

Australian Standard<sup>®</sup>

**The design, installation and operation of  
underground petroleum storage  
systems**



This Australian Standard® was prepared by Committee ME-017, Flammable and Combustible Liquids. It was approved on behalf of the Council of Standards Australia on 15 January 2008.

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  - Plastics and Chemicals Industries Association
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- 

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**RECONFIRMATION**  
**OF**  
**AS 4897—2008**  
**The design, installation and operation of underground petroleum storage systems**

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Technical Committee ME-017 has reviewed the content of this publication and in accordance with Standards Australia procedures for reconfirmation, it has been determined that the publication is still valid and does not require change.

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## NOTES

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## PREFACE

This Standard was prepared by Standards Australia Committee ME-017, Flammable and Combustible Liquids, to provide requirements and recommendations for the underground storage of petroleum products. It is based on the Australian Institute of Petroleum (AIP) CP 4—2002, *Code of Practice—The design, installation and operation of underground petroleum storage systems*, which has been withdrawn by AIP.

This Standard is intended to promote the safe, environmentally sound and efficient underground storage of petroleum products. It is intended to be used by oil industry employees, service station operators, installation contractors and regulatory authorities. It is not intended to replace any statutory regulations in any area, which take precedence over the requirements of this Standard. The relevant regulatory authority having jurisdiction may determine the extent of application of this Standard.

Individual companies may have additional or special policies and requirements that exceed or vary the requirements set out in this Standard. In such situations, such companies also need to be consulted.

Statements expressed in mandatory terms in notes to tables are deemed to be requirements of this Standard.

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## STANDARDS AUSTRALIA

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Australian Standard**The design, installation and operation of underground petroleum storage systems**

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## SECTION 1 SCOPE AND GENERAL

**1.1 SCOPE**

This Standard sets out requirements for the design and installation of underground petroleum storage systems for the storage of petroleum products or used oil, and provides requirements for the operation, maintenance, testing, repair and re-use of new and existing underground petroleum storage systems.

This Standard also sets out inventory control and loss investigation procedures that are appropriate to all underground petroleum storage systems.

NOTE: In this Standard, the term ‘underground petroleum storage system’ is abbreviated to UPS system.

**1.2 APPLICATION****1.2.1 Where this Standard applies**

This Standard applies to the following:

- (a) New installations, in terms of design and installation.
- (b) New and existing installations, in terms of operation, maintenance, testing, repair and re-use of UPS systems.
- (c) All installations, in terms of inventory control and loss investigation procedures.

**1.2.2 Where this Standard does not apply**

This Standard does not apply to the following:

- (a) Existing UPS systems, with regard to their design and installation.
- (b) Structures such as sumps, separators, stormwater or wastewater collection systems, catchment basins, pits, septic tanks.
- (c) Bunded tanks situated below ground level, but not in the ground, such as those in a basement, cellar or tunnel.
- (d) Pipework that is not associated with an UPS system.
- (e) Storage systems for liquefied petroleum gas (LP Gas), which are covered by AS/NZS 1596.

**1.2.3 Application of sections**

Table 1.1 summarizes the processes to be followed for the installation of new UPS systems and upgrading of existing UPS systems in order to comply with this Standard and lists the relevant references that apply.

**TABLE 1.1**  
**PROCESSES FOR NEW AND UPGRADED UPS SYSTEM**

| Stage | Task                                    | Reference             |
|-------|-----------------------------------------|-----------------------|
| 1     | Classify site                           | Section 2             |
| 2     | Determine minimum equipment level       | Section 3             |
| 3     | Design equipment                        | Sections 4, 5 and 6   |
| 4     | Install equipment                       | Section 6, Appendix F |
| 5     | Perform equipment integrity test (EILT) | Clauses 6.4.4, 8.5    |
| 6     | Inventory control                       | Section 7, Appendix D |
| 7     | Maintenance and testing                 | Section 8, Appendix G |

### 1.3 REFERENCED DOCUMENTS

A list of documents referred to in this Standard is provided in Appendix A.

### 1.4 DEFINITIONS AND ABBREVIATIONS

For the purpose of this Standard, the definitions and abbreviations below apply.

NOTE: Words that are not included in this list of definitions are assumed to have the meanings that are commonly assigned to them in general usage.

#### 1.4.1 Acceptable

Satisfying all the requirements of the regulatory authority and this Standard.

#### 1.4.2 AIP

Australian Institute of Petroleum.

