Under Revision. See DR91129 Dup

Amendment 1 - September 1988
" 2 - June 1989
" 3 - Oct 1990

ABSA 19

Superseded by AS 1940 – 1993

Standards
Association of
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Australian Standard®
1940—1988

THE STORAGE AND HANDLING OF FLAMMABLE AND COMBUSTIBLE LIQUIDS

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This Australian Standard was prepared by Committee ME/17, Flammable and Combustible Liquids. It was approved on behalf of the Council of the Standards Association of Australia on 5 February 1988 and published on 13 May 1988.

The following interests are represented on Committee ME/17:

Association of Australian Port and Marine Authorities

Australian Institute of Petroleum Ltd

Australian Paint Manufacturers Federation

Board of Fire Commissioners, New South Wales

Confederation of Australian Industry

Department of Defence

Department of Administrative Services

Department of Employment and Industrial Affairs, Queensland

Department of Industrial Relations and Employment, New South Wales

Department of Labour, South Australia

Department of Labour, Victoria

Department of Local Government, Queensland

Department of Mines, Tasmania

Department of Mines, Western Australia

Department of the Arts, Sport, the Environment, Tourism, and Territories

Electricity Supply Association of Australia

Insurance Council of Australia Ltd

Metal Trades Industry Association of Australia

Railways of Australia Committee

Work Health Authority, Northern Territory

Additional interests participating in preparation of Standard:

Country Fire Authority, Victoria

Fire Protection Industry Association of Australia

Western Australian Fire Brigades Board

This Standard was issued in draft form for comment as DR 86193.

Dup

STANDARDS AUSTRALIA

Amendment No 3
to
AS 1940—1988
The storage and handling of flammable and combustible liquids

CORRECTIONS AND REVISED TEXT

The 1988 edition of AS 1940, which was amended in September 1988, and in June 1989, is further amended as follows; the amendment(s) should be inserted in the appropriate place.

SUMMARY: This Amendment applies to Clauses 1.1, 1.4.25.2, 1.4.25.3, 3.2.3, 3.4.1, 4.7.9, 4.11.4, 9.12.7, 9.14.2.

Published on 15 October 1990.

AMDT No 3 OCT 1990

Page 5. Clause 1.1(h).

Change the first word 'or' in the second line to 'of'.

AMDT No 3 OCT 1990

Page 6. Clause 1.4.25.2.

Delete existing Clause and *substitute*:

1.4.25.2 *Combustible liquid*—any liquid other than a flammable liquid, that has a flashpoint, and that has a firepoint less than its boiling point.

NOTE: The boiling point is taken to mean that point at which it is no longer possible to achieve the rate of temperature rise required by ASTM D 92 for the firepoint test.

AMDT No 3 OCT 1990

Page 6. Clause 1.4.25.3.

Delete the item defining Class 3.3, and *substitute*:

Class 3.3— a combustible liquid that has a flashpoint of 150°C or less.

AMDT No 3 OCT 1990

Page 10. Clause 3.2.3(d).

Change 'container' to 'package'.

AMDT No 3 OCT 1990

Page 12. Clause 3.4.1.

Delete the final sentence of the Note and *substitute*:

Therefore Clause 3.3.3(b) cannot validly be applied, and the remainder of Clause 3.3.3 applies from any vent outlet or doorway.

AMDT No 3 OCT 1990

Page 20. Clause 4.7.9).

Change 'that' to 'than' in the second line.

AMDT No 3 OCT 1990

Page 23. Clause 4.11.4.

Change Clause No. '4.11.4' to '4.11.3'.

AMDT No 3 OCT 1990

Page 39. Clause 9.12.7(b).

Change 'B5' to 'B15'.

AMDT No 3 OCT 1990

Page 40. Clause 9.14.2(b).

Change Clause '9.11.4' to Clause '9.11.5'.

