AS 1940—1993

Australian Standard®

The storage and handling of flammable and combustible liquids

This Australian Standard was prepared by Committee ME/17, Flammable Combustible Liquids. It was approved on behalf of the Council of Standards Australia on 18 August 1993 and published on 11 October 1993.

The following interests are represented on Committee ME/17:

Association of Australian Port and Marine Authorities

Australian Chamber of Commerce and Industry

Australian Fire Authorities Council

Australian Institute of Petroleum

Australian Paint Manufacturers Federation

Australian Steel Underground Tank Technical Association

Department of Defence, Australia

Department of Housing and Local Government, Qld

Department of Labour, S.A.

Occupational Health and Safety Authority, Vic.

Department of Mines, Western Australia

Department of Mines, Tas.

Department of Urban Services, A.C.T.

Insurance Council of Australia

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The WorkCover Authority, N.S.W.

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PREFACE

This Standard was prepared by the Standards Australia Committee on Flammable and Combustible Liquids to supersede AS 1940—1988. This new edition is the result of a comprehensive review of the Standard from cover to cover. Aside from minor editorial changes and clarifications of intent, the principal areas of change from the previous edition are as follows:

(a) The overall structure of the Standard has been changed slightly by the rearrangement of the Sections. Certain requirements are common to various types of installation, i.e. package stores, tank depots, service stations and the like. Some of these had been grouped in Section 1 where they often went unnoticed, while others were scattered repetitively through the various Sections. To rationalize, a new Section 3 has been introduced. Substantial rearrangements and the consolidation of the general requirements of Sections 7, 8, and 9 are described later in this Preface.

(b) The scope, and particularly the exclusions, have been adjusted in detail. The exclusion of processing plant remains under debate. Obviously major refining process plant has no place in this Standard, being designed under specific controls. Industrial processes that consume or use flammables under less expert control, while technically subject to analysis of hazardous zones, are to be a subject for future consideration.

(c) The definitions of classes of flammable or combustible liquids have been reviewed in detail. The decimal numerical system of subdividing Class 3 liquids could not be retained, because of difficulties in achieving alignment with national and international classification systems. Some thought was given to returning to the original A, B, C and D system on the grounds of simplicity and independence, but the ultimate decision was to align the flammable classes with the packaging–group system of the Australian Dangerous Goods Code. Since combustible liquids are not part of that system, they have an independent class identification, but this has advantages in that it becomes easier to highlight the lower level of hazards and to make special provisions for them.

(d) The definitions of liquids and of manufactured products have been altered to cater more clearly for viscous liquids and pastes.

(e) All previous editions have made a distinction between protected works, which are mainly off–site uninvolved buildings, and those on–site facilities which include offices, workshops and the like associated with the activity. To minimize misunderstanding, the distinction has been clarified by the use of two specifically–defined terms, i.e. ‘protected works’, and ‘on–site facilities’.

(f) Minor storage has been thoroughly reviewed, and the quantities in Table 2.1 have been adjusted substantially. In addition, manufactured products are treated as a separate class of goods.

(g) Section 4 has been totally rewritten. Much of this exercise has been editorial, i.e. an attempt to express more clearly the principles already established. However, there are a number of changes to detail, and illustrations have been introduced to clarify the intent of separation distances.

(h) The control of access, general site security and the provision of warning and exclusion notices, have been refined, with some attention being given to the distinction between the restriction of the public on one hand and the control of one’s own staff activities on the other. As a consequence, security fences feature prominently in separation distance considerations.

(i) A very large number of adjustments have been made throughout the Section on tank installations to such things as height of firewalls, capacity of compounds, sub–divisions within compounds, drainage, and the use of tank chambers. Of particular note, previous editions had permitted a reduction of the catchment volume of a compound where only combustible liquids were stored. This concession has been withdrawn, so that all liquids, even those of low combustibility, require full bunding.

(j) Section 7, Systems for Piping, Valves, Pumps and Tank Heating has been modernized and now incorporates a former separate Section that dealt with the heating of liquids, and which has been substantially trimmed of redundancies.

(k) Section 8 now deals with the loading of flammable liquids into tankers, a subject which was not treated in sufficient detail in previous editions.

(l) Section 9, Operations, has been totally restructured following a review of basic philosophy which has led to a fresh approach. Procedures are seen as the key to all operations; it is essential to formulate them, to promulgate them, to train to them, to enforce and police them, and finally to ensure that they are kept up–to–date.