#### 1.4.3 API

American Institute of Petroleum.

#### 1.4.4 AS

Australian Standard.

#### 1.4.5 Authority (authorities)

The regulatory body or bodies having statutory jurisdiction over the UPS system.

#### 1.4.6 Beneficial use

The use of the environment, or any element or segment of the environment, which is conducive to public benefit, welfare, safety, health or aesthetic enjoyment or which requires protection from the effects of waste discharges, emissions or deposits.

#### 1.4.7 Cathodic protection (cathodically protected)

Coating the metal with a suitable dielectric material and installing a cathodic protection system.

#### 1.4.8 Cathodic protection system

A system for preventing or reducing corrosion in a metal surface by making the metal a cathode by using either—

- (a) an impressed direct current; or
- (b) attached sacrificial anodes.

#### **1.4.9 Certify (certification, certified)**

To acknowledge in writing that compliance with this Standard has been achieved and demonstrated. Certification includes the following information:

- (a) Who performed the certification, being either—
  - (i) the name and Australian Company Number (ACN) of the company; or
  - (ii) the name, signature and qualifications of the competent and experienced person.
- (b) The date of certification.
- (c) Where it is not apparent, the method of determining compliance for which certification was required.

#### **1.4.10 Competent and experienced person**

A person with appropriate practical and theoretical knowledge and actual experience to carry out a particular task safely and effectively. This person has the necessary ability and training and all the relevant qualifications, accreditations, certifications, licences and approvals required for the particular activity with which he or she is concerned, an understanding of relevant statutory requirements and of this Standard, and an appreciation of the hazards involved. The person is also able to recognize the need for specialist advice or assistance when necessary and to assess the importance of the results of examinations and tests in the light of their purpose.

#### **1.4.11 Corrosion specialist**

A competent and experienced person engaged in the practice of control of corrosion in steel UPS systems, and certified as a ‘corrosion technologist’ by the Australasian Corrosion Association Incorporated or other equivalent body.

#### **1.4.12 Dispenser**

A measuring or metering unit designed specifically for the dispensing of product from a UPS system to a vehicle fuel tank or other receptacle, and includes all components, whether external or internal, mechanical, electrical or hydraulic.

#### **1.4.13 DSC**

Daily Sales Calculation.

#### **1.4.14 Earth (noun)**

The conducting mass of the general body of the earth.

#### **1.4.15 Earth (verb)**

The act of connecting any conductor to earth.

#### **1.4.16 Environment**

Any part of the natural or man-made surrounds, above or below ground.

#### **1.4.17 Equipment**

Any component of an UPS system.

#### **1.4.18 Equipment integrity test (EIT)**

A test conducted to evaluate whether an UPS System is leaking to the environment, or is not providing containment as originally designed.

NOTE: EIT is also known as Precision Leak Testing.

#### **1.4.19 Equipment level**

The minimum equipment requirements for a particular UPS system.

**1.4.20 Existing**

That which exists and is operating.

**1.4.21 Exposure pathway**

The route by which a release of product from a UPS system can reach a sensitive receptor. An exposure pathway needs to encompass a source of the product, a mechanism or path through which the product can travel, a receptor, and a time factor for travel.

**1.4.22 Fate and transport modelling**

An analysis using mathematical models to estimate the persistence and mobility of chemicals of concern through various environmental media.

**1.4.23 Fill point spill containment device**

A container that is fitted to the fill point of a tank to catch and contain a spill during product delivery to that tank.

**1.4.24 Groundwater monitoring well**

A well that has been installed as part of a groundwater monitoring leak monitoring system.

**1.4.25 Hydrogeological survey**

A survey to determine the rate and direction at which a release of hydrocarbons can spread from the point of release. Such a survey takes into account—

- (a) soil permeability and porosity;
- (b) the existence, depth, fluctuation in level and gradient of the water table; and
- (c) the existence of service trenches.

**1.4.26 Installation contractor**

A competent and experienced person engaged in the installation of equipment.

**1.4.27 Interstitial space**

The space between the two walls of double-walled tanks or product piping.

**1.4.28 Inventory control**

The performance of reconciliation of volumes of product or used oil in tanks.

**1.4.29 Leak (leaked, leaking)**

Any loss of product or used oil from an UPS system due to its not providing full and continuous containment.

**1.4.30 Leak monitoring**

The process provided to detect a leak in equipment of an UPS system.

**1.4.31 Leak monitoring system**

Any system, device or method that provides leak monitoring for equipment.