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TABLE 8.1
TANK INSPECTION SCHEDULE—CATEGORY 6 TANKS

Part of tank	Frequency of inspection	Minimum standard type of inspection	Purpose
1. Tank shell	Maximum 10 years	Ultrasonic*	To prove the integrity of the tank and its continued compliance with allowable design stresses
2. Other structural members	Maximum 10 years	Ultrasonic*	
3. Bottom plates	Maximum 10 years	Ultrasonic* or by removing 'coupons'	To determine whether plate thickness has deteriorated below acceptable standards (see Clause 8.7.9.8)
4. Roof plates	Maximum 10 years	Ultrasonic*	
5. Visual external inspections of whole tank including seals of floating roofs	Monthly	Visual	To ensure no visual evidence of abnormal stress, leaking, or other malfunctions
6. Valves and vents	Monthly	Visual	To ensure that fittings are operating normally
	Maximum 10 years	Remove and full test	
7. Other fittings & appurtenances	Quarterly	Visual	To ensure that fittings are sound, and operating normally
8. External foundations	Monthly	Visual	To ensure no signs of leaking or stress indicating imminent failure
9. Foundations	Maximum 10 years	Physical	To ensure foundations have not subsided or put tank at risk
10. Roof seals on floating tanks	Maximum 10 years	Physical	To ensure seal performances are within acceptable limits

* The frequency of testing may need to be varied according to the type of service, and ultrasonic testing may be waived if visual inspection indicates that such testing is not necessary.

STANDARDS AUSTRALIA

Amendment No 2
to
AS 1940—1988
SAA Flammable and Combustible Liquids Code

REVISED TEXT

The 1988 edition of AS 1940, which was amended in September 1988, is further amended as follows; the amendment(s) should be inserted in the appropriate place.

SUMMARY: This Amendment applies to Clause 8.7.

Published on 19 June 1989.

AMDT No 2 JULY 1989

Page 34. Clause 8.7.

Add new Clause 8.7.9.

8.7.9 Maintenance of storage tanks.

8.7.9.1 *General.* The owner of a Category 6 storage tank shall take all practical means to ensure that it remains in serviceable condition when in use.

8.7.9.2 *Regular inspection.* The owner of a storage tank referred to in Clause 8.7.9.1 shall cause that tank and its foundations, fittings, and appurtenances to be inspected and tested in accordance with Table 8.1.

8.7.9.3 *Records and reports.* The owner of a storage tank referred to in Clause 8.7.9.1 shall maintain a permanent record of all such inspections and tests. Such records shall be available to the Authority on request.

8.7.9.4 *Repair of defects.* Where defects create local stresses that exceed allowable limits, the tank shall not continue to be operated unless either repairs are effected or the filling level is limited to ensure that stress levels are not exceeded.

8.7.9.5 *Limited filling height.* Where a limited filling height has been imposed in accordance with Clause 8.7.9.4, the Authority shall be notified. The Authority may permit continued operation at a limited filling height for a period not exceeding one year provided that—

(a) a thorough evaluation of the structural strength of the tank has been made by a qualified Engineer;

(b) the limited filling height does not stress the weakest part of the tank beyond allowable design limits;

(c) any such testing includes non-destructive examination of shell plates and welds, account being taken of any pitting or grooving or other imperfections that may be apparent; and

(d) sufficient metal thickness measurements of shell plates have been taken to ensure that the minimum effective thickness of each strake has been determined.

8.7.9.6 *Approval of repairs.* Any repair program shall be such as to ensure that the tank is restored to the design standard for the proposed service.

8.7.9.7 *Hydrostatic test.* Prior to return to operating service after structural repairs, a hydrostatic test shall be satisfactorily completed in accordance with AS 1692. A hydrostatic test shall not be required for minor repairs or repairs to fittings or appurtenances.

8.7.9.8 *Floor plates.* Sufficient measurements of floor plate thickness as required by Table 8.1 shall be taken to ensure that the minimum thickness has been determined. Where the effective thickness at any point is less than 4 mm, the floor plate shall be repaired by any method that will effectively prevent further corrosion or leakage.

