

**The Environmental Risk Management Authority  
P O Box 131  
WELLINGTON**

**Code of Practice for the  
Management of Existing Stationary  
Container Systems  
up to 60,000 litres Capacity**

**Approved Code of Practice  
Under the Hazardous Substances and New  
Organisms (HSNO) Act 1996**

**Code Reference:           HSNOCOP 13-2  
Date of Approval:        April 2008**

## **Preface**

This Code of Practice (No. HSNOCOP 13-2) is approved pursuant to Sections 78 and 79 of the Hazardous Substances and New Organisms Act. The Environmental Risk Management Authority has delegated the power to approve codes of practice to the Chief Executive of the Authority, and this Code of Practice is approved in accordance with that delegation. It is confirmed that the requirements of Sections 78 and 79 have been met.

Approval of the code is limited to those matters in the document that relate to legislative requirements under the HSNO Act and its regulations.

This code has been developed by the Environmental Risk Management Authority and sets out means of compliance with the requirements of clause 100(2)(c) of Schedule 8 and clauses 3(1)(b) and 4(4)(d) of Schedule 9 to the Hazardous Substances (Dangerous Goods and Scheduled Toxic Substances) Transfer Notice 2004 (as amended). For the tanks covered by this code it also provides a means of compliance with regulations 39 and 40 of the Hazardous Substances (Emergency Management) Regulations 2001.

This Code applies to stationary tanks, used to contain hazardous liquids, that were in use at the commencement date of the relevant transfer notice for the hazardous liquid, or which had been designed and construction had commenced by that date.

The anticipated publication date in the Gazette for the Notice of Approval of this Code of Practice is 10 April 2008.

Pursuant to Section 80 (1) (a) of the Act, a copy of the code may be inspected at the Wellington office of ERMA New Zealand.

Pursuant to Section 80 (1) (b) of the Act, a copy of the code is available to download from the ERMA New Zealand website ([www.ermanz.govt.nz](http://www.ermanz.govt.nz)).

Approved this 4th day of April 2008.

A handwritten signature in black ink, appearing to read 'Rob Forlong', is written over a faint, light grey watermark of the ERMA New Zealand logo. The signature is written in a cursive style with a long horizontal stroke extending to the right.

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Rob Forlong  
**Chief Executive**  
**ERMA New Zealand**

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# Code of Practice for the Management of Existing Stationary Container Systems

## 1. INTRODUCTION

The purpose of this Approved Code of Practice (Code) is to provide controls to accept the design, installation and management of stationary container systems not exceeding 60,000 litres together with their associated secondary containment systems and which were in use for the containment of hazardous liquids **as at the commencement date of the relevant transfer notice**. For hazardous liquids that were transferred in the Hazardous Substances (Dangerous Goods and Scheduled Toxic Substances) Transfer Notice 2004, they must have been in use **before the 1<sup>st</sup> of April 2004**.

In most cases, these stationary container systems were previously included in an approval such as a licence under the Dangerous Goods Act 1974.

This code essentially adopts the controls that existed in the Dangerous Goods (Class 3 – Flammable Liquids) Regulations 1985 and the Toxic Substances Regulations 1983.

It is recognised that some stationary container systems were constructed prior to these two regulations coming into force. It is not intended to exclude these stationary container systems from this Code but the standards which they were constructed to are not necessarily included in this Code. For these stationary container systems it is necessary to determine the standard that they were constructed to (where this is able to be confirmed) and ensure that they conform to that standard.

The Environmental Risk Management Authority has developed and approved this Code as a means of compliance with the requirements of Schedule 8 of the Hazardous Substances (Dangerous Goods and Scheduled Toxic Substances) Transfer Notice 2004, and regulations 39 and 40 of the Hazardous Substances (Emergency Management) Regulations 2001, in accordance with clause 100(2)(c) of Schedule 8

and clauses 3(1)(b) and 4(4)(d) of Schedule 9 to the Hazardous Substances (Dangerous Goods and Scheduled Toxic Substances) Transfer Notice 2004 (as amended)<sup>1</sup> (the Transfer Notice). This code is not intended to encompass any other requirements of the Hazardous Substances and New Organisms Act 1996, nor any other legislative requirements (e.g. the Resource Management Act, Health and Safety in Employment Act etc), which are also required to be complied with.

This Code provides standards against which Test Certificates can be issued.

Users of this Code are advised that Regional and District Councils may have requirements that are in addition to this Code.

Existing stationary container systems may be confirmed, managed and certified (if necessary) without the need to submit an application for a compliance plan if they comply with this Code. Where a test certifier determines that a stationary container system satisfies this Code, a stationary container system test certificate may be issued.

## **1.1. Scope**

Improper management of hazardous substances may cause injury, death, ill health, or lead to damage to the environment. Bulk hazardous liquids must be securely contained if the risks are to be avoided.

This Code applies to separate configurations of stationary container systems which:

- i) include a stationary tank with a capacity not less than 250 litres and not exceeding 60,000 litres, unless it is a stationary tank to which Part 13 of Schedule 8 of the Transfer Notice applies, in which case it includes a stationary tank of any capacity not exceeding 60,000 litres, and
- ii) (a) do not fully meet the requirements of Schedule 8 of the Transfer Notice 2004 (as amended)<sup>2</sup>, and/or  
(b) do not fully meet the requirements of regulations 39 or 40 of the Hazardous Substances (Emergency Management) Regulations 2001<sup>3</sup>, and

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<sup>1</sup> Including the amendments up to and including 30th June 2006.

<sup>2</sup> Refer Schedule 8 clause 2 (c) of the Transfer Notice

iii)(a) were being used to contain a hazardous liquid that requires the controls for stationary container systems as set out in Schedule 8 of the Transfer Notice to apply and were in use immediately before the commencement date of the relevant transfer notice, or

(b) were designed to be used to contain a hazardous liquid that requires the controls for stationary container systems as set out on Schedule 8 of the Transfer Notice to apply, and construction of the stationary container system to that design had commenced before the commencement date of the relevant transfer notice.

Notwithstanding the above, this Code does not include stationary container systems used to supply a domestic oil-burning installation if the capacity of the tank does not exceed 2500 litres.

This Code is also applicable to stationary container systems that may have multiple stationary tanks, but each of those stationary tanks does not exceed 60,000 litres.

The stationary container systems covered by this Code include:

- 1) Above ground stationary tanks designed in accordance Regulation 60 of the Dangerous Goods (Class 3 – Flammable Liquids) Regulations 1985, constructed and installed in accordance with these regulations and which contained or were, prior to the above date, intended to contain a hazardous liquid with a 3.1 flammable classification.
- 2) Above ground stationary tanks designed in accordance with AS1692 “Steel Tanks for Flammable and Combustible Liquids” and installed in accordance with the Dangerous Goods (Class 3 – Flammable Liquids) Regulations 1985 and which contained or were, prior to the above date, intended to contain a hazardous liquid with a 3.1 flammable classification.
- 3) Above ground stationary tanks per 1) or 2) above with secondary containment of less than 110% and which were designed and installed in accordance with the provisions for compounding as set out in Regulation 61 of the Dangerous Goods (Class 3 – Flammable Liquids) Regulations 1985.
- 4) Above ground stationary tanks for use with oil burning equipment or internal combustion engines which were designed, constructed and installed in accordance

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<sup>3</sup> Refer Schedule 9 clause 4 (4) (d) of the Transfer Notice

with Regulations 100 through 127 of the Dangerous Goods (Class 3 – Flammable Liquids) Regulations 1985.

- 5) Movable stationary tanks e.g. sledge tanks.
  
- 6) Above ground stationary tanks (fixed bulk containers) for the storage of hazardous liquids with Class 6 (toxic) or Class 8 (corrosives) classification, designed, constructed and installed in accordance with the Toxic Substances Regulations 1983 and/or a standard approved by the Ministry of Health (refer Appendix 3 of this Code).
  
- 7) Stationary tanks for the storage of hazardous liquids with a Class 9 (ecotoxic) classification, designed, constructed and installed in accordance with the provisions of the Dangerous Goods (Class 3 – Flammable Liquids) Regulations 1985, the Toxic Substances Regulations 1983 and/or a standard approved by the Ministry of Health.
  
- 8) Above ground stationary tanks which are of an indeterminate design but where it can be reasonably demonstrated that the construction and installation of the stationary tank meets the requirements of either –
  - i) Regulations 58 to 72 of the Dangerous Goods (Class 3 – Flammable Liquids) Regulations 1985 for above-ground tanks for flammable liquids; or
  - ii) The Toxic Substances Regulations 1983 and/or a standard approved by the Ministry of Health (refer Appendix 3 of this Code) for a hazardous liquid with a Class 6 (toxic) or Class 8 (corrosives) classification.
  
- 9) Below ground stationary tanks designed, constructed and installed in accordance with Regulations 44 to 57 of the Dangerous Goods (Class 3 – Flammable Liquids) Regulations 1985 and/or the Code of Practice for the Design, Installation and Operation of Underground Petroleum Storage Systems (UPSS) dated 1992, and contained or intended to contain, a hazardous liquid with a Class 3 classification.
  
- 10) Below ground stationary tanks not greater than 5000 litres located on farms not less than 4 hectare in size, for the containment of hazardous substances with a 3.1

hazard classification. This does not include stationary tanks containing substances used to supply an oil burning installation or a stationary internal combustion engine.

11) Below ground stationary tanks which are of an indeterminate design but where it can be reasonably demonstrated that the construction and installation of the stationary tank meets the requirements of either –

i) Regulations 44 to 57 of the Dangerous Goods Class 3 Regulations 1985 for below-ground tanks for flammable liquids; or

ii) UPSS Code of Practice for below-ground tanks.

Note: installations which include stationary containers that are not encompassed by the configurations listed above are required to comply with the requirements of Schedule 8 of the Transfer Notice as well as regulations 39 or 40 of the Hazardous Substances (Emergency Management) Regulations 2001, or must have a compliance plan submitted in accordance with Schedule 8 clause 101 and/or Schedule 9 clause 5 of the Transfer Notice.

## **1.2. The HSNO Act and the Role of Codes of Practice**

The HSNO regulations are largely performance based, that is, they specify a desired outcome without necessarily prescribing how to achieve it. They do not require that a single specific means be used to comply with any regulation and this allows for variations in the method used for compliance.

The HSNO Act provides for Codes of Practice to be issued or approved by the Authority to identify acceptable solutions to comply with the specified regulatory requirements. An Approved Code of Practice provides users with a method of implementing the control requirements with a degree of prescription and assistance.

In addition, specific provisions of the HSNO regulations and Gazetted Transfer Notices permit Codes of Practice to be approved by the Authority as alternatives to other specified requirements provided they can be shown to provide an equivalent level of safe management.

### **1.3. Means of Compliance**

This Code provides a means of compliance with the requirements of Schedule 8 of the Hazardous Substances (Dangerous Goods and Scheduled Toxic Substances) Transfer Notice 2004, and regulations 39 and 40 of the Hazardous Substances (Emergency Management) Regulations 2001, in accordance with clause 100(2)(c) of Schedule 8 and clauses 3(1)(b) and 4(4)(d) of Schedule 9 to the Hazardous Substances (Dangerous Goods and Scheduled Toxic Substances) Transfer Notice 2004 (as amended). Use of this Code eliminates the requirement to submit an application for compliance plans as referenced in Schedule 8 clause 101 and Schedule 9 clause 4 of the Transfer Notice.

### **1.4. References**

Hazardous Substances and New Organisms Act 1996  
Hazardous Substances (Emergency Management) Regulations 2001.  
Hazardous Substances (Dangerous Goods and Scheduled Toxic Substances)  
Transfer Notice 2004 (as amended)  
Dangerous Goods (Class 3 – Flammable Liquids) Regulations 1985  
Toxic Substances Regulations 1983.

### **1.5. Application of this Code of Practice**

This Code applies when the Transfer Notice cannot be directly applied e.g. when the standard to which the stationary container was constructed is not referenced in the Transfer Notice. In these circumstances it is an alternative means of compliance. For some stationary container systems it may be appropriate to apply one or more elements of this Code.

If a requirement is specified in Schedule 8 but is not included in this Code, compliance with the requirement of Schedule 8 is required. In particular, Part 19 Test Certification, is required to be complied with (with the durations nominated in section 9 of this Code). Table 1.5 is provided as a guide:

Table 1.5 Relevant clauses of Schedule 8 of the Transfer Notice

<p style="text-align: center;"><b>Clauses of Schedule 8 of the Transfer Notice for which alternatives or practical applications are offered in this code</b></p>
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5-6
8(2)
9 -10
13
19,20,22,23,24,25,26,29,30,31
32-34
62(3)(b)
77(b)(i)
81(3)

Situations will arise where the detail of some elements of the existing stationary container system is not available (e.g. the specification that the below ground stationary tank was constructed to, or an element of the specification that cannot be verified such as a component of a below ground tank). It is intended by the use of this Code that such circumstances can be accepted and recorded provided that the stationary container system was accepted under the previous legislation e.g. licensed under the Dangerous Goods Act 1974. This does not however imply acceptance of a facility that does not meet accepted practices.

## 1.6. Definitions

Definitions are as per Part 2 of Schedule 8 of the Hazardous Substances (Dangerous Goods and Scheduled Toxic Substances) Transfer Notice 2004, with the following additions:

**Approving Authority** means the Approving Authority prior to 1 April 2004, i.e. either:

- 1) the Chief Inspector of Explosives and Dangerous Goods, Department of Labour;  
or
- 2) the Director of Public Health (Manager Public Health Programmes), Ministry of Health; or,
- 3) as delegated by either of these parties e.g. territorial or regional authority; or
- 4) for the period 2 July 2001 to 1 April 2004, any of the above parties as delegated by the Environmental Risk Management Authority of New Zealand.

**Approved** means a suitably appropriate, mandatory item of equipment that prior to 1 April 2004, was required to be either;

- 1) approved by the Chief Inspector of Dangerous Goods, Department of Labour in accordance with the Dangerous Goods Act 1974 and Regulations; or
- 2) approved by the Director of Public Health, Ministry of Health in accordance with the Toxic Substances Act 1979 and Regulations; or
- 3) for the period 2 July 2001 to 1 April 2004, any of the above parties as delegated by the Environmental Risk Management Authority of New Zealand.

**Capacity** means the full water capacity of the stationary tank, including the ullage space e.g. for a horizontal tank this includes the full barrel capacity of the tank and for a vertical tank includes the volume up to the roof to shell joint. Where an overflow is fitted below these levels, the volume is to the invert level of the overflow.

**Fixed Bulk Containers** means an above-ground stationary tank, as defined in Attachment 3, clause 17A (1), approved in accordance with the Toxic Substances Regulations 1983 for the storage of hazardous liquids with a Class 6 (toxic) or Class 8 (corrosives) classification.

**Movable Stationary tank** means an above ground stationary tank that is mounted on a structure, or has a lifting device attached to the tank superstructure (e.g. sledge or skid tanks), that enables the tank to be relocated. The movable stationary tank is to be periodically relocated. As a guide, it is anticipated that the majority of movable stationary tanks would be relocated at least six weekly. It does not include portable use facilities (PUF tanks) or tanks used for the transportation of hazardous substances (e.g. trailer tanks or transportable containers). Movable stationary tanks are limited to the containment of:

- 1) Hazardous substances with flammable classifications 3.1C or 3.1D.
- 2) Substances with class 6, 8 and 9 hazard classifications which do not have a flammable classification and which are not subject to tracking provisions.
- 3) Hazardous substances with flammable classifications 3.1A or 3.1B provided they are contained in a stationary tank constructed to UL2085, SWRI 95-03 or SWRI 93-01.

**Transfer Notice** means the Hazardous Substances (Dangerous Goods and Scheduled Toxic Substances) Transfer Notice 2004 including the amendments up to and including 30th June 2006.

**Visual Inspection** means the elements of the stationary container system are sighted to check the integrity of the containment system and to detect any loss of containment or a condition that could lead to a loss of containment. A log detailing the date, time and results of the visual inspection is to be maintained.

## **2. GENERAL REQUIREMENTS FOR EXISTING STATIONARY CONTAINER SYSTEMS**

### **2.1. Accepted Engineering Principles and Practice to be Applied<sup>4</sup>**

The question as to whether a stationary container system complies with this Code is to be determined having regard to the need to comply with this Code in a way that is—

- 1) practicable; and
- 2) consistent with accepted engineering principles and practice.

### **2.2. General Performance Requirements for Stationary Container Systems<sup>5</sup>**

- 1) Subject to subclause 2.2 (2)(a) below, all parts of a stationary container system must be designed, constructed, installed, operated, maintained, inspected, tested, and repaired so that the stationary container system contains any hazardous substance that is put into it without leakage of that hazardous substance (including any diluent or desensitising agent), when subjected to all likely—
  - i) operating temperatures; and
  - ii) pressures; and
  - iii) stresses and loadings (including seismic and wind stresses and loadings); and
- 2) All parts of a stationary container system that are likely to come into contact with a hazardous substance must be designed, constructed, installed, operated, maintained, inspected, tested, and repaired so that, when the stationary container system contains a hazardous substance—
  - (a) it is able to contain the hazardous substance—
    - i) if the stationary container system is designed for use in specific environmental conditions or a specific temperature range, or both, in those environmental conditions, or that temperature range, or both; or
    - ii) if a hazardous substance to be contained in the stationary container system is subject to requirements relating to environmental conditions or the temperature range in which it must be contained, or both, in those environmental conditions, or that temperature range, or both; or
    - iii) in any other case, in the temperature range minus 10°C to plus 50°C; and
  - (b) any materials used in the construction, maintenance, or repair of the stationary container system do not react with the hazardous substance in or on the stationary container system, or interact to significantly affect or weaken the stationary container system so that the requirements of this Schedule cannot be complied with.