**1.4.32 Line leak detector (line leak detection)**

A device used as a leak monitoring system for product piping.

**1.4.33 Manufacturer**

A competent and experienced person engaged in the fabrication or supply of equipment.

**1.4.34 MSR**

Monthly Summary Report.

**1.4.35 New**

Any UPS system that is commissioned on a date that is three or more months after the publication date of this Standard.

**1.4.36 NHMRC**

National Health and Medical Research Council.

**1.4.37 Non-corrodible piping**

Piping that is constructed—

- (a) of fibre-reinforced thermosetting resin composite that is compatible with the product being transferred; or
- (b) of flexible plastic conforming with UL 971 or equivalent standard in terms of protection of the environment; or
- (c) in a manner that is no less protective of the environment and human health and safety than the above options.

**1.4.38 Non-corrodible tank**

A tank that—

- (a) is constructed of fibre-reinforced thermosetting resin that is compatible with the product being stored; or
- (b) is constructed of steel in compliance with AS 1692 Category 4 and provided with cathodic protection; or
- (c) is constructed with a steel inner wall and a fibre-reinforced thermosetting composite outer wall, with an interstitial space between the two walls; or
- (d) does not require cathodic protection and whose inner wall is compatible with the product being stored; or
- (e) is constructed and protected from corrosion in a manner that is no less protective to the environment and human health and safety than the above options.

**1.4.39 Non-potable groundwater**

Groundwater that does not satisfy the requirements of potable groundwater.

**1.4.40 Non-potable groundwater aquifer**

An aquifer that does not satisfy the requirements of a potable groundwater aquifer.

**1.4.41 Operator**

The occupier of the site, or any person who is responsible for, or has control of, the daily operation of the UPS system.

**1.4.42 Owner**

Any person who has legal or beneficial ownership rights of the UPS system.

**1.4.43 Permeability**

The coefficient of permeability and a measure of the capacity of a porous medium to transmit water.

NOTE: Reference should be made to Appendix B for classifications of the ranges of permeability.

**1.4.44 Piping**

All pipes, pipe fittings and valves used in conjunction with piping systems.

#### **1.4.45 PICA**

Petroleum Industry Contractors Association.

#### **1.4.46 Potable groundwater**

Groundwater that is contained in an aquifer and that is of a quality suitable for human consumption, as defined by NHMRC *Australian Drinking Water Guidelines*.

#### **1.4.47 Potable groundwater aquifer**

Any aquifer that contains potable groundwater and which is used or has been identified for future use as a source of supply for a reticulated water system.

#### **1.4.48 Product (petroleum product)**

A single substance or mixture of at least 70% hydrocarbon by volume, that—

- (a) is used, or could be used, as a fuel or lubricant; and
- (b) is liquid at standard reference conditions of temperature and pressure.

For the purpose of the Standard, the term ‘product’ does not include used oil.

NOTE: Standard reference conditions for petroleum products are a temperature of 15°C and a pressure of 101.325 kPa (absolute), with the exception of liquid hydrocarbons having a vapour pressure greater than atmospheric at 15°C, in which case the standard pressure is the equilibrium vapour pressure at 15°C. These conditions are taken from AS 2649.

#### **1.4.49 Product piping**

Piping that routinely contains product. For the purposes of this Standard, product vent piping, product fill piping and product vapour recovery piping are not classified as product piping.

#### **1.4.50 Repair (repaired, repairing)**

The restoration of equipment that has been damaged or has deteriorated such that it is not performing as originally designed, to the same compliance level as manufacturer’s standards and to restore equipment to its original compliance level.

#### **1.4.51 Re-use (re-used)**

Any equipment that has been part of an operating UPS system and has been decommissioned and removed from the UPS system, and is to subsequently become part of a new UPS system.

#### **1.4.52 Secondary containment**

Containment that is designed to prevent a leak from a UPS system reaching outside the containment area. For the purposes of this Standard, this includes double-walled tanks and double-walled product piping.

#### **1.4.53 Sensitive receptors**

Any of the following:

- (a) Residential areas.
- (b) Schools.
- (c) Wetlands.
- (d) Water supply catchments, or surface water bodies with recreational activity or food chain significance.

- (e) Subsurface locations such as basements, tunnels, manways, utility chambers and similar constructions into which people can enter, in residential or commercial areas, where leakages of flammable hydrocarbons could infiltrate and accumulate, either directly or floating on groundwater, and so pose a danger to people.