NOTE: The Australian Institute of Petroleum is currently developing a detailed code of practice on storage tank integrity testing and inspection methods. It is also recommended that reference be made to the AIP Guide for Inspection of Refinery Equipment, Chapter XIII (Storage Tanks).

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STANDARDS ASSOCIATION OF AUSTRALIA
Incorporated by Royal Charter

AMENDMENT No 1
to
AS 1940—1988
THE STORAGE AND HANDLING OF FLAMMABLE AND COMBUSTIBLE LIQUIDS

CORRECTION

The 1988 edition of AS 1940 is amended as follows; the amendment(s) should be inserted in the appropriate place.

SUMMARY: This amendment applies to Table 2.1.

Published on 12 September 1988.

AMDT No 1 SEPT. 1988

Page 9. Table 2.1.

Delete existing table and *substitute* the table attached.

AMDT No 1 SEPT. 1988

TABLE 2.1
MINOR STORAGE

Location	Class of liquid		
	3.1	3.2	3.3 and 3.4
Residential buildings of any type			
Within a dwelling	5 L	25 L	50 L total 3.3 and 3.4
In an outhouse or garage attached to a dwelling, but separated from it by a 1-hour fire-rated partition	25 L	50 L	100 L total 3.3 and 3.4
Outdoors, or in a shed or garage that is either 1 m clear of the dwelling or separated from it by a 3-hour fire-rated partition.	100 L	250 L	500 L total 3.3 and 3.4
A supply tank for domestic oil-fired appliances installed in accordance with AS 1691 will be excluded from any calculation of the quantity stored on the premises			
Commercial building	5 L per floor per tenancy	25 L per floor per tenancy	500 L total 3.3 and 3.4 per floor per tenancy
Hospitals	10 L per 50 m^2 of floor space	25 L per 50 m^2 of floor space	100 L total 3.3 and 3.4
Educational establishments (excluding laboratories)	5 L per floor	25 L per floor	500 L total 3.3 and 3.4 per floor
Laboratories			
Works, factory or plant laboratory	50 L per 50 m^2 of floor space	100 L per 50 m^2 of floor space	200 L total 3.3 and 3.4
Laboratories in other locations	10 L per 50 m^2 of floor space	25 L per 50 m^2 of floor space	100 L total 3.3 and 3.4
Factories and warehouses			
Inside:	100 L; or 1 L per 10 m^2 space with no more than 100 L in any 500 m^2 area: Maximum package size 20 L	250 L; or 1 L per 2 m^2 with no more than 250 L in any 500 m^2 area	1000 L; or 2 L per 1 m^2 space with no more than 1000 L in any 500 m^2 area
PLUS:			
In attached outhouses or sheds if separated by a 1-hour fire-rated partition	120 L in packages not over 20 L each	As immediately above	As immediately above
OR:			
Outside, or in a detached shed or outhouse separated by at least 1 m from the buildings	As immediately above	1400 L in tanks not over 700 L each, or in packages not over 210 L each	1500 L total 3.3 and 3.4
	In addition to the above, manufactured products may be stored as follows: (a) 3.1 and 3.2 products—2000 L (b) 3.3 and 3.4 products—no limit		
Shops	As for factories and warehouses (above) except that Class 3.1 and 3.2 manufactured products in sealed containers that will not be opened in the premises, except for tinting of paint for immediate sale, may be stored up to a maximum quantity of 10 000 L, provided that the Class 3.1 products do not exceed 5000 L.		
Service stations			
If the service station building is built up to property boundary	250 L in packages not over 20 L each	250 L in packages not over 20 L each	3000 L total 3.3 and 3.4
If no part of the service station building is within 5 m of a property boundary or if the boundary comprises a blank masonry or concrete wall sufficient to qualify as a fire wall	500 L total in containers not over 5 L capacity 200 L total in containers of 20 L capacity 300 L total in containers over 20 L capacity Any containers kept in a sales office shall be unopened sealed containers not over 20 L capacity Reduce the total Class 3.1 quantity by 75 L for every 1 m shortfall in the building-to-boundary clearance	*Inside* 50 L total in containers not over 5 L capacity each 200 L total in containers of 20 L capacity 1000 L in a tank or in drums not over 210 L capacity each *Outdoors* An additional 1000 L	3000 L total 3.3 and 3.4
Farm premises			
Tank(s) aboveground	2500 L	5000 L	10 000 L
Underground tank(s)	5000 L	5000 L	10 000 L
Construction sites			
Densely populated or congested areas	25 L per floor	50 L per floor	10 000 L
Other locations	2500 L	5000 L	10 000 L