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<sup>4</sup> This is a reproduction of Schedule 8, clause 5 of the Transfer Notice

<sup>5</sup> This is a reproduction of Schedule 8, clause 6 of the Transfer Notice

### **2.3. Determination of the Specification to which the Tank was Designed and Constructed**

The sources of information available for above ground and below ground stationary tanks may include (amongst others) tank markings, a prior approval by an Approving Authority, LAB numbers, documentation and physical inspection.

Where there is insufficient documentary evidence, additional steps may need to be undertaken (by the Test Certifier or a competent person<sup>6</sup>) in order to satisfactorily determine whether the tank meets the design and construction requirements nominated in this Code. Such steps may include a measurement of the tank plate material, confirmation of tank integrity (i.e. no significant corrosion) etc,

In order to assist with the identification of the stationary tank as a tank designed and constructed in accordance with the requirements of regulation 60 of the Dangerous Goods (Class 3 – Flammable Liquids) Regulations 1985, a checklist has been included as Appendix 7.

In some cases the evidence may be lacking and there may not be an opportunity to sight the tank itself (e.g. below ground tank). In this circumstance the Test Certifier (or a competent person<sup>6</sup>) may use accepted engineering principles and practice, consistent with the requirements of this Code. In particular, evidence of the tank being licensed under previous legislation and the date of the first licence could be used to demonstrate that the tank had been constructed and installed in accordance with the standards of the day.

It is entirely feasible that whilst it can be concluded that a stationary tank can in principle meet the requirements of a particular specification, there may be various aspects of the specification that cannot be determined. In these circumstances the inability to inspect and draw a conclusion is to be noted in the records associated with the stationary tank but it should not preclude the tank from being identified as designed/constructed to that standard.

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<sup>6</sup> In this context competent person means an engineer familiar with the design and construction of stationary tanks

## **2.4. Assessment of Stationary Container System**

It is necessary to undertake an assessment of the stationary container system to ensure that it is fit for purpose i.e. that it has been maintained with sufficient integrity to contain the hazardous substance. Such an assessment should include:

- Level of corrosion and corrosion protection
- Weld integrity
- The condition of the seismic and wind restraints
- Integrity of the foundation supports
- Appropriate pressure/vacuum management

## **2.5. Separation Between Above Ground Stationary Tanks**

The separation requirements of Schedule 8 clause 18 to 31 of the Transfer Notice are required to be complied with unless:

- 1) The inter-tank separation distances conform to the distances recognised in prior legislation e.g. the Dangerous Goods (Class 3 – Flammable Liquids) Regulations 1985 (refer to Attachment 2); or
- 2) There is evidence of a prior approval of the separation distance e.g. as evidenced by way of a document issued by an Approving Authority prior to the commencement date of the relevant transfer notice (1<sup>st</sup> April 2004 for hazardous liquids that were transferred in the Hazardous Substances (Dangerous Goods and Scheduled Toxic Substances) Transfer Notice 2004).

## **2.6. Marking**

This information as set out in Schedule 8 clause 77(b) (i) of the Transfer Notice is to be permanently and legibly marked on stationary containers that are:

- greater than 2500 litres capacity and used or intended to be used to contain a hazardous liquid with a class 3.1A or class 3.1B hazardous classification; or
- greater than 5000 litres and used to contain a hazardous liquid that does not have a class 3.1A or class 3.1B classification.

The requirements of this schedule 8 clause 77(b) (i) are:

- (A) the specification to which the tank was designed (if any):
- (B) the date on which the tank was manufactured:
- (C) the materials used in the construction of the tank:
- (D) the name or mark and address of the manufacturer of the tank:

- (E) the maximum and minimum design pressure of the tank:
- (F) the maximum and minimum design temperature of the tank:
- (G) the maximum permitted density of any liquid that may be contained in the tank:
- (H) the maximum safe fill of the tank:
- (I) a stationary tank identifier which the test certificate and records can be linked to e.g. the serial number of the tank manufacturer.

Where all or some of these details are not marked on the tank but the required information can be determined from documentary evidence, this may form the basis of the markings.

The determination of the material of construction of the stationary container system is to be ascertained wherever possible e.g. mild steel, specific grade of stainless steel, type of fibreglass resin and the layering details etc.

In circumstances where the information is not known, the following markings can be adopted as a minimum requirement:

- (A) the specification that has been determined, or for below ground tanks only, “unknown” if the specification cannot be determined.
- (B) an estimated date of manufacture e.g. earlier than 1970 (estimated):
- (C) generic material e.g. steel, GRP etc:
- (D) unknown:
- (E) free venting or the maximum and minimum design pressure of the tank:
- (F) unknown:
- (G) the density of the substance in the tank:
- (H) the maximum safe fill of the tank:
- (I) a stationary tank identifier which the test certificate and records can be linked to.

For below ground stationary tanks the marking may be included with the on-site documentation, on a placard located in the tank manway, or firmly attached to the nearest structure in a permanent manner.

## **2.7.Records**

The requirements of Schedule 8 clauses 81 and 82 of the Transfer Notice are to be complied with as from the date of issue of the first Stationary Container Test Certificate.

## **2.8.Maintenance and Repair**

The requirements of Schedule 8 clauses 83 to 88 of the Transfer Notice are to be complied with as from the date of issue of the first Stationary Container Test Certificate.

Notwithstanding this, partial improvements to stationary container systems encompassed by this Code are able to be undertaken without triggering a requirement to fully upgrade everything else on the stationary container system to the requirements of Schedule 8 of the Transfer Notice. In the event that reconstruction takes place, that section of the stationary containment system (e.g. the stationary tank) must be upgraded to fully comply with the requirements of the Transfer Notice.

In this context, reconstruction includes extensive repairs or alterations to the structure of the stationary container system such as the replacement of a strake of the stationary tank etc. Partial improvements include activities such as patch repairs on the floor or walls and replacement of valves as well as minor improvements such as installation of an overflow and seismic holding down bolts to meet the requirements of the Transfer Notice, etc.

## **2.9.Secondary Containment System**

Where the stationary container system has a secondary containment system and reconstruction of this secondary containment system is required for reasons other than capacity to fulfil the requirement for 110% of the existing tanks, this secondary containment system is to be upgraded to fully comply with the requirements of the Hazardous Substances (Emergency Management) Regulations 2001 pertaining to secondary containment i.e. for above ground stationary tanks the capacity of the secondary containment system must be at least 110% of the capacity of the stationary tank, or, for above ground tanks with integral secondary containment, to the original specification.

In this context, reconstruction includes extensive repairs or alterations to the structure of the secondary containment system such as replacement of bund walls, installing additional stationary containers in the secondary containment system etc. and is not intended to include making partial improvements such as sealing concrete joints etc.

## **2.10. Inventory Control**

Inventory control as variously required in the following sections of this Code is to be undertaken in accordance with the provisions of Schedule 8 clause 86 of the Transfer

Notice (which refers to Supplement No 1 of UPSS Code of Practice (included as Attachment 1)). Whilst these provisions relate expressly to below ground tanks at service stations, the principles also relate to other below ground stationary tanks and also to above ground stationary tanks.

The stock reconciliation is to be undertaken by way of tank dip stick readings or a suitable alternative method (e.g. contents gauges) and must be carried out with records kept in accordance with the principles of the Supplement No 1 of UPSS Code of Practice (included as Attachment 1) at the intervals specified in Appendix 8 of this Code.

Readings must be permanently recorded using an appropriate format (hard copy or electronic). Visual inspections and their results are also to be recorded.

A suitable alternative to inventory control for above ground stationary container systems up to 60,000 litre capacity and which are accessible is to undertake visual inspections. These inspections are to include:

- A visual inspection of the stationary container system
- A visual inspection of the bund
- A visual inspection of mechanical connections such as flanges, manways etc
- A visual inspection of pipework and other facilities that are outside of the bund

When it is appropriate to undertake stock reconciliations for above ground stationary tanks, consideration is required to be given to:

- the ability to access the tank top in a safe manner with suitable and safe equipment.
- Whether there is any part of the stationary container system that is not visible.

In all cases a record is to be maintained.

## **2.11. Test Certification**

This Code provides for existing stationary container systems to be brought under the test certification regime for stationary container systems as prescribed in Part 18 of the Transfer Notice. The Location Test Certificate as required by the Hazardous

Substances (Classes 1 to 5 Controls) Regulations and the Stationary Container Test Certificate as required by Part 19 of the Transfer Notice and as varied by clause 9 of this Code are required. The duration of stationary container test certificates for petrol and diesel encapsulated by this code are specified in clause 9.

In order to minimise compliance costs, clause 9 of this Code does not require Stationary Container Test Certificates for below ground stationary container systems that contain petrol, which are not greater than 5000 litres. These stationary containers are subject to Location Test Certificates and this Code provides a standard which Location Test Certificates can be issued against for secondary containment.

### **3. EXISTING SINGLE SKIN ABOVE GROUND STATIONARY TANKS FOR CLASS 3.1 SUBSTANCES**

#### **3.1.Design and Construction**

Subject to clause 2.3 of this Code, stationary tanks of this category for the containment of substances with a class 3.1 hazard classification must be designed and constructed in accordance with Appendix 2 of this Code or to a specification nominated in Appendix 6 of this Code.

#### **3.2.Secondary Containment**

The secondary containment system of stationary tanks of this category, (which are required to have secondary containment) may be:

- 1) a compound in accordance with Appendix 4 of this Code; or
- 2) for a stationary tank intended for the storage of hazardous substances with a 3.1 D classification that is situated in a remote location (e.g. airfields, industrial yards, truck stops and rural or low density locations) , either a separate steel bund or a “tank half-shell”; or.
- 3) for a stationary tank intended for the storage of hazardous substances with a 3.1 D classification, a compound having a capacity adequate to retain not less than 50% of the maximum contents of the largest stationary tank in that compound, where this was approved by the Approving Authority.

In the case of 3) above and whereby the base of the stationary tank is not situated directly on the ground, the person in charge must undertake visual inspections that are documented (electronically or hard copy). In the case of 3) above and the base of the stationary container is directly situated on the ground such that it is not visible, the person in charge must undertake regular stock reconciliations in accordance with Appendix 8 of this Code, as well as visual inspections. In both cases the frequencies should be in accordance with the provisions of Appendix 8.

Stationary containers with a secondary containment system that have a containment capacity between 100% and 110% of the largest stationary tank are accepted under this Code. [Note that secondary containment systems with 110% or greater containment capability are likely to comply with the Hazardous Substances (Emergency Management) Regulations and are therefore unlikely to require to meet the provisions of this code of practice.]

Existing stationary containers that contain diesel fuel (automotive gas oil and marine diesel fuel) and which:

- were exempt in accordance with Regulation 6 of the Dangerous Goods (Licensing Fees) Regulations 1976; and
- have a capacity no greater than 2500 litres; and
- are located on a farm not less than 4 ha in area; and
- are used in farm work; and
- are not connected to an installation adapted for the burning or using of the fuel

may have a secondary containment system which is 0% of the stationary tank capacity provided they continue to meet the requirements of Regulation 6 of the Dangerous Goods (Licensing Fees) Regulations 1976. These requirements are:

- the goods are stored in an above-ground tank or tanks situated at distances of not less than 20 m from any protected work and not less than 6 m from dangerous goods of classes other than [classes 3.1A, 3.1B and 3.1C] or from combustible materials stored above ground, and the tank or tanks and their attached fittings are of approved design and construction.
- The goods shall either be compounded or shall be so located that any spillage either under the action of fire or otherwise, will not endanger any building, or flow into any stream, lake, or natural water.

## **4. EXISTING MOVABLE STATIONARY TANKS (SKID OR SLEDGE TANKS)**

### **4.1.Limitation**

Movable stationary tanks are limited in clause 1.6 to:

- Hazardous substances with flammable classifications 3.1C or 3.1D.
- Substances with class 6, 8 and 9 hazard classifications which do not have a flammable classification and which are not subject to tracking provisions.
- Hazardous substances with flammable classifications 3.1A or 3.1B provided they are contained in a stationary tank that is constructed to UL2085, SWRI 95-03 or SWRI 93-01.

## **4.2.Design and Construction**

Subject to clause 2.3 of this Code, movable stationary tanks must be:

- 1) designed and constructed in accordance with Appendix 2 of this Code or to a specification nominated in Appendix 6 of this Code; and
- 2) have a supporting frame of non combustible material and sufficient strength to support the tank and its contents for its conditions of use.

The term “non combustible” is intended to include material that will not readily combust (e.g.) steel, concrete, bricks)

## **4.3.Secondary Containment**

For existing movable stationary tanks that have integral secondary containment and the secondary containment is not subject to the collection of rainwater, the secondary containment system is required to have a capacity at least as large as the primary tank. Existing movable stationary tanks that do not have integral secondary containment are required to have:

- 1) secondary containment systems in accordance with clauses 3 to 8 of Appendix 4 of this Code with a containment capacity of at least 110% of the tank capacity, and if the secondary containment system comprises a compound of earthen construction, have visual inspections, that are recorded (electronically or hard copy), undertaken no less frequently than weekly, or
- 2) secondary containment systems in accordance with clauses 3 to 8 of Appendix 4 of this Code with a containment capacity of at least 100% of the tank capacity, and visual inspections, that are recorded (electronically or hard copy), undertaken no less frequently than weekly.

## **4.4.Test Certification**

Note that the provisions of Schedule 8, clause 84 (a) (iii) of the Transfer Notice, state that a test certificate for a movable tank is not invalidated simply by virtue of the tank being relocated.

## **5. EXISTING STEEL ABOVE GROUND STATIONARY TANKS WITH INTEGRAL SECONDARY CONTAINMENT (INCLUDING CONTAINERISED REFUELLING UNITS) FOR CLASS 3.1 SUBSTANCES**

### **5.1. Design and Construction**

Subject to clause 2.3 of this Code, existing steel above ground stationary tanks with integral secondary containment systems (including double skin stationary tanks) for the containment of hazardous liquids with a class 3.1 flammable classification must be designed and constructed in accordance with Appendix 2 of this Code or to a specification nominated in Appendix 6 of this Code.

The outer skin of a double skin stationary tank or a tank constructed to UL2085, SWRI 95-03 or SWRI 93-01 is the secondary containment system (i.e. the skin which contains a leak in the event of a failure of the primary tank).

### **5.2. Secondary Containment**

For existing stationary tanks which are:

- 1) intended to contain hazardous liquids with classes 3.1A, 3.1B or 3.1C flammable classification and which are constructed to UL2085, SWRI 95-03 or SWRI 93-01, or
- 2) intended to contain low flashpoint diesel or hazardous liquids with class 3.1D flammable classification located in remote locations (e.g. airfields, industrial yards, truck stops and rural or low density locations), and
- 3) where the secondary containment is not subject to the collection of rainwater,

the secondary containment system is required to have a capacity at least as large as the primary tank.

### **5.3. Barriers**

Double skin steel above ground stationary tanks that are:

- 1) not additionally compounded or
- 2) not constructed in accordance with a recognised specification that includes impact tests (e.g. UL2085)

must have consideration given to the risk of impact protection.

The installation must be assessed and where there is an identified risk of impact, impact protection must be provided. This must have sufficient strength and be placed at a sufficient distance from the tank to prevent damage to the tank.

An example of a barrier to prevent damage by vehicles is the W guardrail type highway crash barrier, installed in accordance with the supplier's instructions.

## **6. EXISTING ABOVE-GROUND STATIONARY TANKS FOR USE IN CONNECTION WITH OIL BURNING INSTALLATIONS OR STATIONARY INTERNAL COMBUSTION ENGINES**

### **6.1.Limitation**

This section is limited to stationary tanks that contain diesel fuel or low flashpoint diesel fuel.

The requirements of this section are in addition to the requirements of sections 3 and 5 of this Code.

### **6.2.Design and Construction**

Subject to clause 2.3 of this Code, stationary tanks must be designed and constructed in accordance with Appendix 2 of this Code or to a specification nominated in Appendix 6 of this Code.

### **6.3.Secondary Containment**

The secondary containment system of stationary tanks of this category may be:

- 1) a compound in accordance with Appendix 4 of this Code; or
- 2) for a stationary tank intended for the storage of hazardous liquids with a 3.1 D classification that is situated in a remote location (e.g. airfields, industrial yards, truck stops and rural or low density locations), either a separate steel bund or a “tank half-shell”; or
- 3) for a stationary tank intended for the storage of hazardous liquids with a 3.1 D hazard classification, a compound having a capacity adequate to retain not less than 50% of the maximum contents of the largest stationary tank in that compound, where this was approved by the Approving Authority.

### **6.4.Oil Storage Tanks Within or Adjoining a Building**

A stationary tank that otherwise complies with the requirements for above-ground stationary tanks in Section 4 of this Code and constructed in accordance with Appendix 2 of this Code or a relevant standard nominated in Appendix 6 to this Code, may be installed for the storage of fuel with a flammable hazard classification of 3.1D

within or adjoining any building provided that the requirements of Appendix 5 of this Code are complied with.

## **7. EXISTING ABOVE-GROUND STATIONARY TANKS FOR CLASS 6 TOXIC SUBSTANCES AND CLASS 8 CORROSIVE SUBSTANCES**

### **7.1. Design and Construction**

Subject to clause 2.3 of this Code, stationary tanks for the storage of hazardous liquids with a Class 6 (toxic) or Class 8 (corrosives) classification which do not have a flammable hazard classification may be designed and constructed to a specification referenced in Appendix 3 of this Code.

Subject to clause 2.3 of this Code, stationary tanks for the storage of hazardous liquids with a Class 6 (toxic) or Class 8 (corrosives) classification which have a specific gravity not greater than 1.0 may be designed and constructed to a specification referenced in Appendix 2 of this Code provided that the requirements of Appendix 3 clause 1.3 are complied with, in particular AS/NZS 4452:1997 or AS3780:1994.