(m) The Fire Protection Section has been significantly revised.

It is foreshadowed that the next revision of this Standard will—

(i) broaden the coverage to include potable liquids in containers over 20 L and with a strength exceeding 24% V/V ethanol. Organizations planning construction or expansion activities should take due cognizance of this proposal;

(ii) increase the water supply duration of Clause 10.11.7 for cooling and hydrant water from 1.5 to 4 h; and

(iii) consider limitations on tank farm layouts, including cluster tanks, to two rows from an access road.

This Standard, as amended from time to time, reflects changes in technology, and incorporates improvements which are derived from operational experience and the lessons of accidents and near misses. It also reflects control philosophies which have evolved and been proven in the intervening period since the last edition.

Users of this Standard should recognize that it represents a significant improvement in loss control over past editions and is intended to be applied in its entirety to new facilities built after the Standard's publication date.

The Committee encourages users of this Standard to critically reassess their sites, equipment and procedures whenever a new edition is published and supports initiatives by users to adopt and implement those parts which are practicable and which can improve overall site safety.

The Committee does not suggest that any of the provisions of this Standard are retrospective; however, users should check with the relevant statutory authority where this Standard has been adopted through legislation.

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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The storage and handling of flammable and combustible liquids

SECTION 1 SCOPE AND GENERAL

1.1 SCOPE This Standard sets out requirements for the design, construction and operation of installations for the storage and handling of flammable and combustible liquids in locations that are generally industrial, commercial or rural in nature. It includes matters relating to operations and management of emergencies.

1.2 APPLICATION This Standard applies to the storage and handling of liquids which are listed as Dangerous Goods Class 3, Flammable Liquids, in the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code). It applies equally to Class 3 liquids which have a subsidiary risk assigned and it also applies to substances of other classes which possess a subsidiary flammable liquid risk. Flammable liquids are defined in Clause 1.8.29.1.

NOTE: Further details based on the 5th Edition of the ADG Code are provided in Appendix A.

It also applies to combustible liquids which are liquids at the temperature at which they are stored (see Clause 1.8.29) and meet the criteria given in Clause 1.8.29.2. It also applies to a combustible liquid which is a dangerous good of another class as given in the ADG Code. In the event of contradictory requirements existing between the Standard, the Code or any other Standard the more onerous requirements shall apply.

A combustible liquid that is heated and kept above its flashpoint shall be treated as being a PG III liquid.

This Standard is written from a viewpoint of commonly used flammable and combustible liquids of the hydrocarbon or industrial solvent range. For storage and handling facilities for dangerous goods of another class that are flammable (have a subsidiary flammable liquid risk), this Standard is relevant to the flammability aspects.

It is necessary to keep in mind that some flammable or combustible liquids may have other physical or chemical attributes that may need additional precautions and design considerations, such as, but not limited to—

(a) being polymerizable liquids;

(b) needing inert gas blankets; or

(c) being heated liquids.

1.2.1 Relationship with regulations This Standard is intended to provide technical requirements for implementation by reference in statutory regulations.

NOTE: It should be noted that an installation may come under the jurisdiction of several authorities with differing areas of responsibility, and that an approval from one does not necessarily constitute an approval from others. Thus the construction and operation of any plant may require separate approvals from authorities interested in flammable and combustible liquids, factory or machinery safety, fire safety, electricity, gas, health, environment, water supply, sewerage and drainage, or the training and licensing of personnel.

1.3 NEW DESIGNS AND INNOVATIONS Any alternative materials, equipment, designs, methods of assembly or procedures, which do not comply with specific requirements of this Standard or are not mentioned in it but which give equivalent results to those specified, may be acceptable. Under such conditions a State regulatory authority can give advice on the procedure for approval.

1.4 INTERPRETATIONS Questions concerning the interpretation of any part of this Standard may be referred to Standards Australia.

NOTE: Where the Standard is referenced by regulation, Standards Australia will provide advice on interpretation. However, that advice is not binding on the statutory authority.

1.5 CLASSIFICATION The criteria for classification of a liquid as Dangerous Goods Class 3, i.e. a flammable liquid, are stated in the ADG Code.

NOTES:

1 A Committee (the ACTDG Competent Authorities Subcommittee), consisting of the Dangerous Goods Statutory Authorities of each State and Territory, is available for classifying substances which are not listed in the ADG Code.