NOTES:

1. In the case of laboratories, commercial buildings and the like, this table is intended to cater for the day-to-day working stock in the laboratory or workroom. If these quantities are to be exceeded, it will be necessary to install a cabinet, compartment or major store facility according to the scale needed.
2. If storing the maximum permissible allowance for one class of liquid, it is permissible to store at the same time on the same area the maximum limit for each or all of the other classes of liquid.
3. Where the maximum allowance is specified in terms of quantity per unit area, any arrangement which results in an undue concentration at one point should be avoided. Such a concentration could in some conditions be ruled as being no longer minor, thus requiring proper storage provisions as in Section 3.

AUSTRALIAN STANDARD

THE STORAGE AND HANDLING OF FLAMMABLE AND COMBUSTIBLE LIQUIDS

Known as the SAA FLAMMABLE AND COMBUSTIBLE LIQUIDS CODE

AS 1940—1988

First published as part of CB5—1942.
Second edition 1957.
Third edition 1969.
Revised and redesignated AS 1940—1976.
Second edition 1982.
Third edition 1988.

PUBLISHED BY THE STANDARDS ASSOCIATION OF AUSTRALIA
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PREFACE

This Standard was prepared by the Association's Committee on Flammable and Combustible Liquids to supersede AS 1940—1982. A number of published amendments have been incorporated, and additional changes have been made.

The major features of this edition in comparison with the previous edition are as follows:

(a) The classification system for the flammability or combustibility of liquids has been changed; the former Classes A, B, C, and D now become Classes 3.1, 3.2, 3.3, and 3.4 respectively. The alphabetical system had been devised because discrepancies between the then IMCO (now IMO)* and other numerical systems of the time had made it impossible to attach further numerals to cover combustible liquids. That problem diminished with the establishment of the ADG Code† as a prime authority; the alpha system became a cause of confusion itself, being something extra to memorize, so it was time to abandon it.

(b) The philosophy of separation distances to protected works on adjoining properties has been altered, and aligns with AS 1596, *SAA LP Gas Code*. The distance from an ignition source is in effect the basic safe separation distance, and this sets the lower limit for all separation distances. Boundary distances are usually the same, and those for on-site protected works are usually slightly larger. A larger distance applies to off-site protected works, but it is permissible to measure across the boundary to that works, or to take advantage of empty land adjoining, provided that restrictions are applicable should that land be developed.

(c) The treatment of unattended and unsupervised self-service stations has been revised because of the growth in the use of credit cards.

(d) The treatment of work in confined spaces has been rationalized and simplified, as it is now covered in a specialist Standard, AS 2865, *Safe working in a confined space*.

(e) Section 9 has been revised substantially. Apart from numerous adjustments to detail, significant aspects are as follows:

  (i) The requirements for package filling have been separated from package storage and both are treated in more detail.

  (ii) Fuel dispensing has been expanded, with additional attention to marine dispensers.

  (iii) Tank storages have been reviewed, with particular attention given to the escalation of requirements according to size. There is less tolerance of poor or non-existent water supplies on smaller sites, and the requirements for foam facilities have spread down the scale. The ready availability of hose reels and cheap booster pumps has substantially improved the ability to provide effective small scale protection.

  (iv) Fixed foam systems for larger tankages have been treated in more detail.