#### **7.1.A Polyethylene Rotationally Moulded Tanks**

Notwithstanding clause 7.1 above, a rotationally moulded polyethylene stationary tank is permitted provided that:

- The maximum size of the tank is 30,000 litres, and
- The circumferential creep is no greater than 2.5%, and
- The substance stored is compatible with the tank material, and
- Where a tank used to store a hazardous liquid with an SG greater than 1.0, there must be evidence that the tank was manufactured to contain substances with a specific gravity which meets or exceeds the specific gravity of the substance contained, and
- The substance stored has been determined as being compatible with the material of construction of the tank, and
- The service life of the tank has not been exceeded.

Circumferential Creep is the ratio between the initial circumference and the current measured circumference as a percentage. On an existing tank the circumferential measurement shall be made at a height of 300 mm to 400 mm from the base of the tank when the tank is full. This is to be compared with a measurement made at a height 25-75mm from the base of the tank.

In the absence of definitive information, the service life of a rotationally moulded tank is to be 10 years.

The duration of a stationary container test certificate for such a tank shall consider the factors specified in clause 9.1 of this Code.

## **7.2.Secondary Containment**

Single-skin tanks require secondary containment in accordance with Appendix 4 of this Code or a means of secondary containment that is at least equivalent, given the characteristics and adverse effects of the hazardous substances stored.

Double-skin stationary tanks for the storage of the above substances do not require additional secondary containment.

The outer skin of double skin tanks (i.e. the skin which contains a leak in the event of a failure of the primary tank), is required to have a capacity at least as large as the primary tank.

## **7.3.Barriers**

Double skin above ground stationary tanks that are not additionally compounded must have consideration given to the risk of impact protection in accordance with the provisions of clause 5.3.

## 8. EXISTING BELOW-GROUND STATIONARY TANKS

### 8.1. General

Unless comprehensive records for a below-ground stationary tank exist – including design specifications, site plans and records of the stationary tank installation - the assessment of a Stationary Container System incorporating a below ground stationary tank is essentially limited to that which can be satisfactorily determined by:

- 1) The type of installation; and/or
- 2) Evidence acquired on the basis of the stationary tank's above-ground situation including visible pipework, connections, fittings, transfer points and inspection manways; and/or
- 3) Records kept by the local authority; and/or
- 4) Historical knowledge acquired from the person in charge, stationary tank owner or property owner.

A number of below ground stationary tanks have been installed without a physical secondary containment system and it will be necessary to place a higher priority on monitoring the ongoing condition of these below-ground stationary tanks by way of:

- 1) Regular and systematic stock reconciliation; and/or
- 2) Periodic checking of any observation wells and monitoring wells; and/or
- 3) A form of integrity testing such as a pressure or vacuum test.

In addition to the stationary tank itself, there may also be buried pipework. Consideration should be given to periodic integrity testing of this pipe work.

Supplement No 1 of the UPSS Code of Practice (reproduced as Attachment 1) nominates several site characteristics that pertain to the risk that may be posed by a below ground stationary container and recognizes three Environmental Sensitivity Zones. A précis of these zones is:

*Zone A: Highly sensitive areas - areas where there is a high risk that any leakage from a UPSS will contaminate an aquifer which is used or has been identified for future use as a source of supply for a reticulated potable water system.*

*Zone B: Moderately sensitive areas - areas that are within 100 metres (or such greater distance that the authority (i.e. the authority having statutory control*

*or obligation to control the works) shows is needed) of any pumping station drawing potable water from an underground source or of areas such as inland waterways and wetlands where any leakage from a below ground stationary tank will have a medium or long term adverse effect on that environment, as determined in consultation with the authority.*

*Zone C: Areas of lesser sensitivity – areas where any leakage from a below ground stationary tank is unlikely to pose a significant threat to human life or the environment. For example:*

- 1) not within the boundary of, or within a groundwater flow upstream of, or above a potable aquifer; or
- 2) not within 100 metres of, or within a groundwater flow upstream of, or above any well, bore, spring or natural waterway; or
- 3) not within proximity of a room or basement located below the level of the top of the stationary tank.

## **8.2.Design and Construction**

Subject to clause 2.3 of this Code, stationary tanks must be designed and constructed in accordance with Appendix 1 of this Code and to a specification nominated in Appendix 6 of this Code.

## **8.3.Existing Below-ground Stationary Tanks with Integral Secondary Containment**

This clause relates to the types of tanks that have a primary skin and a secondary skin with the interstitial space monitored (i.e. there must be a monitoring system installed and which is in functioning condition).

This clause includes (amongst others):

- Double-skin fibreglass below-ground stationary tanks
- Double-skin steel below-ground stationary tanks
- Single-skin steel below-ground stationary tanks inside an HDPE pit liner
- Single-skin fibreglass below-ground stationary tanks inside an HDPE pit liner
- Below-ground stationary tanks inside a concrete chamber.
- Steel below ground tanks that are fibreglass or HDPE wrapped (i.e. the fibreglass or HDPE is a secondary skin with an interstitial space).

Existing stationary tanks of the above categories must have been designed, constructed and installed in accordance with:

- A specification nominated in Appendix 6 and Appendix 1 of this Code; or
- The UPSS Code of Practice.

In circumstances where the secondary containment system is not considered to comply with the requirements of the Hazardous Substances (Emergency Management) Regulations or this Code, the stationary tank should be considered as though it did not have secondary containment.

#### **8.4.Existing Single-Skin Below-Ground Stationary Tanks Without Secondary Containment**

This section includes the following types of stationary tank:

- Single skin below-ground steel tanks (these may or may not have cathodic protection, may or may not be coated in a protective medium e.g. fibreglass or HDPE )
- Single skin below-ground fibreglass tanks.

Subject to clause 2.3 of this Code, these stationary tanks must have been designed, constructed and installed in accordance with:

- A specification nominated in Appendix 6; or
- Appendix 1 of this Code; or
- The UPSS Code of Practice.

Existing below-ground stationary tanks installed in Zone A must have a form of secondary containment with the space between the stationary tank and the secondary containment periodically monitored.

Existing single skin below ground stationary tanks without secondary containment that are installed in Zone B may, as an alternative to installing a physical secondary containment system, undertake a comprehensive stock management system in accordance with the requirements of Appendix 8 provided that they have a demonstrated level of integrity that is in addition to this stock management system. This may include:

- 1) Installation of sufficient observation wells and/or monitoring wells such that a leak from the stationary tank will be detected by observation of these wells, and/or
- 2) Periodic integrity testing of tanks (e.g. at 10 yearly intervals) and/or
- 3) If the stationary tank is owned by an organisation that has a large number of such tanks and that organisation has a risk ranking program<sup>7</sup> in operation, the stationary tank may be nominated on the risk ranking program. These stationary tanks must have correction procedures detailed in accordance with that risk ranking program by March 31<sup>st</sup> 2008. (Note; this option is restricted to organisations with risk ranking programs. It is not acceptable to use this option as a means of delaying compliance.)

Existing single-skin below-ground stationary tanks of this category and which are located in Zone C may, as an alternative to installing a physical secondary containment system, undertake a comprehensive stock management system in accordance with the requirements of Appendix 8.

## **8.5.Existing Below Ground Stationary Tanks on Farms**

This section includes existing below-ground stationary tanks which are:

- Not greater than 5000 litres capacity; and
- Located on farms not less than 4ha in size; and
- Compliant with the requirements of clause 8.4 of this Code.

Where a stationary tank is of indeterminate design and it cannot be satisfactorily determined as to whether the stationary tank would comply with any of the specifications in the third bullet point above, and the tank is located in a Zone C area and at least 3 metres from any buildings, the stationary tank may be considered to comply if it meets the requirements of Appendix 1 except for the following:

- Clause 1.2 ii) is not applicable (i.e. the stationary tank is not required to have corrosion protection)
- the vent pipe internal diameter must be at least 25mm.

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<sup>7</sup> A risk ranking program means a program that determines the risk of failure based upon a set of relevant factors. Corrective action is then determined based upon the determined level of risk.

In circumstances whereby evidence may be lacking and there may not be an opportunity to sight the tank itself (e.g. below ground tank), the Test Certifier (or a competent person<sup>8</sup>) may use accepted engineering principles and practice to determine compliance with this Code.

It is entirely feasible that whilst it can be concluded that a stationary tank can in principle meet the requirements of a particular specification, there may be various aspects of the specification that cannot be determined. In these circumstances the inability to inspect and draw a conclusion is to be noted in the records associated with the stationary tank, but it should not of itself preclude the tank from being identified as designed/constructed to that standard.

## **8.6.Observation Wells and Monitoring Wells**

Where observation wells and/or monitoring wells are installed in addition to a stock management system, these should be checked at least monthly.

The results should be permanently recorded using appropriate format (hard copy or electronic) and must include details of findings, i.e. presence of water, liquid-phase product or both.

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<sup>8</sup> In this context, competent person means an engineer familiar with the design, construction or repair of stationary tanks

## **9. DURATION OF EXISTING STATIONARY CONTAINER SYSTEM TEST CERTIFICATE**

The duration of stationary container system test certificates for existing stationary containers encapsulated by this code of practice and containing petrol or diesel are included in table 9.1. It should be noted that one of the issues taken into account in determining these durations is the fact that location test certificates are required for locations storing petrol (quantities greater than 50 litres).

It is recognised that for some organisations with existing stationary containers, the requirements contained in this Code may be additional to the practices currently followed. Where it is necessary to introduce new practices to comply with this Code (such as a stock management programme) it is acceptable and appropriate to issue the initial Stationary Container System Test Certificate for 1 year. When compliance has been demonstrated, the duration of the certificate must be as set out in the table.

Some existing stationary container systems may have characteristics which give reason (e.g. reduced corrosion allowance) for the duration of the stationary container system test certificates to be less than the period stated in table 9.1. In these circumstances, a certificate with reduced duration may be issued provided that the reason for the reduced duration is made known to the person in charge.

### **9.1. Polyethylene Rotationally moulded Stationary Tanks**

The duration of a stationary container system test certificate for a polyethylene rotationally moulded tank shall be no longer than 1 year.

Table 9.1 Stationary Container Test Certificate Durations

	<b>Petrol</b>	<b>Diesel</b>
Stationary container systems with a capacity not greater than 5000 litres, installed below ground, which meet the requirements of this code and which do not supply burners or internal combustion engine.	Not required.	Duration: 3 years for tanks without secondary containment and 10 years for tanks with secondary containment
Stationary container systems with a capacity greater than 5000 litres installed below ground and which meet the requirements of this code.	Duration: 10 years	Duration: 3 years for tanks without secondary containment and 10 years for tanks with secondary containment
Single skin above ground tanks with 110% secondary containment (>2500 litres for petrol and >5000 litres for diesel)	Duration: 10 years	Duration: 10 years
Single skin above ground tanks with less than 110% secondary containment (>2500 litres for petrol and >5000 litres for diesel)	Duration: 5 years	Duration: 5 years
Movable tanks without integral secondary containment (>2500 litres for petrol and >5000 litres for diesel)	Duration: 3 years	Duration: 3 years
Movable tanks with integral secondary containment (>2500 litres for petrol and >5000 litres for diesel)	Duration: 5 years	Duration: 5 years
Double skin above ground tanks (including tanks to UL2085, SWRI 95-03 & SWRI 93-01).	Duration: 10 years	Duration: 10 years
Above ground or below ground stationary container systems which supply burners or internal combustion engines.	Duration: 3 years.	Duration: 3 years

## **10. STATIONARY TANKS CONTAINING SUBSTANCES WITH CLASS 9 HAZARD CLASSIFICATION**

The Class 9 hazard classification is introduced with the Hazardous Substances and New Organisms Act. Existing stationary container systems that contain a hazardous liquid with a Class 9 hazard classification only, and which are designed, constructed, installed and managed in accordance with the provisions of sections 3, 4, 5, 7 or 8 of this code are accepted under this code.

# **APPENDIX 1: SPECIFICATION FOR EXISTING BELOW GROUND STATIONARY TANKS**

**(Based on the requirements of the Dangerous Goods (Class 3 – Flammable Liquids) Regulations 1985)**

## **1.1 Limitation**

This appendix is limited to existing below ground stationary tanks which:

- 1) store hazardous liquids with 3.1 flammable classification,
- 2) were designed, constructed and installed prior to the commencement date of the relevant transfer notice.
- 3) are not greater than 60,000 litres capacity.

## **1.2 Installation Parameters**

The below ground stationary tank must be designed and constructed as follows:

- 1) The stationary tank must be constructed of suitable materials that are compatible with the substance being stored e.g. welded construction of mild steel plate or fibreglass.
- 2) The stationary tank must be effectively protected from corrosion, taking into consideration the nature of the location and the ground condition, by one or more of the following methods;
  - i) A protective coating or wrapping, or
  - ii) Cathodic protection, or
  - iii) Corrosion resistant materials of construction
  - iv) A method that is at least equivalent to the above. This should include an assessment of the ground conditions
- 3) All piping and other equipment connected to the stationary tank must be supported so as to prevent damage to the piping and the connections.
- 4) Where there is a risk of a stationary tank moving from its foundations due to the presence of high ground water, the stationary tank must be secured against the movement by either -
  - i) reinforced concrete bearers or anchors fitted laterally across the top of the stationary tank and situated beneath the top cover and/or concrete slab cover and designed to the oil company's or stationary tank manufacturer's specifications; or

- ii) concrete deadman anchors fitted longitudinally parallel to the stationary tank and situated on the pit floor, and must include securely fastened anchoring strops fitted laterally at intervals across the top surface of the stationary tank in accordance with the stationary tank manufacturer's specifications.
- 5) Where a below ground stationary tank is installed near the foundation of a building or other structure, there must be a means of preventing the load from the building or structure from being transmitted to the below ground stationary tank.

### **1.3 Location and Cover of Existing Below Ground Stationary Tank**

Every below ground stationary tank must be placed below the surface of the ground to provide cover for the tank or situated such that the ground level has been raised to provide cover for the tank. In both cases the following apply:

- 1) Where the stationary tank is under an open yard in a position where it will not be subject to frequent or heavy traffic loadings and the tank is not less than 3m from any building, not less than 400mm of earth or, alternatively, not less than 300 mm of cover of which not less than 100 mm is concrete as set out in (4), or
- 2) Where the stationary tank is under a building or an open yard within 3m of a building and will not be subject to any traffic loading, not less than 600mm of earth, or 300mm of earth and 100 mm of concrete as set out in (4), or
- 3) Where the stationary tank is subject to frequent or heavy traffic loading, not less than 900mm of earth, or 500mm of earth and 150mm of reinforced concrete, provided that where the reinforced concrete is supported by the walls of a concrete chamber the thickness of the material between the stationary tank and the concrete may be reduced to not less than 350mm.
- 4) Where concrete is used to provide cover over a stationary tank, the concrete is to extend to at least the horizontal outline of the stationary tank, or if the stationary tank has been placed in a concrete chamber, to the top of the walls of the chamber.
- 5) Any existing below ground stationary tank used for the storage of hazardous liquids with 3.1 A, 3.1B or 3.1C classifications must not be located beneath a building unless circumstances render this unavoidable, in which case it must be subject to any special operational conditions considered appropriate at the time of installation by the Approving Authority. Unless meeting the requirements of 1.3. (4) the tank must be installed below the lowest floor of the building.
- 6) Any below ground stationary tank containing a hazardous liquid with a flammable classification of 3.1A, 3.1B or 3.1C, the top of which is above the level of the floor or basement of any building and within 2 metres horizontally of any portion of the building above that floor or basement, must be installed in a concrete pit or behind a barrier of concrete or other suitable material that is impervious to hazardous substances.

## **1.4 Means of Determining Capacity of Below Ground Stationary Tank**

- 1) A means of determining the capacity of the below ground stationary tank and the quantity of hazardous substance in the tank must be fitted to the tank or must be kept readily available whenever a delivery of hazardous substance product into the tank is to be made.
- 2) The means of determining the capacity of a below-ground stationary tank must be calibrated to the individual tank for which it applies.

## **1.5 Piping attached to Below Ground Stationary Tanks**

- 1) Every below ground stationary tank used for the storage of a hazardous liquid with a flammable classification of 3.1A, 3.1B or 3.1C is to be situated below the level of any piping attached to the tank except where stationary tanks are reserved for storage for bulk distribution or where a suitably appropriate anti-siphon device is installed in the pipeline as near as possible to the stationary tank.
- 2) All piping attached to any below ground stationary tank must enter through the top of the stationary tank.

## **1.6 Ventilating Pipes**

- 1) Every below ground stationary tank must be fitted with a ventilating pipe of not less than half the diameter of the filling pipe and of such a size as to prevent unsafe pressures developing. The minimum internal diameter of vent pipes for existing stationary tanks is 25mm.
- 2) The ventilating pipe for a stationary tank containing a hazardous liquid with a 3.1A, 3.1B or 3.1C classification must terminate in the open air in such a position that flammable vapours will not accumulate or travel to an unsafe position, but in no case must it terminate less than 4 metres above the ground nor less than 1 metre from any opening into a building. The outlet of the vent pipe must prevent the entry of water and must be fitted with brass wire gauze of 500 microns nominal aperture.
- 3) Notwithstanding this requirement, in circumstances whereby the contained substance dictates that a vapour scrubber is required, the location and height of the vent pipe termination can be separately determined.

- 4) The ventilating pipe for a stationary tank containing a hazardous liquid with a 3.1D classification need only terminate at such a height and in such a location as to prevent the entry of foreign matter into the pipe.

## **1.7 Fill Pipes and Dip Pipes**

- 1) The fill pipe and the dip pipe of the below ground stationary tank are to be sealed with vapour tight caps.
- 2) Dipping and filling must be extended below the level of the draw off pipe (i.e. the dip tube and the fill pipe are to extend into the stationary tank to a depth below the depth of the draw off pipe) and any openings in the wall of the dipping and filling pipes must be covered with brass wire gauze 500 microns nominal aperture size.
- 3) The sump where the fill pipe and the dip pipe terminate at ground level is, where necessary, to be covered with supported metal covers or other suitable alternative so that the stationary tank cannot be damaged by traffic or by other cause of mechanical injury and must be located such that water cannot overlie the opening under normal circumstances.
- 4) The fill pipe is to be tagged with a durable symbol identifying by name the hazardous substance stored in the below ground stationary tank.
- 5) Where there is more than one below ground stationary tank, each fill pipe is to be identified to readily ascertain the stationary tank to which the fill pipe is connected to.

