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REFRIGERATING SYSTEMS

STANDARDS ASSOCIATION OF AUSTRALIA
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The following interests are represented on Committee ME/6:

Australasian Steamship Owners Federation

Australian Institute of Refrigeration, Air Conditioning and Heating (Inc)

Australian Retailers Association

Commercial Refrigeration Manufacturers Association of Australia

Confederation of Australian Industry

Department of Employment and Labour Relations, Qld

Department of Housing and Construction

Department of Industrial Relations, N.S.W.

Department of Labour and Industry, Tas.

Department of Labour and Industry, W.A.

Department of Labour, S.A.

Electricity Supply Association of Australia

Metal Trades Industry

Railways of Australia Committee

Refrigeration and Air Conditioning Contractors Association of Australia

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AUSTRALIAN STANDARD

REFRIGERATING SYSTEMS

AS 1677—1986

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PREFACE

This edition of this standard was prepared by the Association's Committee on Refrigeration, as a replacement for AS 1677—1981. That standard had been revised and amended a number of times since it was first published as AS CB3 in 1933, but this edition represents a total reappraisal of the subject, and it differs substantially from its predecessors in a number of ways.

The most significant change concerns the approach to the selection of the plant type, the refrigerant, and the occupants of the building. The development of a new attitude is discussed in some detail in the Foreword, which explains its origin in a study of some proposals put to ISO/TC 86/SC1, and the development of new concepts from that basis. The Foreword should be read carefully in order to understand the framework within which this edition was written.

Other aspects of this standard which differ significantly from previous editions are as follows:

(a) Section 2 is totally new, as it represents the substantial shift in philosophy mentioned above and in the Foreword.

(b) Section 3 is substantially the same as in the previous edition but Clauses 3.1.1 and 3.1.2 differ slightly, generally to take advantage of modifications to AS 1210, SAA Unfired Pressure Vessels Code, in the intervening years. Clause 3.2.1 represents a modification to attitudes towards those sections of plants that can be blanked off by isolation valves, and reflects concern with hazards that result from oversight during maintenance operations.

(c) Section 4 is new, and gathers together a number of miscellaneous installation clauses that had been scattered throughout the previous standard. A degree of modernization has been carried out, and a number of redundancies have been dealt with.

(d) The six clauses grouped under Clause 4.4 reflect a considerable change in approach to machinery areas. Key points are as follows:

  (i) Earlier editions appeared to place undue emphasis on dedicated refrigeration plant rooms, and did not differentiate clearly enough between two quite distinct needs. One is the need to ensure that the equipment is safe from interference or damage, and has enough air movement for normal needs. The other is the occasional need to isolate the machinery atmospherically in order to achieve a low hazard rating for the application of Section 2.

  (ii) This edition attempts to clarify the point that if physical security is the only issue, then the options vary from an inherently safe open location to a lock-up plant room, but if circumstances demand the latter, then the room does not require any great degree of elaboration. Normal construction and ventilation regulations will do.

  (iii) If machinery isolation is required for the purpose of hazard ratings, then the requirements of the former 'Class T machinery room' are necessary. These are grouped under the title of 'Machinery Isolation Area' together with an explanation of why such an area might be needed.

(e) Clause 4.4.4 has been extensively rewritten compared with the previous edition mainly to simplify it, and to rectify an unnecessarily harsh requirement for electrical equipment for ammonia.

(f) Section 5 is another instance of the gathering together of a number of operational clauses that had been scattered throughout the previous edition. Some attempt has been made to rationalize these clauses, but further development in future editions is anticipated.

(g) Conflicting requirements that related to the diameter-length relationship of safety valve discharge pipe have been rationalized by deleting the former Appendix on the subject and relying on AS CB18, SAA Pressure Piping Code, Part 1—Ferrous Piping.

(h) Certain of the tables of data on refrigerants have been eliminated or rationalized. Only those refrigerants in common use are detailed. In the rare event that information on an uncommon refrigerant is required, reference can be made to other sources, which are listed.

This standard sets out fundamental requirements for the general design, construction, installation and operation of a broad range of refrigeration equipment. It constitutes a statement of basic principles and ultimate aims, and is intended to provide an authoritative source of fundamental safety principles for the use of responsible and competent persons or organizations; it must not be regarded as being either an

instruction manual for untrained persons or a specification for detailed plant design. It has no legal authority in its own right, but may acquire legal standing in one or more of the following circumstances:

(i) Adoption by a Statutory Authority having jurisdiction.

(ii) Adoption by a purchaser as a required standard of construction when placing a contract.

(iii) Adoption where a supplier or contractor states that an installation is in accordance with it.

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FOREWORD

Refrigeration standards are notable for the attention paid to the minimization of personal hazard, in recognition of the potential risk to building occupants should refrigerant escape because of a failure of piping, fittings, or components in the refrigeration system. Therefore, such standards all include requirements for the matching of equipment to the way in which a building is used or occupied, for the purpose of reducing such a risk. The factors traditionally considered are as follows:

(a) The degree of toxicity, flammability, or other risk characteristics of the particular refrigerant used.

(b) The quantity of refrigerant which might conceivably escape in the event of accident.

(c) Features of the type of plant (direct, indirect, etc), or features of the installation (isolated machine rooms, etc), which may have a bearing on the degree of probability that a refrigerant, should an escape occur, might penetrate a populated area.

(d) The differing degrees to which the population of differing types of building may be vulnerable to, or unable to escape from, the consequences of leaking refrigerant.

To deal with these variables, the various national and international refrigeration standards, including this standard, have incorporated classification systems for refrigerants, for the nature of building usage, for the types of refrigerating plant, the nature of the plant's location, and the permissible levels of atmospheric contamination. These several factors determine what can or cannot be used in any particular place.

In recent years two proposals emerged, of such significance that a considerable investigation was necessary before this edition could be drafted. These proposals were as follows:

(i) ISO/TC 86/SC 1 had received a proposal that the categories under which buildings were classified according to the nature of their occupancy should be reduced from five to two, the reasons suggested being that all forms of public and private buildings, offices, hospitals, residentials, shops, etc, were in practice being treated in much the same way, thus forming one group, while all forms of industrial type of building formed another natural group.

(ii) The tables which limit the quantity of refrigerant allowed in certain types of system, and other tables indicating toxicity and physiological properties, came under question. These tables are basically intended to limit contamination in the event of leakage. Other important publications on atmospheric contamination are 'Threshold Limit Values for Chemical Substances in Working-room Air' prepared by the American Conference of Governmental Industrial Hygienists and adopted by the Australian National Health and Medical Research Council, and recommendations of the U.S Occupational Safety and Health Administration, known as the 'IDLH Values', i.e. immediately dangerous to life and health. All these authorities differed, and the last two gave values considerably lower than those of this standard, and of most other national refrigeration standards, so it was essential that these apparent contradictions be examined.

Concerning the first matter, i.e. occupancy categories, a considerable study led to a conclusion that the traditional system of classifications of occupancy, plant type, refrigerants, and plant room had indeed become over-complicated, and any attempt to list and provide for each of the vast array of possible combinations of circumstances was bound to fail. A review of the fundamental factors that affect personal safey disclosed only three, viz—

(a) the degree of vulnerability or helplessness of the occupants: three levels have been found necessary, rather than the five of tradition or the two suggested for ISO 1662;