2 Responsibility for classification rests primarily with manufacturers, but in cases of uncertainty, the relevant statutory authority should be consulted who will, if necessary, submit the matter to the Committee for decision.

1.6 EXCLUSIONS This Standard does not apply to the following:

(a) Shipboard installations.

(b) Residential-type heating oil installations comprising Category 1 tanks as defined in AS 1692.

(c) Liquefied gases that are maintained in the liquid phase for storage by means of pressure or refrigeration.

(d) Fuel tanks on any mobile vehicle or equipment.

(e) Any plant or equipment in which a flammable or combustible liquid is processed, together with any vessels which form an integral part of that processing equipment.

The storages associated with processing plant fall within the scope of this Standard.

NOTE: Refining, distilling and processing plants are generally purpose built and designed to take into account the associated risks and the activities proposed. Risk assessments, hazard analyses, operability studies, and safety studies may form part of the design criteria.

(f) Potable liquids. (Refer to Preface.)

NOTE: State authorities may have specific requirements.

(g) Temporary field storages and associated facilities in remote locations for Australian Defence Force exercises or operations.

1.7 REFERENCED DOCUMENTS A list of the documents referred to in this Standard is given in Appendix B.

1.8 DEFINITIONS For the purpose of this Standard, the definitions below apply.

1.8.1 Approved, approval—with the sanction of, acceptable to, and meeting the prescribed standards of, the authority having jurisdiction.

1.8.2 Authority, Authority having jurisdiction—the authority having statutory (legal) control of the installation.

1.8.3 Boundary—the boundary of the whole of the site under the same occupancy as that on which the installation is included, whether fenced or unfenced.

1.8.4 Bund—an embankment or wall which may form part or all of the perimeter of a compound.

1.8.5 Capacity (of a tank)—the maximum working volume or space within a tank, i.e. the volume the tank will accept without leakage.

NOTE: It is recognized that the available capacity of a tank will normally be less than the full capacity.

1.8.6 Category of tank—that category as classified in AS 1692 and as follows:

(a) *Category 1*—tanks up to 1200 L capacity, for aboveground use, intended principally for the storage of oil fuel in domestic type applications.

NOTE: Category 1 tanks should not be used for the storage of flammable liquids as they do not incorporate a liquid seal.

(b) *Category 2*—vertical or horizontal cylindrical tanks up to 2500 L capacity, for above-ground use, intended principally for farms and similar open space locations.

(c) *Category 3*—rectangular tanks and tanks of unconventional shapes, intended principally for industrial use aboveground as either head tanks or storage tanks.

(d) *Category 4*—horizontal cylindrical tanks up to 150 m^3 capacity, for underground or above-ground use, intended principally for industrial or service station use.

(e) *Category 5*—vertical cylindrical tanks up to 150 m^3 capacity, for above-ground use, intended for industrial use.

(f) *Category 6*—vertical tanks up to any capacity, of a size and type that is usually erected on site.

1.8.7 Commercial building—any building that is partly or wholly used for offices, professional rooms, consulting rooms, or the like.

1.8.8 Combustible liquid—see Clause 1.8.29.2.

1.8.9 Compound—an area bounded by natural ground contours or by a bund, sufficiently impervious to retain spillage or leakage pending recovery (a pit or a tank may be used to provide the same function).

1.8.10 Confined space—a space of any volume as defined by AS 2865.

1.8.11 Dangerous occurrence—an incident such as—

(a) an explosion or fire;

(b) any occurrence resulting in the death of, or serious injury to, any person, or in substantial damage to property; or

(c) any other occurrence involving imminent risk of explosion, fire, death, injury or damage.

1.8.12 Dwelling—any building or portion of a building that is used or is intended, adapted, or designed to be used for living purposes.

1.8.13 Dispenser—a measuring or metering unit intended principally for the dispensing of liquids from a storage tank to the fuel tank of a vehicle, boat, or light aircraft.

1.8.14 Fire point—in relation to a liquid, is the temperature at which the liquid, when tested according to the method set out in IP 36/84 published in the IP Methods, first evolves vapour at a sufficient rate to sustain burning for at least 5 s after application of the test flame specified in the method.

1.8.15 Fire resistance level (FRL)—A measure of the fire resistance of a material or structure as determined in accordance with AS 1530.4. It consists of three numerals representing, in order, the period of resistance for—

(a) structural adequacy;

(b) integrity; and

(c) insulation.