## **APPENDIX 2: SPECIFICATIONS FOR ABOVE GROUND STATIONARY TANKS FOR FLAMMABLE LIQUIDS WITH CLASS 3 HAZARD CLASSIFICATION.**

**(Based on Regulation 60 of the Dangerous Goods (Class 3 – flammable Liquids) Regulations 1985)**

### **1.1 Limitations**

This specification specifies the stationary tank construction only. Other requirements (such as secondary containment as required by the Hazardous Substances (Emergency Management) Regulations 2001) are in addition to this. Refer also to Appendix 4 of this Code, which is an equivalent provision to Regulation 61 of the Dangerous Goods (Class 3 – Flammable Liquids) Regulations 1985 pertaining to Compounds.

This appendix is limited to existing above-ground stationary tanks which are no greater than 60,000 litres and which store hazardous liquids with a 3.1 classification.

### **1.2 General Performance Requirements**

Existing above-ground stationary tanks in which hazardous substances are stored must be constructed of sufficient strength to hold their contents safely.

Except for movable stationary tanks, the stationary tanks must be erected on foundations that will prevent any dangerous subsidence. Movable stationary tanks must be erected on a supporting frame of adequate strength to support the stationary tank and to allow relocation to occur.

Except as may have been otherwise approved by the Approving Authority, the stationary tank must be constructed of metal and, if mounted on supports, the supports must be of non combustible material<sup>9</sup>.

### **1.3 Specification**

Stationary tanks must be constructed by means of welding or riveting from mild-steel plate of such thickness as will comply with the table set out below:

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<sup>9</sup> Non combustible is intended to include material that will not readily combust e.g. steel, concrete, bricks.

<b>Maximum capacity of tank</b>	<b>Minimum thickness of plate</b>
Litres	mm
500	1.6
1,000	2
2,500	2.5
5,000	4
7,500	5
60,000	6

- 1) Horizontal cylindrical stationary tanks must have either dished curved ends or (in the case of tanks with flat ends) have the ends adequately stiffened, if necessary.
- 2) Rectangular stationary tanks must be stiffened by angle bars and suitable stays.
- 3) Stationary tanks must be protected from exterior corrosion by painting or some other approved means.

#### **1.4 Design and Construction Requirements**

- 1) Every above-ground stationary tank used for the storage of hazardous liquids with a flammable classification of 3.1A, 3.1B or 3.1C must have its separate parts (including any pipeline immediately connected to the stationary tank) electrically bonded together throughout the whole system which must be effectively earthed.
- 2) Every above-ground stationary tank used for the storage of hazardous liquids with a flammable classification of 3.1A, 3.1B or 3.1C must be equipped with a means of preventing the build-up of excessive internal pressures if the stationary tank is exposed either to the effects of an external fire or an explosion within it.
- 3) For the purposes of subclause 1.4 2) above, the term “means” includes providing a weak seam in the top of a stationary tank or, in the case of a vertical cylindrical stationary tank, at the joint between the top and the shell of the stationary tank, or, in the case of a horizontal cylindrical stationary tank or a small vertical cylindrical stationary tank, providing a suitably fitted manhole cover or other emergency relief device.

- 4) Every above-ground stationary tank must be so designed as not to be subject to any unsafe pressure as a result of filling or withdrawing its contents, or of any temperature change, and, unless the Approving Authority otherwise permitted, any vent or other opening in the stationary tank (other than one which closes immediately the stationary tank ceases breathing) must, in the case of hazardous liquids with a flammable classification of 3.1A, 3.1B or 3.1C, be screened with brass-wire gauze of 500 microns nominal aperture size. Vents on stationary tanks for hazardous liquids with a 3.1D classification must be screened in such a manner as will prevent entry of foreign matter.
- 5) An effective means for determining the contents of every above-ground stationary tank must be provided in respect of every such stationary tank (e.g. by dipstick or gauge). A sight glass is not preferred, but if installed it must be capable of being isolated from the stationary tank.
- 6) The means of determining the capacity of an above-ground stationary tank must be calibrated to the individual stationary tank for which it applies.
- 7) The maximum safe fill must also be clearly marked.

## **1.5 Stop Valves**

- 1) An approved all-steel valve that can be used to cut off the flow of hazardous liquids with a flammable classification of 3.1 must be installed, as close to the stationary tank as possible, in every pipeline that is used for conveying hazardous liquids with a flammable classification of 3.1 to or from any above-ground stationary tank and which terminates at or in the stationary tank below the level of any hazardous substances that may be stored in it.
- 2) The termination of every pipe at which connection is made for the transfer of hazardous liquids with a flammable classification of 3.1 into or from an above-ground stationary tank must have a stop valve fitted as close as practicable to the transfer point. If the transfer point is not secured against unauthorized access the end of the pipe must be closed when not in use with an oil tight cap of which must be secured against unauthorized access.

- 3) All pipelines, filling arms and similar fittings used for the transfer or delivery of hazardous liquids with a flammable classification of 3.1A, 3.1B or 3.1C from or to above-ground stationary tanks, must be electrically bonded and earthed.

# **APPENDIX 3: SPECIFICATIONS FOR ABOVE GROUND STATIONARY TANKS FOR CORROSIVE AND TOXIC SUBSTANCES**

**(As approved by the Director of the Ministry of Health in accordance with the provisions of the Toxic Substances Regulations 1983)**

## **1.1 Introduction**

This appendix is structured to show the applicability of each standard with a summary of scope and content for each. This list of specifications relates only to the design and construction of above ground stationary tanks only (known as Fixed Bulk Containers under the Toxic Substances Regulations); other peripheral aspects are dealt with by the broader requirements of Regulation 17A (2) (included as Attachment 3) of the Toxic Substances Regulations, for example bunding, marking, seismic restraint, etc.

## **1.2 Specifications**

*BS 799-Part 5:1987 Oil burning equipment. Specification for oil storage tanks*

### **Applicability**

- horizontal cylindrical tanks having a capacity of not more than 60,000l, with dished or flat ends.
- horizontal oval tanks having a capacity of not more than 3,500l.
- vertical cylindrical tanks having a capacity of not more than 145,000l, with dished ends and/or with flat bottom end plates.
- rectangular tanks having a capacity not more than 150,000l.
- tanks with a maximum internal pressure of 73.6 kPa.

### **Scope and Content**

This specification is primarily for tanks used for the storage of liquid fuel in association with oil burning equipment. However, with appropriate allowance for the type of contents, the specification can be used for the storage of corrosives or toxic substances.

The Standard includes requirements for pressure testing (method specified in an Appendix to the Standard); painting and cleaning; marking; construction and plate thickness (tabulations are given in the Standard, relevant to tank type); manholes and inspection openings; level indicators; drain valves; filling pipes and connections; vent pipes; outlet valves and pipes; and installation (location, insulation, etc) of tanks.

### ***BS 1564: 1975 Specification for pressed steel sectional rectangular tanks***

#### **Applicability**

- tanks constructed of pressed steel plates 1220 mm square.
- tanks ranging in capacity from 1,818 to 1,229,239 litres.
- temperatures up to 100 °C.

#### **Scope and Content**

This is a revision of a Standard first published in 1949. This 1975 revision was undertaken to provide tank sizes in metric units and to cater for steel plate being supplied in metric thicknesses. Sectional dimensions are interchangeable with the Imperial dimensions of the 1949 edition of the Standard and thus the capacities quoted are unusual.

Sectional tanks provide a convenient means for the bulk storage of a variety of liquids not subject to pressure other than static head. As with all sectional assemblies, the components are readily transportable and, subject to unit multiples, can be erected to give varying proportions of length to breadth and depth.

The Standard has sections dealing with types of tanks; working temperatures; materials of construction; dimensions and thicknesses of unit plates; permissible stresses; flanges; jointing materials; bolts, studs nuts and washers; staying (internal supports); connections; supports; access ladders; marking; inspection; erection; and testing.

**Applicability**

- tanks constructed of carbon steel.
- tanks ranging in capacity from 5,000 litres to 90,000 litres (Note however that this Code of Practice is limited to stationary tanks of 60,000 litre capacity).
- maximum internal pressure 40kPa
- maximum internal vacuum 1 kPa.
- temperature range of liquid contents -10 °C to 150 °C.

**Scope and Content:**

This Standard specifies requirements for the design and construction of carbon steel fusion welded horizontal cylindrical storage tanks, with dished and flanged ends, for the storage of liquids within the temperature ranges of -10 °C to +150 °C. (Note that this temperature range was deleted in 1980). The Standard applies both to above-ground tanks with saddle supports and underground tanks.

The Standard is intended to provide for tanks of adequate safety and reasonable economy, in a range of sizes to suit the requirements of user industries for the static storage of petroleum and other chemical products vented to atmosphere. Tanks intended for the storage of liquids corrosive to mild steel should be suitably protected.

Dimensions for lifting lugs are included and certain of the requirements for welding and testing have been revised. Manhole details are given and manholes are shown positioned near one end of the tank, with the advantages that:

- 1) it is easy to avoid a joint weld through a manhole;
- 2) some degree of production standardisation can be achieved;
- 3) tank manlid connections can be grouped at one end.

The tanks specified in this Standard comply with the performance requirements for Type A tanks in BS 799 – Part 5. Details of the range of dished and flanged ends upon which the range of standard diameter tanks sizes has been based are given in Tables. Other matters covered include: working conditions (i.e. up to an

including 0.40 bar internal pressure, maximum internal vacuum of 10 mbar); standard tank sizes and ullages; forms of construction; materials of construction (i.e. types of steel) including fittings; design criteria; fabrication requirements; tank testing; inspection; and marking.

***BS 4994: 1987 Design and construction of vessels and tanks in reinforced plastics***

**Applicability**

- tanks constructed of polyester, epoxy or furane resin systems and reinforced with glass fibres.
- includes horizontal cylindrical tanks, vertical cylindrical tanks and rectangular tanks.
- maximum internal pressure of 0.5 kPa.
- maximum internal vacuum of 0.5 kPa.
- temperature range -30 °C to +110 °C.
- no limitation is placed on the capacity of vessels and tanks designed to this Standard.

**Scope and Content**

This Standard is a revision of BS 4994: 1973. Its purpose is to establish a general standard for the design, fabrication and use of vessels and tanks in reinforced plastics for industrial service. The revision was made to take into account experience with reinforced plastics vessels and tanks and the opportunity was also taken to extend the scope to include filament winding and rectangular tanks, and to categorise vessels in relation to duty.

In the 1973 edition of this Standard the minimum value for the overall design factor was 6. In this 1987 edition that value has been increased to 8. The change has been made because experience has shown that the overall strain limitation does not permit lower values than 8.

The manufacture of vessels and tanks in reinforced plastics is a wide field, involving a large number of materials, both plastics and reinforcing systems, and widely different methods of manufacture. It is not practicable to cover all aspects in a single Standard and therefore BS4994 covers the use of polyester, epoxy and

furane resin systems in wet lay-up applications. Information on the engineering properties of reinforced plastics is somewhat limited and this applies particularly to the changes in such properties over long periods. In the absence of comprehensive information about long-term properties therefore, the material properties used for design are based on short-term tests.

Metallic vessels, being made from materials which are normally isotropic, are conveniently designed by calculating permissible stresses based on measured tensile and ductility properties. In contrast, laminar constructions are usually anisotropic and the design method in this Standard, being based on unit loadings, is particularly suited to the design of composites of reinforced plastics.

The calculation of an appropriate laminate construction is based on the allowable unit loading and unit modulus for the type of construction proposed. In addition, the allowable strain in the laminate is limited to ensure that breakdown of the resin-reinforcement bond does not occur in any part of the structure.

Design factors are included to cover such variables as:

- 1) deterioration of the composite properties over a long period;
- 2) the effect of temperature on the properties of the composite;
- 3) repeated or alternate loading.

As a result of adopting what was effectively a minimum design factor of 8, and taking into account the other design factors, environmental stress cracking of the laminate in aqueous environments has not been a cause of failure in vessels and tanks produced in accordance with this Standard. This mode of failure has been a common source of trouble in other laminates. Furthermore, tests have shown that the allowable strains are below the level at which environmental stress cracking is likely to occur. The Standard includes the following general headings: materials and design loadings; design, construction and workmanship; inspection and tests; erection; and voluminous appendices.

***AS 2634 - 1983 Chemical Plant Equipment Made from Glass-fibre Reinforced Plastics (GRP) Based on Thermosetting Resins.***

## **Applicability**

- tanks constructed of polyester, epoxide, furane or vinylester resin systems and reinforced with glass fibres.

The purpose of this standard is to establish a general standard for the design, and fabrication in reinforced plastics for industrial service.

This standard specifies requirements for certain components of chemical processing equipment made from laminates constructed using glassfibre reinforced thermosetting resin systems. It specifies design, dimensional, constructional and installation requirements for ducting and fittings, pipes and fittings and for stationary cylindrical non-pressure tanks.

It is applicable to tanks

## ***BS PD 5500: 2000 Specification for unfired fusion-welded pressure vessels***

### **Applicability**

- vessels constructed of carbon steel, carbon manganese steel, low alloy steel, aluminium and aluminium alloys.
- includes horizontal cylindrical and vertical cylindrical vessels.
- minimum internal pressure greater than 14 kPa.
- minimum internal vacuum less than 0.6 kPa.
- no limitation is placed on the capacity of vessels designed to this Standard (Note however that this Code of Practice is limited to stationary tanks of 60,000 litre capacity).

### **Scope and Content**

**NOTE:** Standards New Zealand has officially adopted this BS PD 5500: 2000 standard for use in New Zealand. The original BS 5500: 1991 standard is superseded by the new PD BS 5500: 2000. This Standard provides a specification for the design, manufacture, inspection and testing of pressure vessels manufactured from carbon, ferritic alloy and austenitic steels, nickel and aluminium. PD 5500 differs from the superseded BS 5500 only insofar as it does not retain the latter's status as a national standard. Thus, this specification is founded on the experience derived from the application of BS 5500 and provides

an integrated set of rules which have been shown to provide vessels of suitable integrity for a wide range of duties and risk environments.

This specification addresses the requirements for materials in various ways: the main text gives requirements for steels; certain other materials are covered by supplements which identify either where the main text is applicable or where specific requirements of the supplement apply.

The document's contents include: design; manufacture and workmanship; inspection and testing; and a wide range of annexes.

***BS 7777: 1993 Flat-bottomed, vertical, cylindrical storage tanks for low temperature service***

***BS 777-1: 1993 Guide to the general provisions applying for design, construction, installation and operation***

Gives guidance on the selection and design of single, double and full containment tanks for the above-ground storage of liquids.

***BS 7777-3: 1993 Recommendations for the design and construction of prestressed and reinforced concrete tanks and tank foundations, and for the design and installation of tank insulation, tank liners and tank coatings***

Gives recommendations that are applicable for single, double or full containment tanks at service temperatures down to  $-165\text{ }^{\circ}\text{C}$ , and single containment tanks down to  $-196\text{ }^{\circ}\text{C}$ .

***NZS/ANSI/API 650: 1998 (Tenth Edition) Welded steel tanks for oil storage***

**Applicability**

- tanks constructed of carbon steel.
- vertical cylindrical tanks with flat bottoms, closed and open top.
- maximum internal pressure of 17 kPa.
- temperatures up to  $93\text{ }^{\circ}\text{C}$ .

## **Scope and Content**

This specification covers materials, design, fabrication, erection and testing requirements for vertical, cylindrical above-ground, closed and open-top, welded steel storage tanks in various sizes and capacities for internal pressures approximating atmospheric pressure (internal pressures not exceeding the weight of the roof plates), but a higher internal pressure is permitted when certain additional requirements are met.

The Standard applies only to tanks whose entire bottom is uniformly supported, and to tanks in non-refrigerated service that have a maximum operating temperature not exceeding 200 °F (93 °C). Designed to provide the petroleum industry with tanks of adequate safety and reasonable economy for use in the storage of petroleum and its products, and other commonly handled or stored liquids. The Standard does not present or establish a fixed series of allowable tank sizes; instead, it is intended to permit the purchaser to select whatever tank size may best suit their needs. The appendices to this Standard provide a number of design options requiring decisions by the purchaser, standard requirements, recommendations, and information that supplements the basic Standard. The document has the following headings: materials of construction; design; fabrication; erection; methods of inspecting joints; welding procedures and welder qualifications; and marking.

### **1.3 Additional Relevant Documents**

The following documents are not approved specifications in terms of Regulation 17A (2) (a) of the Toxic Substances Regulations. However if a tank or vessel is constructed to one of these specifications the design may still be used, provided that an exemption had been granted by the Medical Officer of Health, upon consideration of full design details and all relevant information had been submitted to the Ministry of Health for consideration.