  (v) Piping and pumping systems are now covered in a separate group of clauses. Boost provisions have been reviewed.

  (vi) The traditional view that diesel engines are more reliable in terms of availability for fire pumps than electric motors has been examined, found inaccurate, and discarded. A survey by NFPA‡ has indicated that the likelihood of a failure to start, or of being under maintenance or otherwise unavailable when required, is considerably higher for a diesel engine than for an electric motor. Preference is now given to the electric pump, with one important proviso, that electricity supply to the area is a grid system and not a vulnerable single feeder.

  (vii) Extra provisions have been made for tanker loading bays.

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* Inter-governmental Maritime Consultative Organization—now International Maritime Organization.

† Australian Code for the Transport of Dangerous Goods by Road and Rail.

‡ National Fire Protection Association (U.S.A.)

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STANDARDS ASSOCIATION OF AUSTRALIA

Australian Standard
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. This Standard does not apply to the following:

(a) Shipboard installations.

(b) Residential type installations of a type dealt with in AS 1691.

(c) The transport of flammable or combustible liquids, which is dealt with in AS 2017, AS 2809.1, AS 2809.2 and AS 2809.3.

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

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

(f) Potable liquids.

(g) Bitumen and its mixtures prepared for road-making.

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

SEE AMENDMENT (3)

NOTE: This Standard is written from the viewpoint of commonly used flammable and combustible liquids of the hydrocarbon or industrial solvent range. For storage and handling facilities for other chemicals that are flammable, this Standard may be relevant to the flammability aspects, but it is necessary to keep in mind that such chemicals may have other attributes that need special additional precautions, treatment, or facilities.

1.2 APPLICATION.

1.2.1 Relationship with regulations. The requirements of this Standard may be read in conjunction with, but do not take precedence over, any Statutory Regulations that may apply in any area.

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 of any plant may require separate approvals from authorities interested in flammable and combustible liquids, factory or machinery safety, electricity, gas, health, environment, water supply, sewerage and drainage, or the training and licensing of personnel.

1.2.2 New designs, innovations. Notwithstanding the specific requirements of this Standard, any novel materials, designs, methods of assembly, etc, which give equivalent results to those specified are not necessarily prohibited. The responsible committee (ME/17, Flammable and Combustible Liquids) can act in an advisory capacity concerning equivalent suitability, but specific approval remains the prerogative of the Authority.

1.2.3 Interpretations. Questions concerning the meaning, application or effect of any part of this Standard may be referred to SAA Committee ME/17 for interpretation. The authority of this committee is limited to matters of interpretation, and the committee will not adjudicate in disputes.

1.3 REFERENCED DOCUMENTS. A list of the Standards and other documents referred to in this Standard is given in Appendix E.

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

1.4.1 Approved, approval—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 of the subject installation.

1.4.3 Boundary—the boundary of the whole of the site under the same occupancy as that on which the installation is included.

1.4.4 Bund—an embankment of earth, or a wall of brick, stone, concrete, or other approved material which may form part or all of the perimeter of a compound.

1.4.5 Capacity (of a tank)—the total volume which the tank will accept without spilling or leaking.

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

1.4.6 Category of tank—that category as classified in AS 1692.

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

1.4.8 Combustible liquid—see Clause 1.4.25.

1.4.9 Compound—an area bounded by natural ground contours or by a bund, and intended to retain spillage or leakage. (A pit or a tank may sometimes be used to provide the same function.)

1.4.10 Confined space—any tank, pit, compound, pipe, flue, vessel, or container which contains or has contained any harmful vapours or substances capable of producing them, or which contains or has contained or is made of or coated with any substance capable of causing the amount of oxygen present to be reduced to a dangerous extent.

1.4.11 Dwelling—any building or portion of a building that is used or is intended, adapted, or designed for use for living purposes.

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

1.4.13 Fire rating—the minimum fire resistance rating of a material or method of construction as determined by the method specified in AS 1530.4.