earlier concept that plant inspectors should check this pressure regularly as an indicator of plant condition. However, in unskilled hands such a procedure runs a risk of air or water incursions, so the test point was dropped as being undesirable.
3. A comprehensive list of mandatory standards for surface finishes, electroplating etc is deleted. To make such requirements mandatory brings with it a number of organizational problems such as the certification of purchased components, stores inspection and segregation, all of which seemed unwarranted for what is essentially ordinary commercial quality.
4. A former appendix dealing with test packages has been deleted, to be covered by a separate standard.

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STANDARDS ASSOCIATION OF AUSTRALIA

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for
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FOREWORD

The philosophy on which standards for frozen food cabinets are based has changed considerably in the last 15 years. The purpose of this Foreword is to describe the changes and developments that have taken place, and to explain the basis for the technical requirements of this edition.

A standard such as this is intended to form a part of the overall system of regulations and standards which supervise the quality of frozen food as it passes along the distribution chain from the initial freezer through various transport stages and retail outlets to the eventual customer. It had been the practice to write such requirements in terms of the temperature of actual items of frozen food, based on a concept that inspectors could make checks along the food chain by testing the temperatures of such individual items.

It was recognized early that such a checking procedure posed all sorts of problems of inconsistency, largely due to the wide variety of thermal characteristics, shape, and size of the articles to be measured. Therefore, the frozen food test pack was introduced to afford a degree of standardization, but the basic idea still remained that it was a simulation of a frozen food product, and should have all the characteristics of a frozen food.

By 1975, it was recognized that the concept of having a field inspector check by measuring product temperature was impracticable for a variety of physical and legal reasons. The committee then set out to provide facilities for implementing a altogether different field inspection technique. The 1975 edition of the standard accordingly required provisions for checking two features which are critical to the correct functioning of the refrigerator, i.e. its operating suction pressure and the ambient temperature. The intention was that these features could be checked from time to time to ensure that both remain as they were when the appliance was tested for compliance.

Another major change at that time was the modification of the required temperature levels. It had become obvious that the −18°C requirement was impracticable so the temperature levels in the upper layer test packages were raised to −15°C overall mean and −12°C peak. These values were in line with those of BS 3053, which were in the process of being adopted by the international standards committee on refrigeration, ISO/TC 86. Manufacturers felt that they would be able to provide this level of performance in open top display cabinets, which were the most difficult problem, and the various governmental agencies considered that these temperature levels were acceptable, in view of certain other qualifying conditions already proved, i.e. temperatures at lower levels in the bin are considerably lower, residence times of products are known to be comparatively short, and the customers are known to cause considerable migration of individual packages from place to place within the storage.

Another notable alteration in the previous edition of this standard was the settling of the climate class debate. Throughout the world, committees drafting refrigerator requirements have traditionally worked from a premise that any given refrigerator will need to work only within one of the traditional climatic zones, i.e. tropic, temperate or cold. However, in a country such as Australia even the normally cold areas are subject to heatwaves, and there are few areas which don't get quite cold at some times. It was decided that in any event, considerations of the district climate were irrelevant. More important was the internal climate of the building in which the cabinet was installed. Hence the two climate classes for this standard simply relate to whether the store is or is not air-conditioned. It was considered that very few retail outlets would not make at least some attempt to modify any extremes of climate, and these few would need to be treated as special cases.

Experience with the 1975 edition indicated two important flaws. The temperature requirements were still too low by about 2°C for the open top display cabinet with a conventional compressor refrigerator, even at evaporator temperatures as low as −40°C. Tests have indicated that for this type of cabinet the best average temperature that can be expected in the visible top layer is −13°C. Any lower temperature requires a different type of refrigeration plant altogether, for which there is a cost penalty which cannot be justified by the rather minimal gains. The second problem concerned the concept that checks of refrigerant pressure and temperature would give an indication of any deterioration of the plant condition. It was subsequently decided that pressure tappings could cause more harm than good, because air or moisture can enter the system during a check. The idea has therefore been abandoned, so the necessary pressure tappings are no longer mandatory and a number of other related adjustments have had to be made.

It is recognized that the capability of a frozen food retail cabinet varies from type to type. If considering product temperature alone, the open top bin type cabinet is the worst performer, and a unit with a closed insulated opaque door is the best, with gradations of quality between these two extremes according to door design and opacity. It is a deliberate decision that there are valid merchandising reasons for the continued use of the open top type, and the lesser performance is at least acceptable if not entirely desirable, so in effect the standard has been adjusted to suit the practicalities.

Ice cream was given specific consideration, because its rate of quality deterioration is known to be amongst the more rapid of the various food products. Temperatures such as −13°C and −10°C are prejudicial to the quality of ice cream, and can be tolerated only for a very short time, otherwise deterioration occurs. It should in fact be kept colder than the levels specified in this standard, and ideally should perhaps be kept in special lower temperature retail cabinets. However, the realities are that sale of ice cream from bins is well established, retail operators want to continue this way, there is no history of widespread customer dissatisfaction, and appliances which comply with this standard are probably better performers than those of the past.