American Society of Testing and Materials

**ASTM D 3299: 1995 (Revision 2, 1995)** Filament-wound glass fiber-reinforced thermoset resin chemical-resistant tanks

**ASTM D 4097: 1995 (Revision 2, 1995)** Contact-moulded glass fiber-reinforced thermoset resin chemical-resistant tanks

Underwriters Laboratory

**UL 142: 1993** Steel above-ground tanks for flammable and combustible liquids

**UL 2085: 1994** Insulated above-ground tanks for flammable and combustible liquids

Canadian Standards

**CAN/ULC-S643-M90:** Standard for shop-fabricated steel above-ground utility tanks for flammable and combustible liquids

**CAN 4-S601-M84:** Shop-fabricated steel above-ground horizontal tanks for flammable and combustible liquids

**CAN 4-S630-M84:** Standard for shop-fabricated steel above-ground vertical tanks for flammable and combustible liquids

German Standards

**DIN 6600: 1989** Steel tanks for the storage of flammable and non-flammable water polluting liquids; concepts and inspection

**DIN 6601: 1991 (amended 1994)** resistance of materials of steel tanks against liquids

**DIN 6616: 1989** Horizontal single-wall and double-wall steel tanks for the above-ground storage of flammable and non-flammable water polluting liquids

**DIN 6618-1: 1989** Vertical single-wall steel tanks for the above-ground storage of flammable and non-flammable water polluting liquids

**DIN 6618-2: 1989** Vertical double-wall steel tanks with vacuum-based leak detection systems for the above-ground storage of flammable and non-flammable water polluting liquids

**DIN 6618-3: 1989** Vertical double-wall steel tanks with liquid-based leak detection system, for the above-ground storage of flammable and non-flammable water polluting liquids

**DIN 6623-1: 1989** vertical single-wall steel tanks with less than 1,000 litre capacity for the above-ground storage of flammable and non-flammable water polluting liquids

**DIN 6623-2: 1989** Vertical double-wall steel tanks with less than 1,000 litre capacity, for the above-ground storage of flammable and non-flammable water polluting liquids

**DIN 6624-1: 1989** Horizontal single-wall steel tanks with capacities between 1,000 and 5,000 litres, for the above-ground storage of flammable and non-flammable water polluting liquids

**DIN 6624-2: 1989** Horizontal double-wall steel tanks with capacities between 1,000 and 5,000 litres, for the above-ground storage of flammable and non-flammable water polluting liquids

**DIN 6625-1: 1989** Steel tanks erected on site, for the above-ground storage of hazardous flammable water polluting liquids of Class III A, and of non-flammable water polluting liquids: requirements and testing

**DIN 6625-2: 1989** Steel tanks erected on site, for the above-ground storage of hazardous flammable water polluting liquids of Class III A, and of non-flammable water polluting liquids: design

Australian and/or New Zealand Standards

**AS/NZS 4452: 1997** The storage and handling of toxic substances

This document sets out requirements and recommendations for the storage and handling of Class 6.1 toxic substances. A discussion of the hazards presented by toxic substances and a bibliography of documents providing guidelines on the preparation of emergency plans are provided in appendices.

**AS 3780: 1994** The storage and handling of corrosive substances

This document deals with all aspects of the storage and handling of corrosives. In section 5 storage and handling in bulk is specifically discussed with container types, corrosion protection, vents, liquid lines, foundations, supports and transfer points all being considered. The tanks themselves are to be approved by the relevant regulatory authority where the design and construction of fixed tanks is concerned.

Specific acceptable design standards are cited; these include AS 1692, API 620, API 650 or “other approved standard”.

**AS 1692: 1989** Tanks for flammable and combustible liquids

This Standard specifies requirements for the design and construction of tanks for the storage of flammable and combustible liquids. The document is oriented towards cylindrical tanks of commercial grade low carbon steel for petroleum fuel storage. It is recognised however that the storage of other types of liquids,

or of the use of other materials of construction may render part or all of the Standard inappropriate.

The specification includes general design and construction considerations, contents indication, fill provisions, vents, testing and marking.

The Standard references all documents cited earlier in this technical memorandum which have been granted approved status in terms of the Toxic Substances Regulations; e.g. BS 799-Part 5, BS 1564, BS 2594, BS 4994, BS PD 5500, API 650, etc.

## **1.4 Notes to this Appendix**

- 1) In all cases specifications must only be used for appropriate applications, and the most recent revision at the time of construction is applicable.
- 2) Vessels with a maximum working pressure above 50 kPa must be designed in accordance with the requirements of the Health and Safety in Employment (Pressure Equipment, Cranes and Passenger Ropeways) Regulations 1999.
- 3) Requirements for the construction of reinforced plastic tanks which do not conform to the requirements of BS 4994: 1987 or AS 2634 – 1983 are as follows:
  - The tank and its associated containment system must meet the general requirements of Regulation 17A (2) of the Toxic Substances Regulations 1983, namely bunding, marking, seismic requirements, etc.
  - An engineer experienced in the design of reinforced plastic tanks must undertake calculations substantiating the design of the tank, using the appropriate sections of NZS 3106: 1986 Code of practice for concrete structures for the storage of liquids, to determine the dynamic liquid loads; NZS 4203: 1992 Code of practice for general structural design and design loadings for buildings (or AS/NZS 1170, and NZS 4219: 1983 Specification for seismic resistance of engineering systems in buildings).
- 4) These three Standards will enable the appropriate design loadings to be developed on the various elements of the tank when considering dead load, live load, backfill load (if applicable), construction load, liquid load, wind load, temperature loads and earthquake loads.
  - Earthquake loads should consider forces, shears, and moments resulting from earthquake accelerations of liquid mass, dead mass and external mass (if applicable) responding with the structure. Analysis should consider the fundamental frequency of sloshing and any amplification effects.

- The engineer must submit a signed statement regarding the suitability of the materials of construction with respect to the liquid to be stored in the tank.
- The manufacturer of the tank must be familiar with the materials of construction and the liquid to be stored in the tank. The manufacturers must be competent and suitably equipped to manufacture consistent quality tanks. Compliance with these requirements may be proven by documentation of past experience and track record, or by prototype testing.
- Hydraulic testing must be completed on all tanks in accordance with the appropriate sections of BS 4994: 1987.

## **APPENDIX 4: ALLOWABLE MEANS FOR SECONDARY CONTAINMENT**

- 1) With the exception of 2) below, above-ground stationary tanks must have secondary containment which must be of sufficient capacity to contain the full volume of the hazardous substance capable of being held by the largest stationary tank in the secondary containment system. One suitable form of secondary containment is a compound.
- 2) The exception to 1) above are stationary tanks intended for the storage of diesel fuel and/or low flashpoint diesel and with compounds having a capacity adequate to retain not less than 50% of the maximum contents of the largest stationary tank in that compound and where this was approved by the Approving Authority. Such installations must, in addition to the compound meet the requirements of clause 3.2 of this Code.
- 3) The secondary containment system must be chemically resistant to the substance in such a way that, if leakage occurs, the contents of the container can be recovered subject to unavoidable wastage.
- 4) Where earth is used to form any compound wall, the wall must have a minimum top width of 300 mm and if the wall height is greater than 750 mm, the top width must be not less than 600 mm. Where earth is placed to form the bund it must have a slope not greater than 1m in 1m.
- 5) Where earth is placed to form a compound or bund, it is not suitable to use loose or sandy loam in this circumstance – the earth must be carefully selected and appropriately compacted to form a layer that is impermeable to the substance being stored.
- 6) The interior of any compound must be occupied only by the stationary tank or tanks, and such settling and measuring tanks, piping, valves and other necessary appliances. These additional facilities must be included in the volume calculations of the secondary containment system.
- 7) No person must allow water to accumulate in any compound required under this Code. Compounds must be periodically drained to minimise the accumulation of water e.g. by means of an oil stop valve, by means of pumping or by means of a pipe carried through the wall of the compound at the lowest practicable point. The pipe must be fitted with either a screw-in bung or a lockable valve which must be

kept in the closed position at all times except when draining off accumulated water.

Note that the draining of water from compounds may be subject to requirements of the local or regional authority.

- 8) With the exception of earthen compounds formed around movable tanks, every drainage line fitted to a compound must have a flammable liquid trap installed within the compound unless the Approving Authority determined that the flammable nature of the substance is such as to make this unnecessary or impracticable.

## **APPENDIX 5: OIL STORAGE TANKS WITHIN OR ADJOINING A BUILDING**

This appendix relates to tanks used for the storage of substances with a 3.1D flammable classification.

- 1) Stationary tanks must be installed within a chamber of fire resistant construction complying with the requirements of subclause 11 of this Appendix and must have its walls well bonded to the floor.
- 2) Stationary tanks must not be installed on a floor above any other floors unless it is impractical to do otherwise.
- 3) Except as may have been approved by the Approving Authority, or where the chamber is on the lowest floor and the space between the stationary tank and the chamber is filled with clean sand, no stationary tank or tanks installed inside a building may exceed a total capacity of 25,000 litres if the building is not of fire-resistant construction, or 50,000 litres if the building is of fire-resistant construction.
- 4) If the chamber is provided with an access opening, it must be as small as practicable, and must be kept closed at all times except when it is necessary to enter the chamber.
- 5) Any opening in the chamber must be located with its lowest point above the floor of the chamber, so that the lower portion of the chamber will form a compound adequate to retain that total volume of oil that may be stored in all stationary tanks therein.
- 6) Any opening in the chamber must have a fire resistance of not less than half that material specified for the walls, roof and floor of the chamber specified in subclause 11.
- 7) The size of the chamber must be such as to provide a minimum of 400mm space between the stationary tank and the roof and sides of the chamber.
- 8) Where arrangements are made for maintenance servicing of the stationary tank otherwise than entering the chamber, the space specified in 7 above may be reduced to 10mm.
- 9) Where the chamber is required to be filled with sand per 3 above, the cover on all sides of the stationary tank must not be less than 600mm.

- 10) Unless the chamber is filled with sand it must be vented to the open air by means of a vent or vents having a cross sectional area of not less than 400 cm<sup>2</sup> and constructed of incombustible materials, or an alternative approved by the Approving Authority as an alternative arrangement made to ventilate the chamber prior to any person entering it.
- 11) Construction of the walls, roof and floor of the chamber must be of reinforced concrete (or alternative construction providing an equivalent fire resistance) having a thickness not less than that specified in the following table:

<b>Total Capacity of Tank or Tanks</b>	<b>Thickness of Reinforced Concrete</b>
Litres	mm
Not exceeding 1200	100
Not exceeding 4000	125
Exceeding 4000	150

- 12) Notwithstanding clause 1 of this Appendix 5, a tank may be in a building that is situated in a remote location without the requirement for a chamber of fire resistant construction provided that:
- The tank has a capacity of less than 5000 litres, and
  - The building is only attended by maintenance or service personnel at irregular intervals, and
  - The tank is used to supply a stand by generator, and
  - The building is constructed of non combustible materials.

An example of such an installation is a remote communication site.

# **APPENDIX 6: APPROVED SPECIFICATIONS FOR THE DESIGN AND CONSTRUCTION OF EXISTING STATIONARY TANKS FOR CLASS 3.1 SUBSTANCES**

**(based on approvals by the Chief Inspector of Explosives and Dangerous Goods, Department of Labour)**

In all cases specifications must only be used for appropriate applications, and the most recent revision at the time of construction is applicable.

## **1.1 Above-Ground Stationary Tanks**

<b>API 12B</b>	bolted product tanks (not for hazardous substances with a flammable classification of 3.1A or 3.1B)
<b>API 12D</b>	field welded tanks
<b>API 12F</b>	shop welded tanks
<b>API 650</b>	welded steel tanks for oil storage
<b>ASME VIII</b>	boiler & pressure vessels code (Div-1).
<b>AS 1210</b>	unfired pressure vessels
<b>AS 1692</b>	steel tanks for flammable and combustible liquids
<b>AS 1727</b>	tank containers (international size)
<b>BS 1564</b>	pressed steel sectional rectangular tanks.
<b>BS2594</b>	carbon steel welded horizontal cylindrical storage tanks.
<b>BS 4741</b>	vertical cylindrical welded steel storage tanks for low temperature service.
<b>BS 5500</b>	unfired fusion-welded pressure vessels.
<b>BS 7777</b>	flat-bottomed, vertical cylindrical storage tanks for low temperature service.
<b>BS 7777-1</b>	guide to the general provisions applying to design, construction, installation and operation of above-ground storage of liquids.
<b>BS 7777-3</b>	recommendations for design and construction of pre-stressed and reinforced concrete tanks for the above-ground storage of liquids.

- NS 1545** Norwegian standard for horizontal cylindrical glass fibre reinforced polyester (GRP) petroleum storage tanks
- NZS 1841** fusion-welded tanks
- API 620** Design and Construction of Large, Welded Low Pressure storage Tanks
- API 653** Tank Inspection, Repair, Alteration
- ASTM D4021-81** Glass Fibre Reinforced Polyester Underground Petroleum Storage Tanks
- BS 799-5** Oil burning equipment. Specification for oil storage tanks
- NZS/ BS 2654** Specification for the Manufacture of Vertical Steel Welded Non-refrigerated Storage Tanks with /Butt Welded Shells for the Petroleum Industry
- BS 4994** Specification for the Design and Construction of Vessels and Tanks in Reinforced Plastics
- BS 5387** Specification for vertical cylindrical welded storage tanks for low-temperature service: double-wall tanks for temperatures down to -196°C
- SWRI 93-01** Test Procedures 93-01: Testing Requirements for Protected Aboveground Flammable Liquid/Fuel Storage or Tanks
- SWRI 95-03** Test Procedures 95-03: Method for Evaluating the Fire Performance of Testing Requirements for Protected Aboveground Flammable Liquid/Fuel Storage Tanks
- SWRI 97-04** Testing Requirements for Fire Resistant Aboveground Flammable Liquid/Fuel Storage Tanks in accordance with Section 2-4.5 of NFPA 30A (1996)
- UL142** Steel Above Ground Tanks for Flammable and Combustible Liquids
- UL 2085** Standard for Protected Aboveground Tanks for Flammable Combustible Liquids

## **1.2 Below-Ground Tanks**

- AS 1692 (category 4)** Tanks for Flammable and Combustible Liquids

- ASTM D4021-81** Glass Fibre Reinforced Polyester Underground Petroleum Storage Tanks
- BS/EN 12285.1** Workshop Fabricated Steel Tanks Horizontal Cylindrical Single Skin and Double Skin Tanks for the Underground Storage of Flammable and Non-Flammable Water Polluting Liquids
- NZS 7521** underground steel storage tanks for the petroleum industry
- UL 1316** Standard for Glass-Fibre-Reinforced Plastic Underground Storage Tanks for Petroleum Products,
- UPSS** Code of Practice for the Design, Installation and Operation of Underground Petroleum Storage Systems

## **APPENDIX 7: CHECKLIST FOR EXISTING “REGULATION 60” ABOVE-GROUND STATIONARY TANKS**

- 1) Check if the tank has a manufacturer’s plate that could provide details of:
  - The name of the manufacturer
  - The date of manufacture
  - The date of the last pressure test
  - The design specification of the stationary tank
  - The Department of Labour approval number.
  
- 2) Check the stationary tank capacity against:
  - Dipstick or level gauge
  - Volumetric calculation (Volume =  $\pi \times \text{radius}^2 \times \text{Length or Height}$ ) (for flat end stationary tank).
  
- 3) Check the overall condition of the installation for such things as:
  - Stationary tank integrity
  - Corrosion protection
  - Structural integrity of stationary tank supports and braces, including foundations
  - Any access ladders, guardrails and handrails.
  
- 4) Check that the stationary tank is suitably secured to its supports as well as the supports to the foundations. It shall be mounted firmly on substantial supports capable of withstanding appropriate earthquake loadings when the container is full.
  
- 5) Check the suitability of the installation for the substance contained, e.g. Class 3.1A in a 3.1A stationary tank.
  
- 6) If stationary tank is used for a hazardous substance with a 3.1A or 3.1B or 3.1C flammable classification, check that the stationary tank and all its components are suitably electrically bonded, and the whole installation is earthed.

- 7) Check whether the stationary tank has provision for emergency pressure relief, e.g. a manway, weak seam or relief valve.
- 8) Check the stationary tank venting arrangements for:
  - Vent type and suitability
  - Gauze present and suitable grade
  - Required height termination
  - Vent pipe diameter must not be less than half the fill pipe diameter.
- 9) Check the fill point cap and fill pipe diameter.
- 10) Check suitable means of determining stationary tank contents:
  - Location
  - Suitable material
  - Accuracy/calibration
  - Maximum safe fill marked.
- 11) Check the location of stationary tank shut-off valve.
- 12) Check the condition and material suitability of all pipework.
- 13) Check the compound/secondary containment arrangements:
  - Suitability of materials
  - Minimum capacity required
  - Integrity
  - Presence of water, product, foreign objects
  - Means of periodically draining off accumulated water; drain kept closed by way of screw bung or lockable valve.
- 14) Check the stationary tank location in regard to separation distances:
  - Sources of ignition
  - Areas of high intensity land use
  - Areas of low intensity land use.

15) Check for appropriate stationary tank labelling, valve labelling, signage, emergency management requirements.

16) Check if there are any available stationary tank records:

- Site plan
- Tank drawings and specifications
- Tank history, record of installation.

## **APPENDIX 8: STOCK MANAGEMENT SYSTEM**

### **1. Principles of Stock Management**

The objective of stock reconciliation is to prove that the contained substance is used for its intended purpose and is not being lost to the environment.

Regular and systematic stock reconciliation by way of stationary tank dip stick readings or a suitable alternative method e.g. contents gauges, must be carried out and records kept in accordance with clause 8.1 and Appendix A of Supplement No.1 of the UPSS Code of Practice (included as Attachment 1) at intervals not exceeding:

- 1) Where stationary tanks are in constant daily use: daily or at the commencement of each operator shift; or
- 2) Where stationary tanks are not in constant daily use: weekly, or
- 3) Where stationary tanks are only in use seasonally: monthly during seasons of inactivity, or
- 4) Where stationary tanks are used in connection with internal combustion engines: monthly or before and after each running, whichever is the more frequent.

Readings must be permanently recorded using an appropriate format (hard copy or electronic).

For stationary containers that have a capacity less than 5000 litres the above frequencies may be extended by a factor of two.

In circumstances whereby the above frequencies cannot be strictly applied due to site or usage practicalities, a process that meets the intent described above may be applied.

### **2. Stationary Tanks in Continuous Use**

Some stationary tanks may be used in connection with oil burning installations or used in connection with stationary internal combustion engines (e.g. generators or compressors). A particular issue arises with respect to undertaking stock management for stationary tanks that are in this form of service and which do not have any form of metering.

The preferred option for these stationary tanks is to install a flow monitoring device (e.g. a meter) between the stationary tank and the appliance to enable regular stock monitoring.