#### **1.4.54 Site**

Any property containing all or part of an UPS system.

#### **1.4.55 Site classification**

The category assigned to all sites, in accordance with Section 2.

#### **1.4.56 Spill (spilled)**

Any loss of containment of product or used oil from a UPS system during—

- (a) product or used oil transfer, delivery, or removal; or
- (b) operation; or
- (c) maintenance or testing; or
- (d) repair, re-use or closure.

#### **1.4.57 Statistical inventory analysis (SIA)**

A method of analysing inventory reconciliations by using statistical methods such that the possible cause of discrepancies in inventory control can be identified.

#### **1.4.58 Tank**

A container other than a package or intermediate bulk container, intended for the storage of product or used oil, having a capacity greater than 450 L and remaining permanently in place once installed.

#### **1.4.59 Tank pit observation well**

A well that has been installed within the tank excavation to enable the groundwater in the backfill, and the backfill itself, to be periodically observed for the presence of product vapour or product.

#### **1.4.60 Underground petroleum storage (UPS) system**

One or more completely or partially buried tanks that contain or are intended to contain product or used oil, leak monitoring systems, cathodic protection and all product piping to, from or associated with the tanks and up to the inlet port of the dispensers.

#### **1.4.61 UPS system designer**

A competent and experienced person engaged in the design of whole or part of an UPS system.

#### **1.4.62 Used oil**

Oil that has been used for lubricating or other purposes and has become unsuitable for its original purpose due to the presence of impurities or the loss of its original properties.

#### **1.4.63 USEPA**

United States Environmental Protection Agency.

#### **1.4.64 Vapour monitoring well**

A well that has been installed as part of a vapour monitoring leak monitoring system.

## 1.5 RECORDS

The owner, and where specified, the operator, shall maintain all records and certifications required by this Standard. The records shall be retained for the period specified or, when no specific period is mentioned, for the life of the UPS system.

When there is a change in the UPS system owner or operator, all records and certifications required by this Standard shall be transferred to the new owner or operator as appropriate.

A summary of record-keeping and certification requirements is provided in Appendix C.

## SECTION 2 SITE CLASSIFICATION

### 2.1 SCOPE OF SECTION

This Section sets out the classification system for sites where a new UPS system is to be installed.

The site classification is used to determine the minimum equipment level required for a new UPS system.

NOTE: In some States, regulations require classification according to factors other than those outlined in this Standard. Further information is provided in Appendix B.

### 2.2 SITE CLASSIFICATIONS

#### 2.2.1 General

Each site shall be classified according to the potential for impact on the environment or on human health and safety, should a leak or spill occur. Sites with a high, medium and low potential for impact are Classes A, B and C respectively. These site classifications are defined in Clauses 2.2.2, 2.2.3 and 2.2.4 below.

Each site shall be assessed for classification individually and declared to be Class A, B or C.

NOTE: Such assessment is usually done by a competent and experienced person.

If Equipment Level 1 is to be used, a site classification assessment is not required.

Site classification may be achieved by the collection of available data referring to potable ground aquifers, beneficial use groundwater aquifers, sensitive receptors including human receptors such as residential land use, and permeability.

If there is insufficient information to determine site classification from existing data, a hydrogeological survey, fate and transport modelling and sensitive receptor survey shall be carried out to obtain the necessary information.

A competent and experienced person carrying out any hydrogeological survey, fate and transport modelling or exposure pathway assessment shall have relevant qualifications, e.g. a hydrogeologist, environmental engineer, or environmental scientist.

All information used to determine the site classification, including all testing information and results, for the life of the UPS System.

NOTE: This information is usually retained by the owner of the site.

#### 2.2.2 Class A sites

A site shall be classified as Class A where the subsurface has high or medium permeability and one of the sensitive receptors listed below exists under or near the site:

- (a) A potable groundwater aquifer at any depth that may be affected.
- (b) A surface water body with high amenity value.
- (c) Basements or tunnels sufficiently close to the UPS system for the development of hazardous atmospheres within them.

Alternatively, a hydrogeological survey and fate and transport modelling shall show that there are no complete exposure pathways to the sensitive receptors that could be affected within 2 years by a release from the UPS system.

NOTE: The hydrogeological survey and fate and transport modelling is usually carried out by a competent and experienced person (see Clause 2.2.1).

