

SINGAPORE STANDARD
Code of practice for the storage of
flammable liquids

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liquids**

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Foreword

This Singapore Standard Code of Practice was prepared by the Working Group appointed by the Technical Committee on Petroleum Processes and Products under the direction of the Chemical Standards Committee.

This is a revision of SS 532 : 2007. In this revision, the changes include the following:

- Exclusion of laboratories (including storage area solely supporting operations of laboratories) and petrol service stations from the scope of this standard;
- Insertion of new Table 2 *Capacity limit vs type of container*;
- Insertion of new Subclause 4.2.2 *Maximum Allowable Quantity (MAQ) in Building* and new Table 3 *Design limitation for MAQ* for better clarity on MAQ based on classification of materials;
- Changes in 4.2.5 *Non-sprinkler protected area* and 4.2.6 *Sprinkler protected area* to provide more design options;
- Changes of Table 4 *Groups of packages by quantity and category* and Table 5 *Separation distances for groups to protected place/on-site facility*;
- Insertion of new Subclause 7.10.7 *Leak detection*;
- Insertion of new Subclause 8.2 *Pump station* to ensure that fire is compartmentalised to prevent fire spread to a larger surface area;
- Changes to 8.3.3 *Fuel transfer pipe from outside storage tank to a service tank inside a building* to be applicable for Category 4 liquids only;
- Changes to 9.2.7 *Leakage and spillage* to ensure early leak detection;
- Changes to 9.2.12 *Heated storage* to include recommended action to be taken;
- Insertion of new requirements in 10.5 *Fire pumps* to illustrate good practice;
- Insertion of a new requirement in 10.6 *Hydrant system* to address large flammable liquid storage tank area;
- Insertion of a new requirement for fire alarm system and outdoor audible warning devices in 10.10 *Emergency warning and communication*.

The objective of the standard is to provide guidance and best practices for the safety of persons and the prevention of damage to property when storing or handling flammable liquids. It covers storage and handling of flammable liquids in installations but does not include their transportation.

The revised edition is aligned with the current regulatory authorities, emergency response services, environmental requirements and local publications/standards as well as the United Nations guidelines on GHS.

This standard does not override any statutory requirements but should be used in conjunction with such requirements. It is expected to be used by the relevant Authorities as part of the fire and safety requirements. In the event a flammable liquid is being regulated/administered by more than one regulatory bodies/agencies, the more stringent requirement applies.

The users of this standard is responsible to carry out their respective risk assessment in order to identify any possible gaps or enhancement works for improvement. Additional fire safety provisions and mitigation measures may be required to put in place, and be integrated as one system. The users of this standard shall consult the Relevant Authorities to ensure the overall proposals are acceptable and to address all specific concerns at the time of consultation.

In preparing this Singapore Standard, reference was made to the following publications:

1. Australian Standard AS 1940 : 2004, incorporating its amendment No. 1 The storage and handling of flammable and combustible liquids
2. South African National Standard SANS 10089-1 : 2008 The petroleum industry, Part 1 : Storage and distribution of petroleum products in above-ground bulk installations
3. National Fire Protection Association NFPA No. 30 : 2012 Edition Flammable and combustible liquids code
4. 'Guidelines on storage of flammable & combustible liquids in aboveground atmospheric storage tanks', 1991 edition by Oil and Petrochemical Industry Technical & Safety Committee (OPITSC) and the former Singapore Joint Civil Defence Forces
5. 'Globally Harmonized System of Classification and Labelling of Chemicals (GHS)', Revision 5, 2013 by United Nations

Acknowledgement is made for the use of information from these publications.

At the time of publication, this standard is expected to be used by petrochemical plants, refineries, oil storage facilities, facilities processing or storing flammable and combustible liquids, associations/institutions of fire engineers, professional engineers and safety officers as well as related government agencies.

Attention is drawn to the possibility that some of the elements of this Singapore Standard may be the subject of patent rights. Enterprise Singapore shall not be held responsible for identifying any or all of such patent rights.

NOTE

1. *Singapore Standards (SSs) and Technical References (TRs) are reviewed periodically to keep abreast of technical changes, technological developments and industry practices. The changes are documented through the issue of either amendments or revisions.*
2. *An SS or TR is voluntary in nature except when it is made mandatory by a regulatory authority. It can also be cited in contracts making its application a business necessity. Users are advised to assess and determine whether the SS or TR is suitable for their intended use or purpose. If required, they should refer to the relevant professionals or experts for advice on the use of the document. Enterprise Singapore shall not be liable for any damages whether directly or indirectly suffered by anyone or any organisation as a result of the use of any SS or TR.*
3. *Compliance with a SS or TR does not exempt users from any legal obligations.*

Code of practice for the storage of flammable liquids

1 Scope

This Singapore Standard sets out requirements and recommendations for the safe storage and handling of flammable liquids, as classified in the United Nations Globally Harmonized System of Classification and Labelling of Chemicals (GHS), listed in the Chapter of Flammable Liquids. The standard covers flammable liquids of Category 1, 2, 3 and 4 as classified in GHS. In addition, the standard also covers liquids of flash point up to 150 °C.

This standard does not apply to the following:

- (a) Shipboard installations;
- (b) Any storage that is mobile (fuel tanks and tankers, ISO tanks and tankers), except as defined for transit storage purpose;
- (c) Any plant or equipment in which liquid is processed, together with any vessels which form an integral part of the processing plant or equipment;
- (d) Bitumen and its mixtures prepared for road-making;
- (e) Flammable liquids stored in a tank exceeding 175 millibar above atmospheric pressure;
- (f) Liquefied gases that are maintained in the liquid phase for storage by means of pressure or refrigeration;
- (g) Laboratories (including storage area solely supporting laboratories operations); and
- (h) Petrol service stations.

2 Normative references

The following referenced documents are indispensable for the application of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

API SPEC 6FA	Fire test for valves
API STD 650	Welded steel tanks for oil storage
API STD 2000	Venting atmospheric and low-pressure storage tanks – Non refrigerated and refrigerated
API RP 2003	Protection against ignitions arising out of static, lightning and stray currents
ASTM D5	Standard test method for penetration of bituminous materials
BS EN 12266-1	Industrial valves. Testing of valves. Pressure tests, test procedures and acceptance criteria. Mandatory requirements
BS EN 12266-2	Industrial valves. Testing of valves. Tests, test procedures and acceptance criteria. Supplementary requirements
CP 52	Code of practice for automatic fire sprinkler system

IEC 60079	Explosive atmospheres
NFPA 11	Standard for low-, medium-, and high-expansion foam
NFPA 30	Flammable and combustible liquids code
SS 508	Graphical symbols – Safety colours and safety signs
SS 555	Code of practice for protection against lightning
SS 568	Code of practice for confined spaces
SS 578	Code of practice for use and maintenance of portable fire extinguishers
SS 586-2	Specification for hazard communication for hazardous chemicals and dangerous goods – Part 2 : Globally harmonised system of classification and labelling of chemicals – Singapore’s adaptations
SS 593	Code of practice for pollution control