Less preferred alternatives are to:

- 1) periodically undertake stock reconciliations by way of dip-stick readings (or a suitable alternative method, e.g. contents gauges). Consumption is required to be calculated and the results recorded e.g. over 24 hour periods or weekly periods. Where this option is followed in locations that are not farms greater than 4 hectare in size, the process of stock reconciliation must be supported by further measures for below ground stationary tanks e.g. :
- 2) undertake an integrity test (e.g. a pressure or vacuum test) at periodic intervals - not more than 10 yearly intervals, or
- 3) install sufficient observation/monitoring wells such that a leak will be detected by observing these wells, or
- 4) if the stationary tank is owned by an organisation that has a large number of such stationary tanks and that organisation has a risk ranking program in operation, the stationary tank may be placed on that risk ranking program in accordance with the provisions of point 3 of clause 8.4 of this Code, or
- 5) where the stationary tank is in use for part of the year only, monthly stock reconciliations during periods of non activity. The tank should be full during this period of non activity to monitor the entire tank.

### **3. Calibration of Meters**

In all cases where there is reliance placed on the meters, the accuracy of these must be verified by periodic calibration. For meters in constant daily usage, calibration by an accredited agent is required to be undertaken at least annually and for meters that are not in constant usage calibration must be undertaken at least 3 yearly.

**ATTACHMENT 1: UPSS Supplement No. 1  
MANAGEMENT OF EXISTING UNDERGROUND  
PETROLEUM STORAGE SYSTEMS**

**Code of Practice for the  
DESIGN, INSTALLATION AND  
OPERATION OF UNDERGROUND  
PETROLEUM STORAGE SYSTEMS**

**Supplement No. 1**

**MANAGEMENT OF  
EXISTING UNDERGROUND  
PETROLEUM STORAGE SYSTEMS**

**Addendum: Health and Safety in  
Employment Amendment Act 2002**

Since this document was published the Health and Safety in Employment Act 1992 has been amended by legislation which came into effect from 5 May 2003. While the technical and general information in this document remains current, there may be instances where it does not reflect the changes contained in the amended Act. Your local Occupational Safety and Health Service office can provide further information or you may call:  
**Workinfo on 0800 090 0202**  
**[www.workinfo.govt.nz](http://www.workinfo.govt.nz)**

Acknowledgement

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The organisations particularly concerned include:

Explosives and Dangerous Goods Division, Department of Labour

Ministry for the Environment

Auckland Regional Council

Environment Waikato Regional Council

Taranaki Regional Council

Wellington Regional Council

Canterbury Regional Council

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## **1. INTRODUCTION**

This supplement to the code has been prepared to cover underground petroleum storage systems (UPSS) installed prior to the introduction of the code in 1992. It reflects collective experience and expertise in risk management for these tankage systems, and must be read in conjunction with the code, which applies to existing as well as new installations.

This supplement is not intended to be used as a technical specification. It must be supported by detailed technical documentation to obtain approval for any project work from a licensing authority.

## **2. OBJECTIVE**

It is the aim of this supplement to:

- Identify the risks of product release associated with the use of older storage systems.
- Stipulate procedures and equipment for the proper management of existing UPSS.
- Provide UPSS that will store and dispense their contents in a safe, efficient, effective and workable manner.
- Ensure that the possibility of a product release of sufficient magnitude to be hazardous to life, health, property or the environment from any existing UPSS is minimised.

## **3. RELATIONSHIP OF THIS SUPPLEMENT TO THE CODE**

The code covers the design and installation of all new underground petroleum storage systems (UPSS) installed since its publication by the Occupational Safety and Health Service of the Department of Labour in 1992, and also the operation of all UPSS, whether new or existing.

This supplement covering the management of existing UPSS expands on the relevant provisions of the code and applies to all UPSS, including those installed since the publication of the code. It is intended that this supplement be incorporated in the code at its first review which is expected to be no later than 1997.

## **4. ADDITIONAL DEFINITIONS**

For the purposes of this supplement, the code definitions, plus the additional definitions listed below, shall apply.

### **4.1 Code**

*The Code of Practice for the Design, Installation and Operation of Underground Petroleum Storage Systems, and amendments thereto.*

### **4.2 Corrosion Expert**

A person or organisation having the specialised knowledge and experience needed to design, install and maintain cathodic protection systems.

### **4.3 Dangerous Goods Regulations**

The Dangerous Goods (Class 3 - Flammable Liquids) Regulations 1985, and amendments thereto.

### **4.4 Existing**

An underground petroleum storage system becomes an existing installation as soon as it has been commissioned and remains an existing installation until it has been removed.

### **4.5 Product**

Any petroleum product stored or handled on the site.

### **4.6 UPSS**

Underground Petroleum Storage System

### **4.7 Zones “A” “B” and “C”**

The environmental sensitivity zones described in section 10.1 of the code.

## **5. MANAGEMENT OF POTENTIAL RISKS**

The hazards for the operators, the public, and the environment that may be associated with the storage and handling of petroleum products in underground storage systems arise from:

- Spills
- Leaks
- Fires and explosions.

These can be minimised with good management.

All owners and operators of UPSS must exercise good management, including:

- Sound operating procedures;
- Adequate equipment, properly maintained;
- Supervision to check that good operating procedures are followed and that equipment is maintained;
- Monitoring of product stock to identify any losses that may occur;
- Risk assessment for each and every UPSS site; and
- System up-grading where appropriate.

### **5.1 Avoiding Spills**

Spills are most likely to occur during delivery of product to storage tanks. The person making the delivery must:

- Ensure that there is sufficient space in each receiving tank to hold the amount of product to be delivered;
- Ensure that the delivery hose is connected to the correct fill point, and that hose connections are tight;

- Keep the delivery lines under constant observation during the whole of the delivery; and
- Stop the delivery immediately if any leaks occur. Do not resume delivery until the defect is remedied and it is safe to proceed.

## **5.2 Avoiding Leaks**

Risks of leakage from the system can be minimised by implementing good management systems. Such systems would include site-by-site risk assessment and system upgrading where necessary.

The owner of every UPSS must establish and actively pursue an on-going risk assessment and management system which quantifies the risks of each of the various storage sites, having due regard for each of the release risk and potential impact factors listed in section 7.

High risk sites must be identified and appropriate action taken.

All owners of UPSS must be able to demonstrate to the relevant authorities that they operate soundly-based, on-going risk assessment and management systems. In setting up their systems, owners should refer to the principles set out in documents such as ISO 9000, or to their major supplier of petroleum products.

Whenever circumstances change, the risk assessment for each site must be reviewed to reflect any changes in the original assessment.

## **5.3 Monitoring for Leakage**

Should product leakage occur, it can be identified by following a strict stock reconciliation system (also known as “inventory control”).

Every storage site operator must establish and operate a sound system of stock reconciliation that will identify any losses as they occur. It must be updated regularly—at least daily on busy sites, and no less frequently than fill-to-fill or monthly, whichever is the less, on any other site.

The basic elements of a stock reconciliation system are:

- Measure actual stock in each tank at the beginning of the period (equals opening stock).
- Record all product received into the tank (equals receipts).
- Record all deliveries from the tank (equals sales or throughput).
- Calculate book stock at the end of the period.
- Measure actual stock at the end of the period (equals closing stock).
- Previous period losses/gains shall be considered and carried forward from month to month when assessing trends.

The difference between the book stock at the end of the period and the actual closing stock is the recorded loss or gain. It must be calculated separately for each tank (or pair of coupled tanks). However, petroleum products are volatile, and there will be some vapour losses in handling. Apparent losses can also arise from several factors, including temperature changes and dipping errors. For motor spirits losses of up to 0.5 percent of sales can be expected. Losses of more than 0.5 percent of throughput must be investigated. See also Appendix A — Stock Reconciliation.

Monitoring for the presence of product in observation wells and monitoring wells, where fitted, provides prompt confirmation of suspected leakage. They should be examined for the presence of product or vapour using a bailer or a portable gas analyser. This examination may be carried out at any time by a representative of the owner, or by an authorised officer of the authority. The site operator must check each well

regularly, at least once every month, for any liquid hydrocarbons, and record his observations. See Appendix C—Observation Well and Appendix D — Monitoring Well.

The operator must notify the owner immediately if there is any cause to suspect product loss.

The owner must inform each relevant authority immediately if there is good reason to believe that a product release may have occurred.

## **6. RECORDS**

This section refers particularly to UPSS installed prior to the introduction of the code in 1992.

Where as-builts are not available, general arrangement drawings will be developed.

Information that needs to be readily available on site includes:

- Site layout drawing, including underground tanks, pipework and services.
- Details of secondary containment system, where provided.
- Location of observation wells and monitoring wells.
- Stock reconciliation records.
- Observation and monitoring well monitoring records.
- History of any product releases at site.
- Records of any tank or pipeline test done.
- Records of tests of any cathodic protection installed.

## **7. POTENTIAL RISKS**

The risk of product leakage from a storage system can be considered under two broad categories—the likelihood of product release from the system, and the potential impact on the environment should a leak occur.

**7.1** Factors which influence the likelihood of product release include:

- Soil Corrosivity — See Appendix G. For steel tanks and pipework, corrosivity of the soil is a most important factor in determining how long the system will last in the ground.

Fibreglass tanks and pipework appear to be unaffected when buried, even in corrosive soils.

- Age — Field experience shows that there is no absolute limit to the useful life of a steel underground storage tank. Age of a tank installation is only relevant when considered along with soil corrosivity and any corrosion protection provided. For

fibreglass tanks age appears to be a very minor concern as far as potential leakage is concerned.

- Tank coatings and/or jacketing designed to minimise corrosion.
- When a leak occurs, pipework is all too often the source. Underground pipework may be damaged by heavy traffic passing over, and must be protected by adequate load bearing capacity above— e.g. by a concrete slab or by extra cover depth. It can also be damaged during construction work in the vicinity, but can be protected by first identifying its location and route, and then making sure that all construction work is kept clear of the pipes.
- Cathodic protection systems designed, maintained and monitored to overcome the corrosion problem.
- Double skin tanks, pit liners and HDPE secondary containment systems designed so that leakage from the primary containment can be detected while still being retained by the outer containment system.
- Spill containers retain spillage at fill points and prevent it from seeping away into the ground. See Appendix E — Spill Container.
- Overfill preventers give warning when the tank is full and minimise spills when uncoupling. See Appendix F — Overfill Device.
- Site Stability—Pipework and, to a lesser degree, tanks may be damaged by disturbance of the ground due to earthquake or other causes. Soil type, local subsidence and seismic zoning must be considered.
- Dissimilar metals in close proximity or stray currents underground can create an electric potential capable of causing rapid electrolytic corrosion.

**7.2** The key factors affecting the impact of a product release are early detection and immediate implementation of the response plan.

Other factors include:

- Effective inventory control which can give early indication of a leak in the system.
- Size of tank — the larger the tank, the larger is the potential release, and the larger impact it can have on the area around the tank.
- Environmental risks near the site. Environmental Zones “A” “B” and “C” as defined in section 10.1 of the code and established in consultation with the Regional Councils and territorial authorities cover several factors that have a bearing on the likely environmental impact of any product release. These include proximity to, and possible contamination of an aquifer which is used or intended to be used for potable water supply, or environmentally sensitive waterways, including coastal waters and wetlands.
- Land use in the immediate vicinity of the site and proximity to underground services which could allow escaped product to spread.
- Soil type/permeability. Will any product released spread quickly, slowly or not at all?

- Viscosity of product. Will any product released disperse quickly, slowly or not at all?
- Toxicity of product in terms of effects and degree of exposure required to cause those effects.
- Checks for product in observation wells and/or monitoring wells will aid in early leak detection, and can reduce the amount and therefore the impact of any release.
- Pressurised delivery pipework. If pressurised, the amount of product released should a leak occur may be greater than from unpressurised pipework. However, automatic leak detection is mandatory in pressurised systems and should trigger action by the operator to remedy the situation.
- Location of the non-return valve on the suction system immediately under the dispensing pump will minimise the amount of product released should a leak occur in the suction pipe. *Management of Underground Petroleum Storage Systems* 9
- Continuous automatic leak detection systems for tanks or pipework are designed to prevent any significant release of product.

## 8. RISK MITIGATION

Acceptable ways of reducing the risk of product release include:

### 8.1 Stock Reconciliation

So that any discrepancy in stock quantities that could indicate a leak can be found and investigated promptly, an inventory control system must be used, and stocks reconciled frequently. See section 17 and 18 of the code, and section 5.3 above.

Whenever there is a discrepancy greater than 0.5 percent of throughput or a change in the normal pattern in stock reconciliations, it must be investigated quickly and thoroughly.

A standard format should be used for inventory control so that stock movements can be followed day by day. See Appendix A, which gives an example of a stock reconciliation system.

Statistical inventory reconciliation systems may also be used in the analysis of stock loss trends.

### 8.2 Cathodic Protection

See section 15 of the code.

Where steel tanks or pipework are installed, cathodic protection may be fitted to overcome continuing corrosion.

### 8.3 Observation Wells

See sections 12.9.3 and 16.1 of the code, and Appendix C.

UPSS may have observation wells installed alongside the tank or tanks. The first observation well shall always be at the lowest point of the tank excavation.

### 8.4 Monitoring Wells

See section 16.2 of the code and Appendix D.

Monitoring wells may be installed down groundwater gradient where there are permeable sands and gravel and the highest recorded ground water level is below the tank excavation but within 12 m of ground level.

Monitoring wells may also be required in some highly sensitive areas where ground water level is outside this range, but still reasonably accessible.

The location of wells will be determined after due consideration of relevant site specific factors.

Care must be taken that monitoring wells do not penetrate any significant impermeable layers and provide a route by which a product release may reach groundwater that would not otherwise be affected.

Note: Observation and monitoring wells are to be secured against unauthorised access, and against entry of contaminants either down the side of the well casing or directly into the well.

### **8.5 Spill Containers**

If practicable, spill containers may be installed at tank fill points. See Appendix E — Spill Container.

### **8.6 Drip Sumps**

If practicable, drip sumps should be installed under dispensing units.

### **8.7 Dip Points**

Toby boxes at dip points may be sealed to prevent drips from the dip rod getting into the ground.

### **8.8 Overfill Protectors**

Where not already fitted, overfill protectors may be installed, if practicable, at tank fill points. See Appendix F — Overfill Device.

### **8.9 Tagging of Fill Points and Toby Boxes**

All tank top dip points, direct top and remote fill points, and toby box tops shall be clearly identified by means of permanent markings fixed on or alongside the fitting.

### **8.10 Monitoring Secondary Containment**

All secondary containment systems must be regularly monitored to check for the presence of any product or water within the space between the primary and secondary containment systems. Observations must be noted and a record kept on site.

### **8.11 Tank and Pipeline Testing**

If there is reason to suspect a leak, the owner shall have the whole tank and pipework system checked by applying a proven hydrostatic or other approved test.

“Approved tests” are those tests approved by both:

- The Chief Inspector of Dangerous Goods for use in hazardous areas; and
- The owner, who will only accept tests that have been independently approved by a recognised authority.

Note: Air pressure testing shall not be used in any circumstances.

### **8.12 Tank or Pipework Removal or Replacement**

If found to be leaking, the tank and pipework system shall be removed, repaired, or replaced.



## **9. RESPONSE TO PRODUCT RELEASE**

### **9.1 Emergency Planning**

Both the owner and the operator must ensure that an appropriate response plan is in place to deal with any emergency that may arise, including possible spills, leaks, fire and explosion. It is the operator's responsibility to keep a copy on site and to ensure that all staff are familiar with the plan and can implement it promptly in an emergency.

### **9.2 Response Plans for Product Releases**

The response plan for any product release must include the following essential steps, some of which can be taken concurrently:

- Assess the situation.
- Stop the release at source (if possible).
- If there is a fire or spillage that cannot be controlled on site, call the Fire Service.
- Contain the release if possible.
- Put out the fire if possible with extinguishers on site. Do not use water jets as these will spread the fire.
- If product is flammable, but not burning, remove any potential source of ignition.
- Keep the public away.
- Report the release to the relevant authorities and the owner.
- Re-assess the situation.
- Decide on corrective action in conjunction with the authority and the owner, and clean up the released product.
- Do not re-open the site until it is safe to do so.
- Conduct a review of the incident so that lessons may be learnt and a recurrence prevented.

### **9.3 Additional Information and Guidance**

The response plan should also include essential items of guidance and information for easy reference in an emergency.

These should include:

- Agencies/authorities (including phone numbers) to be advised.
- List of spill containment and clean-up equipment available on site, and also from other local and regional sources.
- Assessment of size and extent of the product release, for example:
  - Able to be contained and cleaned up on site by operator and/or owner.
  - Affects off-site areas but can be cleaned up by operator and/or owner.
  - Affects off-site environment and requires other agencies to assist clean up.
- Requirements for disposal of contaminated material.
- Refer to safe handling of petroleum products — See Appendix B.

## **10. APPLICATION OF THE CODE TO EXISTING INSTALLATIONS**

In addition to this supplement, the sections of the code listed below are particularly relevant to existing installations:

- Section 11 — Removal of Tanks
- Section 15 — Cathodic Protection
- Section 16 — Leak Monitoring
- Section 17 — Operation ~'
- Section 18 — Product Loss Investigation
- Section 19 — Leak Testing
- Section 20 — Site Records
- Section 21 — Change of Ownership or Use.

## **11. APPENDICES**

The appendices included in this supplement to the code provide further detail and enlarge on some sections. They must be read in conjunction with this supplement.

### **Appendix A:**

#### **STOCK RECONCILIATIONS**

Strict regular and systematic stock control is essential. Accounting for product handled is just as important as accounting for cash handled.

The main steps in accounting for stock are:

1. Measure the product quantity in each tank:
  - Before and after each delivery of product to the site, and
  - At least daily on busy sites.

Each tank should have its own dipstick, calibrated for that tank.