This standard limits itself to the design and construction of the appliance and is intended to ensure that it is satisfactory when manufactured. It is recognized that an appliance must be applied correctly, installed properly and in reasonable ambient conditions, and maintained in good operating order, if its performance is to be satisfactory. However, these aspects are outside the scope of this standard.

SECTION 1. SCOPE AND DEFINITIONS

1.1 SCOPE. This standard specifies requirements for frozen food retail cabinets, as defined in Clause 1.4.5. It specifies requirements for construction and performance and prescribes uniform procedures for determining the performance and capacities of such cabinets.

1.2 REFERENCED DOCUMENTS. The following standards are referred to in this standard:

AS 1042 Direct-acting Indicating Electrical Measuring Instruments and Their Accessories

AS 1284 Electricity Meters
Part 1—Alternating Current Watt-hour Meters, Classes 0.5 and 2.0

AS 1571 Seamless Copper Tubes for Use in Refrigeration

AS 1677 SAA Refrigeration Code

AS 3000 SAA Wiring Rules

AS 3100 Definitions and General Requirements for Electrical Materials and Equipment

AS 3182 Refrigerated Food Commercial Cabinets

AS 2605 Refrigerator Test Packages

BS 1339 Definitions, Formulae and Constants Relating to the Humidity of the Air

BS 5643 Glossary of Refrigeration, Heating, Ventilating and Air Conditioning Terms

1.3 CLASSIFICATION. Frozen food retail cabinets may be classified as being suitable for either of two climate classes as follows:

Climate Class 1—a situation in which the ambient temperature will not exceed 25°C, e.g. either a naturally mild climate or a fully and continuously airconditioned store.

Climate Class 2—a situation in which the ambient temperature may exceed 25°C but will not exceed 32°C; e.g. a non-airconditioned store in a naturally mild climate that is not subject to extreme summer temperatures, or one in which a degree of air cooling may be provided to cope with particularly hot weather.

NOTE: It is recognized that summer temperatures in excess of 32°C are common throughout many parts of Australia. Installations in such a climate without some degree of shop cooling are considered to be beyond the capability of standard commercially available cabinets, and it would be necessary to provide cabinets specifically designed for the particular climatic conditions.

1.4 DEFINITIONS. For the purpose of this standard the following definitions apply. For definitions of terms not defined herein, reference should be made to BS 5643 and BS 1339.

1.4.1 Approval, approved—with the approval of, acceptable to, and meeting the prescribed standards of, the authority having jurisdiction.

1.4.2 Authority, authority having jurisdiction—the authority having statutory (legal) control in the particular circumstances.

1.4.3 'Shall' and 'should'—'shall' is taken to be mandatory; 'should' is taken to be advisory.

1.4.4 Frozen food—that which is defined in the appropriate regulations as being frozen food.

1.4.5 Frozen food retail cabinet—an assembly consisting of a thermally insulated enclosure for the merchandizing of frozen foodstuffs, and a refrigerating unit, which may be either incorporated in or remote from the cabinet, and which operates on the vapour compression principle and is arranged to extract heat from within the cabinet. It may be closed or open type, or a combination of both, and of convection or forced draft type including but not limited to the following:

(a) *Closed cabinet*—a cabinet with one means of access at the top, front or rear and intended to be kept closed in normal use. Transparent panel or panels may or may not be fitted in the door, lid or wall to permit view of the products for display.

(b) *Open cabinet*—a cabinet with open top with or without transparent panel or panels to permit view of the products for display.

(c) *Convection (plate type) cabinet*—a cabinet where the temperatures of food products are maintained by air circulation induced by convection from evaporator plates.

(d) *Forced draft cabinet*—a cabinet where the temperatures of food products are maintained by the forced circulation of air.

1.4.6 Multideck display section—a refrigerated superstructure incorporating display shelves, extending above the main body of the cabinet.

1.4.7 Run-in period—a period of initial operation of the refrigerating unit to assure a thorough working-in of mechanical parts.

1.4.8 Type tests—tests performed on a single representative cabinet to establish whether the type of cabinet represented is capable of complying with the stated requirements. Results of type tests are assumed to apply to production units of the same type, provided that they are identical with the sample tested.

1.4.9 Load limits—limits of space in the cabinet inside of which frozen food is capable of being maintained at the appropriate temperature (see also Clause 2.5.1).

1.4.10 Manual defrost—a defrosting system which is effected by manual termination of electricity supply.

1.4.11 Semiautomatic defrost—a defrosting system which is manually initiated and automatically terminated, and which has suitable means of disposal of defrost water.

1.4.12 Automatic defrost—a defrosting system which is automatic in operation and which has suitable means of disposal of defrost water.

1.4.13 Cooling unit—that part of the refrigerating system which performs the function of absorbing heat.