### 2.2.3 Class B Sites

A site shall be classified as Class B where the subsurface has high or medium permeability; and one of the sensitive receptors listed below exists under or near the site:

- (a) Other (non Class A) beneficial use groundwater.
- (b) Human receptors in residential areas, via vapour pathways to residential indoor air space.
- (c) Underground utilities or access chambers sufficiently close to the UPS system that hazardous atmospheres could develop within them.

Alternatively, a hydrogeological survey and fate and transport modelling shall show that there are no complete exposure pathways to the sensitive receptors that could be affected within 2 years by a release from the UPS system.

NOTE: The hydrogeological survey and fate and transport modelling is usually carried out by a competent and experienced person (see Clause 2.2.1).

### 2.2.4 Class C Sites

Class C sites are all sites that are not Class A sites or Class B sites.

## SECTION 3      EQUIPMENT LEVELS FOR NEW UPS SYSTEMS

### 3.1 SCOPE OF SECTION

This Section sets out equipment levels for new UPS systems and replacements of existing UPS systems.

### 3.2 GENERAL

The equipment level required for a UPS system shall be as determined from the site classification (see Section 2). The minimum equipment level for a UPS system shall be in compliance with this Section.

### 3.3 EQUIPMENT LEVELS

Equipment levels for both product and used oil are defined as one of the following:

- (a) Equipment Level 1.
- (b) Equipment Level 2.
- (c) Equipment Level 3.

An existing UPS system shall meet the appropriate minimum equipment levels specified in Table 3.1.

Equipment levels required for new UPS systems and for replacements of existing UPS systems shall meet the appropriate requirements set out in Tables 3.1 and 3.2.

**TABLE 3.1**  
**EQUIPMENT LEVELS**

| Substance | UPS area | Equipment description                    | Equipment Level 1                      | Equipment Level 2 | Equipment Level 3 | Compliance requirements |
|-----------|----------|------------------------------------------|----------------------------------------|-------------------|-------------------|-------------------------|
| Product   | Tank     | Non-corrodible tanks                     | ✓                                      | ✓                 | ✓                 | 4.2.1, 4.2.2            |
|           |          | Secondary containment for tanks          | ✓                                      |                   |                   | 4.2.3                   |
|           | Piping   | Non-corrodible product piping            | ✓                                      | ✓                 | ✓                 | 4.3.1, 4.3.2            |
|           |          | Secondary containment for product piping | ✓                                      | ✓                 | ✓                 | 4.3.3                   |
|           |          | Leak monitoring for product piping       | ✓                                      | ✓                 | ✓                 | 4.3.4                   |
|           |          | Fill point requirements                  | ✓                                      | ✓                 | ✓                 | 4.3.5                   |
|           |          | Vapour recovery                          | Where required by regulatory authority |                   |                   | 4.3.6                   |
|           | Other    | Leak monitoring                          | ✓                                      | ✓                 | ✓                 | 4.5                     |
|           |          | Dispenser sumps                          | ✓                                      | ✓                 | ✓                 | 4.4.1                   |
|           |          | Overfill protection                      | ✓                                      | ✓                 | ✓                 | 4.4.2                   |
|           |          | Tank pit observation wells               | ✓                                      | ✓                 | ✓                 | 4.4.3                   |
|           |          | Groundwater monitoring wells             | ✓<br>(see Note)                        |                   |                   | 4.5.7                   |
|           |          | Earthing of UPS system                   | ✓                                      | ✓                 | ✓                 | 4.4.4                   |
| Used oil  | Tank     | Non-corrodible tanks                     | ✓                                      | ✓                 | ✓                 | 5.2.1, 5.2.2            |
|           |          | Secondary containment for tanks          | ✓                                      |                   |                   | 5.2.3                   |
|           |          | Leak monitoring of tanks                 | ✓                                      | ✓                 |                   | 5.5                     |
|           | Piping   | Non-corrodible piping                    | ✓                                      | ✓                 | ✓                 | 5.3.1, 5.3.2            |
|           |          | Used oil removal point                   | ✓                                      | ✓                 | ✓                 | 5.4                     |

NOTE: Where neighbouring locations include sensitive receptors, Section 2 shall be consulted.

**TABLE 3.2**  
**MINIMUM EQUIPMENT LEVELS FOR NEW AND REPLACEMENT UPS SYSTEMS**

| Site classification | New UPS system    |
|---------------------|-------------------|
| Class A             | Equipment Level 1 |
| Class B             | Equipment Level 2 |
| Class C             | Equipment Level 3 |