Always check that the dipstick matches the tank in which it is being used. If the stick is kept in the dip tube of the tank, first remove it, check the product level indication, and wipe the stick dry at and around the liquid level.

Lower the stick slowly and carefully into the dip tube. Do not plunge, it in as this may create a surge in the dip tube. Pause when the stick is within 50 mm of the bottom of the tank to allow any surge to die down, then slowly lower the stick until it just touches the bottom of the tank and withdraw it immediately.

Read the liquid level and record it in a notebook.

Wipe the stick dry at and around liquid level and repeat the measurement.

Check that it agrees with the quantity recorded. If it does not agree, repeat the dip until a consistent result (within 1 to 2 mm on the stick) is achieved. Record this quantity.

If you have difficulty reading the product level on the stick, product-finding paste may be smeared lightly on the face of the stick at and around the liquid level. This will give a clear “cut” on the stick.

2. Check how much water (if any) is in each tank.

Any water present will lie in the bottom of the tank (motor fuels all float on water, which readily separates and sinks). It can only be identified by using a water-finding paste, which changes colour when immersed in water. Smear a little water-finding paste on the bottom 100 mm or so of the stick and lower it carefully into the tank. Leave it in contact with the bottom of the tank for about 15 seconds and withdraw.

If you have a clear cut, record the quantity of water in the tank. If you find an indication of water, but no clear cut, try again. If no water is indicated, record “nil”.

Any significant amount of water should be removed from the tank.

3. Check all dispensing equipment meter readings and record.  
Then, check the readings again and make sure they agree with the recorded figures.
4. Enter the figures recorded in the appropriate spaces on the daily stock reconciliation form. Following the instructions on the form, calculate the overs (gains) or unders (losses) for the reconciliation period, taking in to account any deliveries received, product used in meter calibration and returned to the tank, any meter replacements, and any other product movement in or out of the tank that might affect the result.
5. Transfer daily overs and unders to the Reconciliation Summary and keep the reconciliation graph up to date.
6. Maintain continuous review of the loss trend shown.  
If the trend indicates that losses are consistently in excess of 0.5 percent, you must investigate further.

If you find a sudden large loss or gain, check your arithmetic. If the arithmetic is correct, check the tank dips, and the delivery dockets that record the amounts delivered. If there is still a sudden large loss recorded, it may be theft or a major failure of tank, or, more probably, pipework. Are all tank openings sealed and locked? Has there been any recent heavy traffic movement or construction work done in the vicinity of the tank or pipework?

If a tank shows a consistent gain in water, it may be getting in via the tank fittings. Check dip caps and both tank-top and remote fill points to make sure that cap washers are seating properly, and that caps are tight. However, where the water gain is large and sudden, it may have been inadvertently delivered along with a product delivery. If a water gain persists, investigate further.

Whenever there is a significant change in the normal pattern of losses and gains, the operator should advise the owner, and also the supplier, who can offer guidance.

7. Typical reconciliation forms are attached.

## Instructions for Pump Meter/Tank Dip Reconciliation

This reconciliation is to be done daily, (preferably at a similar time each day). Details are to be transferred on to a monthly reconciliation summary which shall be held on site. Wait for a quieter time on the forecourt, or the end of a shift when you may have extra personnel available.

1. Read pump meters and take tank dips
2. Enter the meter readings under the appropriate product heading and add them down the column. The total of each column becomes the **Total Closing Meters**.
3. Refer to the previous day's reconciliation and take the **Total Closing Meters** amount and enter it in today's **Total Opening Meters**.
4. Any pump testing or meter alterations should be entered in the **Meter Testing** box. Supporting dockets should also be attached.
5. Subtract **Total Opening Meters** and **Meter Testing** amounts from the **Total Closing Meters**. The balance should be entered in the **Total Meter Sales** box.

**Total Meter Sales** is the actual amount of product that has passed through the pumps.

6. Refer to the previous day's reconciliation and take the **Total All Tanks** amount and enter it in today's **Total Opening Dips**.
7. Enter any deliveries received since the last reconciliation in the **Today's Deliveries** box. Add **Total Opening Dips** and **Today's Deliveries** together and enter this figure as the **Sub Total**.
8. Enter **Total Meter Sales** figure from above and subtract from the **Sub Total**.

**Calculated Closing Dips** are the theoretical amounts that should be in the tanks.

9. Enter today's tank dip readings and the time the dips were recorded. Add them down the column and enter the figure in the **Total All Tanks** box.
10. Enter **Calculated Closing Dips** amount from above and subtract from **Total All Tanks**. Enter this amount in **Today Over/ (Under)** box. (If the figure is a negative, it is an under and should have brackets around it to indicate this).

**Today Over/ (Under)** is the difference between the amount of fuel that should be in your tanks compared with what is actually in your tanks.

11. Refer to the previous day's reconciliation and take the **Year To Date Over/ (Under)** and add/subtract it to **Today's Over/ (Under)**.

Enter this figure in the **Year To Date Over/ (Under)** box.

This is the total loss or gain year to date on your site for each product.

# PUMP METER/TANK DIP RECONCILIATION

*Must be completed between 6 and 24 hours after each delivery or when a pump or the tote is changed.  
Meter testing, pump or tote changes should be supported by fitter's documentation.*

Site: \_\_\_\_\_ Date: \_\_\_/\_\_\_/\_\_\_

Time Dips Recorded: \_\_\_\_\_

*(Important: Dips and meters should be read at the same time)*

		Super 96	Unleaded 91	Diesel
<b>METERS</b>	Pump 1			
	2			
	3			
	4			
	5			
	6			
	7			
	8			
	9			
	10			
Total Closing Meters				
less Total Opening Meters				
<i>(These will be "Total Closing Meters" from previous day's reconciliation)</i>				
less Meter Testing				
<i>(or any product returned to tanks)</i>				
= Total Meter Sales				
Total Opening Dips				
<i>(These will be "Total All Tanks" from previous day's reconciliation)</i>				
plus Today's Deliveries				
= Sub Total				
<b>CALCULATED TANK DIPS</b>	less Total Meter Sales (as above)			
	= Calculated Closing Dips			
	<i>(What should be in the tanks)</i>			
Enter Water dip test beside tank No. Note: Water dips must be taken at least weekly.	Tank 1			
	2			
	3			
	4			
	Total all Tanks			
<b>ACTUAL TANK TANK DIPS</b>	less Calculated Closing Dips			
	= Today's Over/(Under)			
	= Year to Date Over/(Under)			
	<i>Combine previous day's "Year to Date" balance</i>			

Prepared by: \_\_\_\_\_

# INSTRUCTIONS FOR RECONCILIATION SUMMARY

This form should be updated each day in conjunction with the Pump Meter/Tank Dip Reconciliation form.

1. Enter the date, **Total Meter Sales** and **Today Over/ (Under)** figures from the reconciliation sheet.
2. At the end of each seven-day period, total each column and enter this amount in the **Weekly Total** box.
3. At the end of the month, add down the column each amount in the **Weekly Total** boxes, and enter this figure in the **Monthly Total**.

Note: Remember that amounts appearing as an (under) are a negative amount, and should be subtracted.

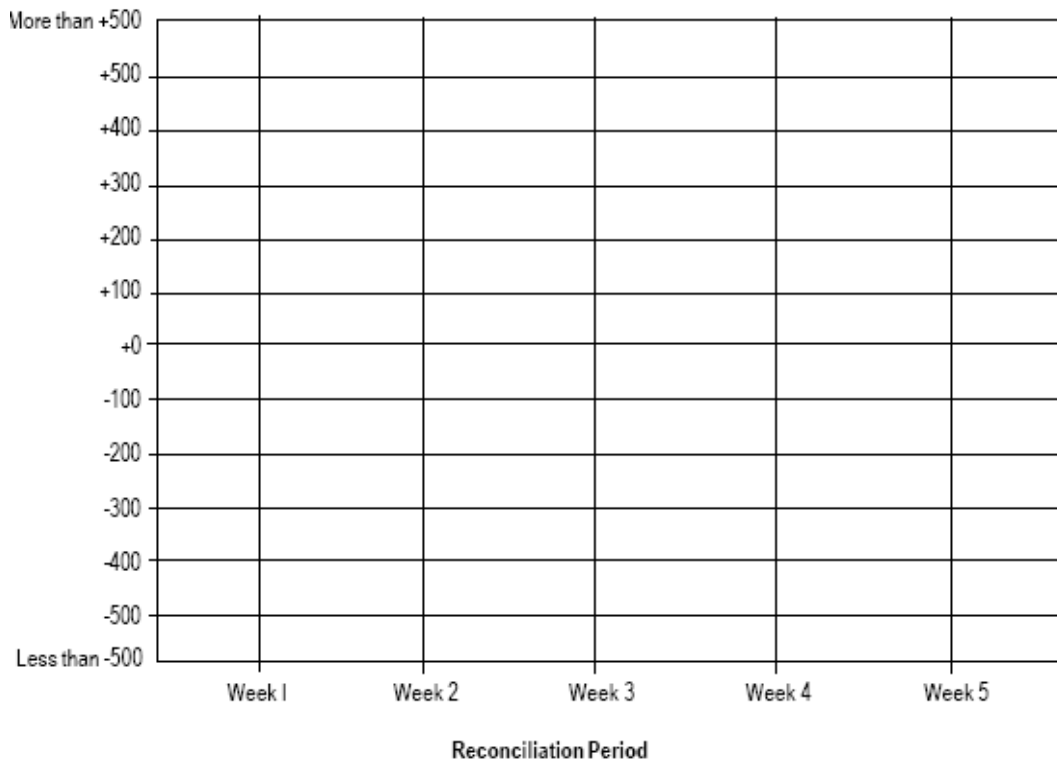
4. At the end of each week, plot the **Weekly Over/ (Under) Variance** total figure on the graph at the appropriate place.

The resulting monthly graphs will provide an easy-to-see summary of the **Overs/Unders** for the site.

## RECONCILIATION GRAPH

Product Grade  
Weekly Over/Unders

Site: \_\_\_\_\_ Month: \_\_\_\_\_





## **Appendix B**

# **SAFE HANDLING OF PETROLEUM PRODUCTS**

### **General**

All petroleum products are hazardous. They can cause EXPLOSION or FIRE.

Most petroleum products are TOXIC when not used with due care.

### **Fire and Explosion**

All petroleum products must be treated as being potentially explosive, even in small quantities.

Petrol, aviation gasoline and most solvents evaporate readily, producing an explosive mixture with air. Kerosene, aviation turbine fuel and the less volatile solvents can also produce explosive vapours, particularly in poorly ventilated areas. All products can accumulate static electricity which may trigger an explosion — kerosene type products are particularly susceptible.

Automotive diesel, fuel oils and lubricating oils can produce explosive conditions if sprayed or heated, even over small areas.

### **Precautions Against Fire and Explosion**

Keep all SOURCES OF IGNITION away from petroleum products and their vapours. Sources of ignition include:

- Matches, lighters and cigarettes, etc.
- Any flame or spark.
- Any non-flameproof electrical equipment, including switches, hand torches, electric radiators, vacuum cleaners, power tools and radios.
- Welding sets, leads, connections and hand-pieces.
- Gas welding torches.
- Motor vehicles and all internal combustion engines.
- Tools which can cause a spark if dropped, etc.
- Grinders.

Petroleum vapours are heavier than air and will readily collect in pits, drainage sumps, cellars, and any low areas. Small quantities of vapour can be quickly and safely dispersed by good and rapid ventilation.

- The presence or absence of petroleum vapours can be checked by a competent operator using an explosimeter.
- Do not enter any tank or pit that has contained or does contain petroleum products unless it has first been tested and a safety certificate issued by a competent person.
- **Do not do any hot work** (e.g. welding, gas cutting, grinding, drilling or power wire-brushing) on any tank or container that still contains any product or that has not been tested and certified gas free by a competent person.

- **Do not transfer or pour petroleum products** from one container to another, without ensuring that both containers are fully earthed and that an effective earthing connection is made between hose nozzle and receiving container before any transfer is started, and is maintained as long as the transfer continues.

### **Toxic Hazards**

Petroleum vapours can quickly asphyxiate. At lower concentrations, they irritate the eyes and lungs, and may cause nausea, headache and depression.

Petroleum products will irritate the eyes and skin and may cause dermatitis on prolonged or repeated contact.

In addition, high octane petrol and aviation gasolines contain toxic lead compounds. Internal surfaces of tanks which have contained these products will be contaminated and must be treated as highly toxic, even after all product has been removed.

### **Precautions Against Toxic Hazards**

- Avoid splashing, or any contact with the eyes or skin.
- Wear PVC gloves and boots, and cotton overalls. Wear goggles or face shield if splashing is possible.
- If clothing gets contaminated with product, remove under a running shower.
- If eye or skin contact occurs, treat as under First Aid Treatment on page 20 of this supplement.

### **Notes for Physician**

Administration of medicinal liquid paraffin may reduce absorption through the digestive tract. Gastric lavage should only be done after endotracheal intubation in view of the risk of aspiration which can cause serious chemical pneumonitis for which antibiotic and corticosteroid therapy may be indicated. Motor gasolines may contain lead compounds, however, the quantities involved are unimportant in the context of the treatment of acute gasoline poisoning.

## **EMERGENCY ACTION**

### **Case of Petroleum Spillage**

- If a spill occurs, extinguish all naked flames.
- Shut down any other potential sources of ignition.
- Ensure area is well ventilated.

**Small Spill:** Absorb spills in enclosed areas. Absorb outside spills using sand, earth, or a proprietary absorbent.

**Large Spill:** Contain and pump into storage.

### **Petroleum Fire**

- Use dry powder, foam, B.C.F., or Carbon Dioxide extinguishers.
- Do not use water jets — these will spread the fire.

### **First Aid Treatment**

#### ***Petroleum Products Swallowed***

- DO NOT INDUCE VOMITING! The main hazard following accidental ingestion is aspiration of the liquid into the lungs, and children are more susceptible than adults.
- Give 300mls (1/2 pint) of milk to drink; if not available, give water.
- SEND TO THE HOSPITAL IMMEDIATELY.

***Eye Contact***

- Wash with copious amounts of water for at least 10 minutes.

***Skin Contact***

- Drench the skin immediately with cold water.
- Remove contaminated clothing under a running shower and wash all contaminated skin with soap and water.

***Inhalation***

- Move victim to fresh air.
- Keep the patient warm and at rest.
- If unconscious, place in the recovery position.
- If patient is not breathing, give artificial respiration.
- Give cardiac massage if necessary.
- SEND TO THE HOSPITAL.

***Medical Treatment***

See Notes for Physician on page 19.

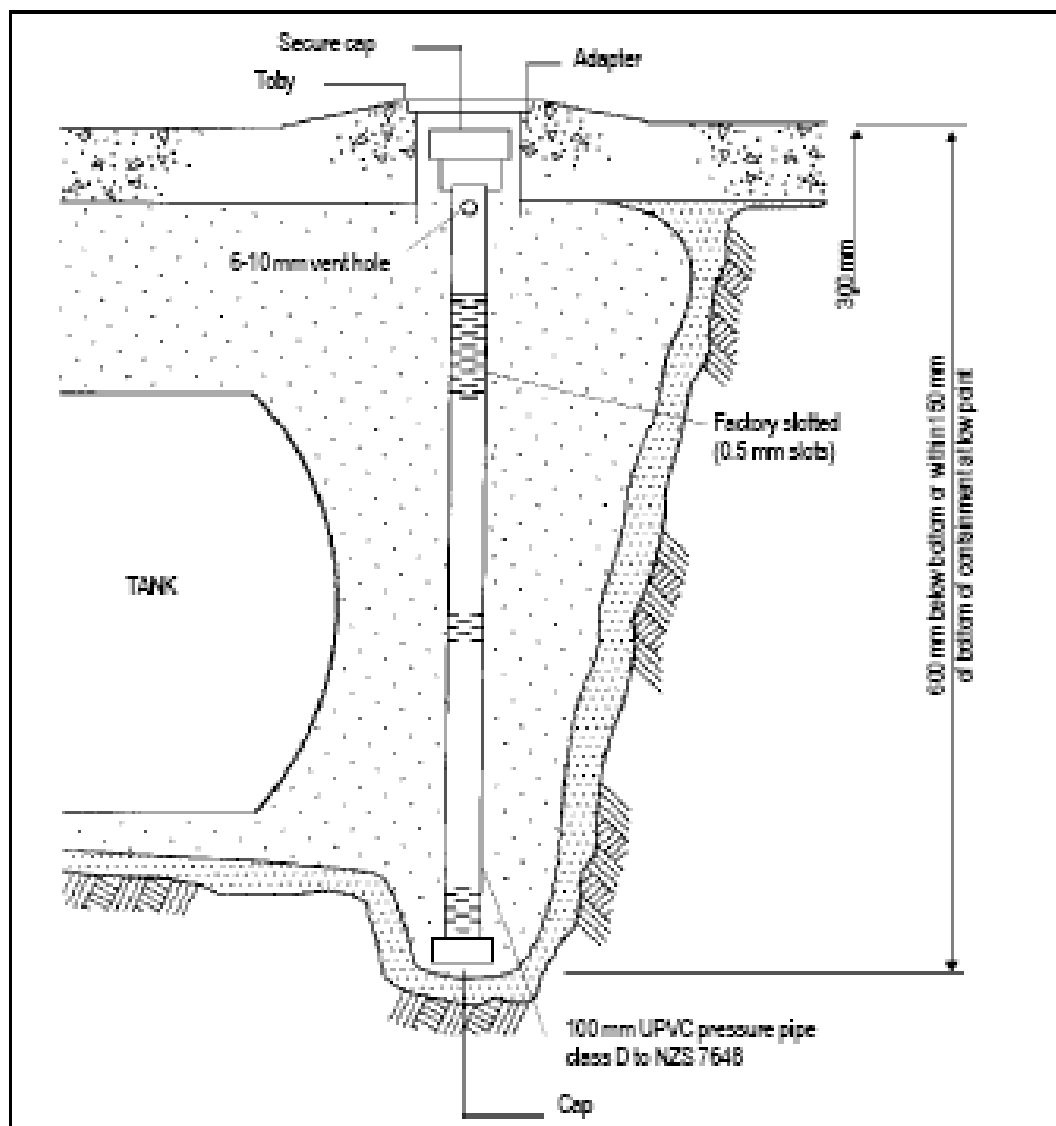
## Appendix C

### OBSERVATION WELL

Observation wells can be used close to a tank or group of tanks as a means of detecting leakage where a separate secondary containment system is used, or where the ground is sufficiently impervious to hold back any product that has escaped.

The observation well is a slotted pipe sunk into the ground surrounded by sand or pea gravel, and fitted inside a toby box so that it is accessible for inspection and sampling if necessary.

Typical details are shown below.



Check observation wells for liquid products using a weighted bailer or a thief pump.

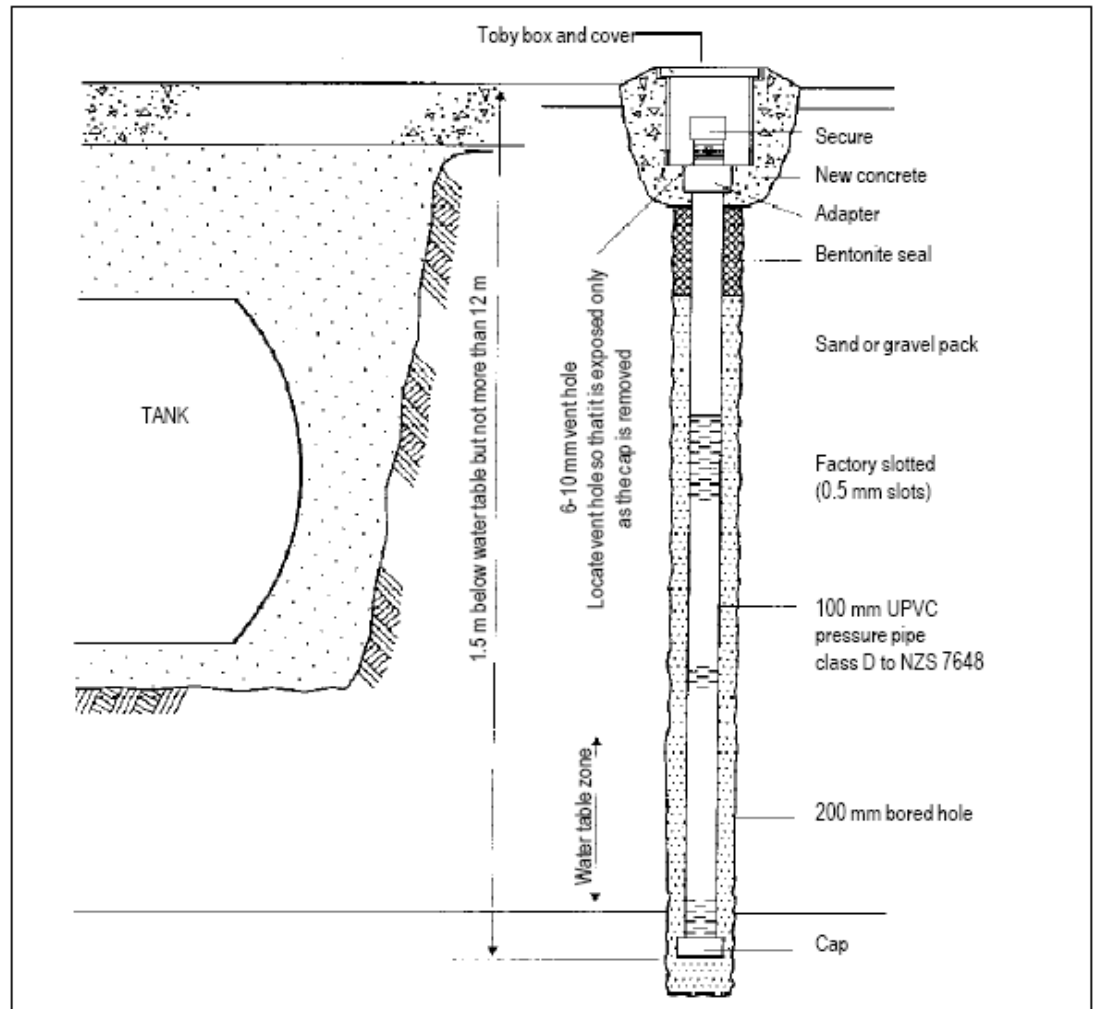
A vapour tester is needed to check for petroleum vapour.

## Appendix D

### MONITORING WELL

Monitoring wells are used to monitor the surface of the ground water in the general area of an underground tank or group of tanks for any sign of petroleum products on sites where the soil is permeable and there is no secondary containment.

Typical details are shown below.



Check monitoring wells for liquid products using a weighted bailer or a thief pump.

A vapour tester is needed to check for petroleum vapour.

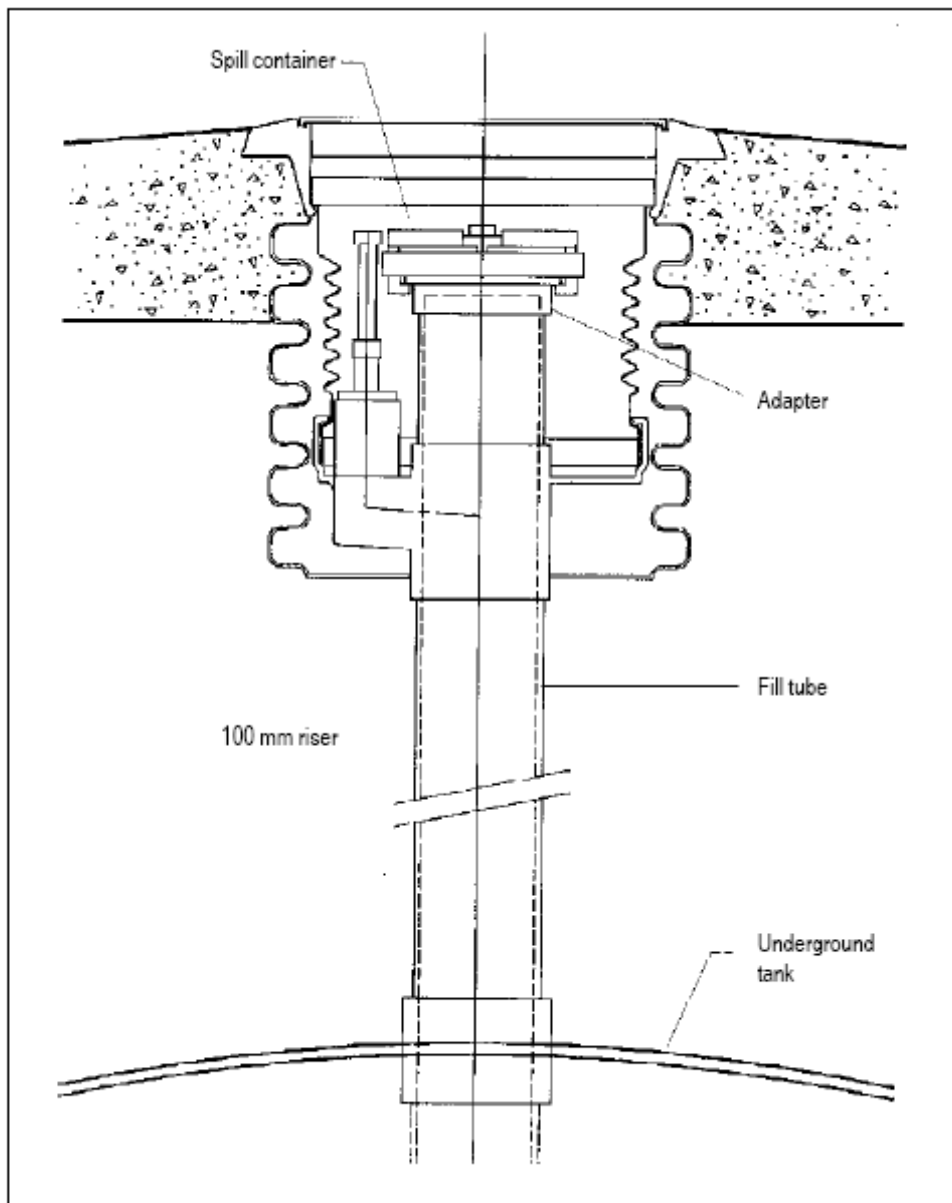
## Appendix E

### SPILL CONTAINER

The spill container is a device that may be fitted at the fill point connected to an underground tank.

It is designed to catch any product that may spill from the hose during delivery or uncoupling. It also provides for the retained product, if uncontaminated, to be dumped into the tank. If the product has become contaminated, it can be pumped or bailed out into an earthed container for appropriate disposal off-site.

Typical details are shown below.



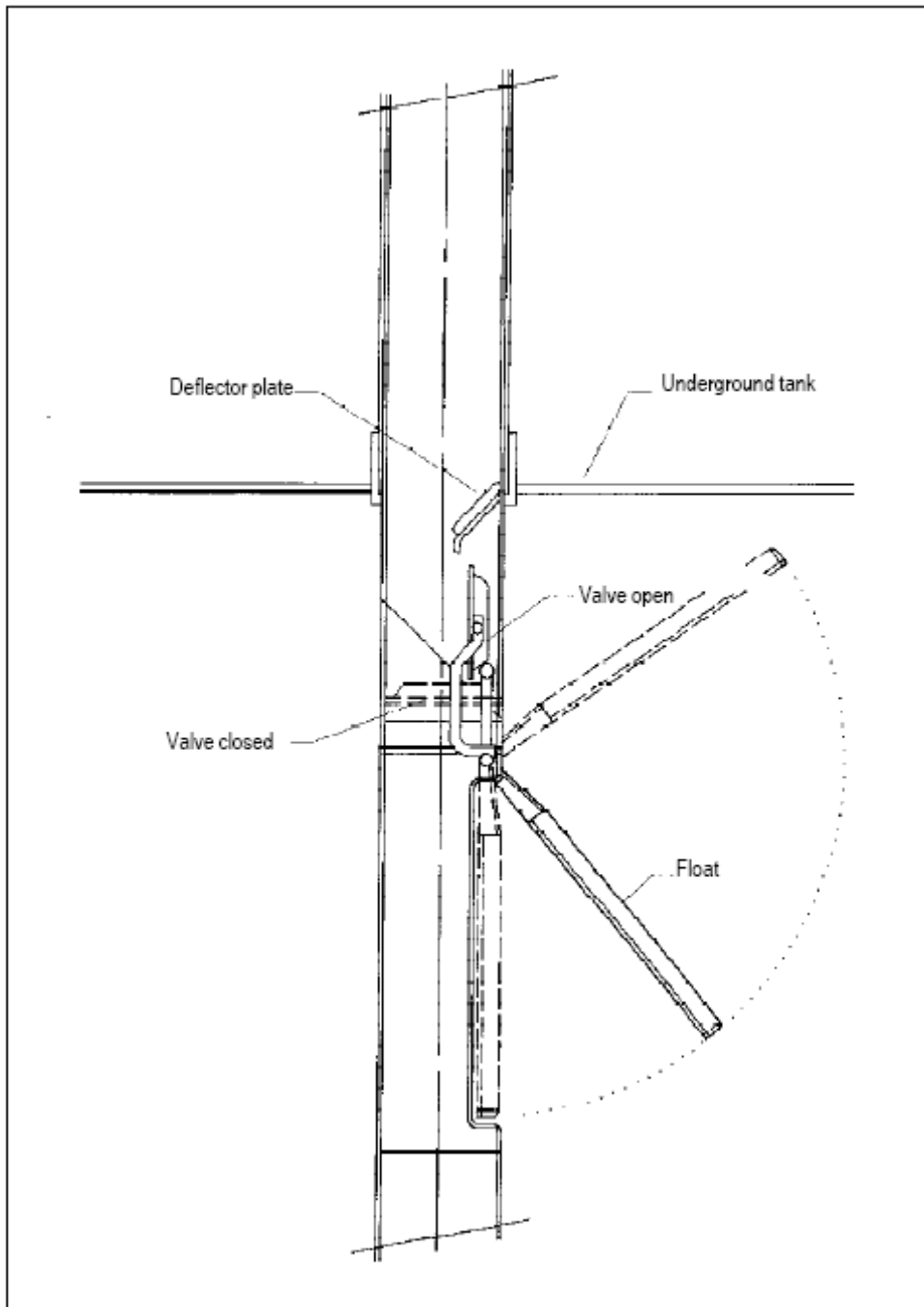
## Appendix F

### OVERFILL DEVICE

The overflow protection device is designed to reduce the flow rate during delivery of product into a tank to a trickle as soon as the product surface in the tank reaches a predetermined high level.

This is achieved by using a pivoted float to trip the closing of a check valve. The device resets itself as product level in the tank falls again.

Typical details are shown below.



## Appendix G

### SOIL CORROSIVITY

Soil corrosivity can only be assessed by considering all the soil qualities that contribute to the rate of corrosion of buried metal structures. These factors include:

- Resistivity — low resistivity favours corrosion while high resistivity (over say 15,000 ohm/cm) reduces the likely rate of corrosion;
- pH;
- Composition of dissolved salts;
- Moisture content and fluctuation of groundwater level;
- Presence of sulphate reducing bacteria;
- Degree of aeration;
- Presence of abnormal constituents in soil such as:
  - Mineral ores,
  - Ash cinders or other corrosion-inducing substances,
  - Sewage effluents;
- Stray electrical currents — direct or alternating;
- Temperature and temperature fluctuations;
- Thermal activity.

Soil corrosivity should only be assessed by a corrosion expert.

## **ATTACHMENT 2: INTER-TANK SEPARATION DISTANCES RECOGNISED IN THE DANGEROUS GOODS (CLASS 3 – FLAMMABLE LIQUIDS) REGULATIONS 1985 REGULATION 64**

### **64 Distances between above-ground stationary tanks**

(1) The minimum clear distance to be maintained between any 2 above-ground stationary tanks shall be the greatest distance specified in the table set out in subclause (2) of this regulation, as qualified by subclause (3) of this regulation, having regard to the capacities of the stationary tanks and the class or classes of dangerous goods stored in the stationary tanks:

Provided that the Chief Inspector may require a greater separation distance between any stationary tank where, in his opinion, this is necessary by virtue of any extraordinary hazard arising from the characteristics of the particular dangerous goods stored therein.

(2) The table referred to in subclause (1) of this regulation is as follows:

Capacity of Tank	Minimum Distance between Tanks	
	Classes 3(a) and 3(b)	Class 3(c)
Litres	Metres	Metres
Up to 5 000	1	0.5
" " 25 000	1	1
" " 50 000	1	1
" " 100 000	1.5	1
" " 250 000	3	2
" " 500 000	5	3
" " 1 000 000	8	5
" " 2 000 000	11	8
" " 4 000 000	13	9
" " 10 000 000	14	10
" " 40 000 000 and over	20	14

(3) For a stationary tank of any capacity intermediate between 2 successive capacities specified in the table, the required distance shall be that which is proportional to the difference in capacity.

## **ATTACHMENT 3: REGULATION 17A OF THE TOXIC SUBSTANCES REGULATIONS 1983**

### **17A Fixed bulk containers**

(1) For the purposes of this regulation, the term **fixed bulk container** means a bulk container (including its base and supports, and any valves, piping, or other fittings) affixed permanently or semi-permanently in a position above the ground, otherwise than on a vehicle.

(2) No person shall use a fixed bulk container for the storage of a substance classified as a toxic substance or a corrosive in the Transport Recommendations unless the container complies with the following requirements:

(a) It shall be substantially constructed to a specification approved by the Director:

(b) It shall be constructed or lined with material that is resistant to corrosion or embrittlement by the toxic substance or corrosive:

(c) It shall be fitted with a vent adequate to prevent increases or decreases of pressure:

(d) It shall be mounted firmly on substantial supports capable of withstanding appropriate earthquake loadings when the container is full:

(e) It shall be labelled with—

(i) The appropriate label specified in Part 1, or Part 2, or Part 3 of Schedule 6 to these regulations, which label shall conform to the specifications set out in New Zealand Standard 5417 (Transportation Labels for Hazardous Substances); and

(ii) The name or description of the toxic substance or corrosive in easily legible letters; and

(iii) The United Nations number:

(f) It shall be situated in a position that—

(i) Permits ready visual inspections of the outer surface of the container, other than the bottom of a self-supporting container resting on its base; and

(ii) Is protected from impact by vehicles or swinging loads:

(g) It shall be erected on ground or flooring that is impervious to the toxic substance or corrosive in such a way that, if leakage occurs, the entire contents of

the container will be safely contained, either by a suitable bund wall enclosure or by dedicated drainage to a collection and holding point:

(h) It shall be fitted with a suitable overflow system discharging either to the area within the bund wall or to the collection and holding point, and constructed so as to prevent any overflow from running over the outer surface of the container or its supports:

(i) It shall have a facility to indicate the product level and be of such a design that the contents of the stationary tank will not leak if the level indicator is damaged.

(3) Notwithstanding subclause (2)(g) of this regulation, where two or more fixed bulk containers are connected to one another in such a way that a leakage from one will lead to the emptying of each of the others, no person shall use those containers for the storage of a substance classified as a toxic substance or a corrosive in the Transport Recommendations unless, in the event of such a leakage, their entire contents will be safely contained either by a suitable bund wall enclosure, or by dedicated drainage to a collection and holding point.

(4) Every person in charge of a fixed bulk container referred to in subclause (2) of this regulation shall maintain it in a state of good repair.

(5) The Medical Officer of Health may, by notice in writing, exempt any person from any of the requirements of subclause (2) of this regulation, either generally or subject to such conditions as the Medical Officer of Health may specify in the notice.