Office of Environment & Heritage

Draft standards and best practice guidelines for vapour recovery at petrol service stations

Draft for consultation only

These draft guidelines have been made available for the purposes of consultation and feedback. You are invited to consider the proposed changes and provide written feedback by close of business on Friday 15 June 2012. Email feedback to vapour.recovery@environment.nsw.gov.au

For technical inquiries, email OEH's Air Policy Section – vapour.recovery@environment.nsw.gov.au.

Note that the regulation which is the subject of this report will be administered by the Environment Protection Authority (EPA).

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1. Introduction

1.1 Purpose of this document

The standards and best practice guidelines have three functions:

1. To specify further relevant standards for vapour recovery at petrol service stations as required by the provisions in Division 5 of Part 6 of the Protection of the Environment Operations (Clean Air) Regulation 2002 (the Regulation). Because these standards are required by the Regulation, they are mandatory, and are set out in section 5 of this document.
2. To provide best practice guidelines for maximising vapour recovery.
3. To provide a convenient summary of all regulatory requirements and best practice guidelines in one document, to help those responsible for the operational management of petrol service stations comply with the Regulation.

This document provides a draft version of the revised standards and best practice guidelines for consultation purposes only. Once submissions have been received and considered, revised guidelines will be drafted. Until this time, the current guidelines should be used for regulatory purposes.

Section 5 of this document sets out mandatory requirements, whereas the rest of this document sets out non-mandatory guidelines. Those responsible for the operational management of petrol service stations should be aware of their obligations under the Regulation and the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008. Compliance with this document will not necessarily ensure compliance with either the vapour recovery provisions of the Regulation or the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008.

1.2 Background

The refilling of underground petrol storage tanks and the filling of vehicle fuel tanks lead to the displacement of petrol vapour equal in volume to that of the fuel being transferred. This vapour is released into the atmosphere unless otherwise captured. It contains benzene, xylene, toluene and other volatile organic compounds (VOCs) which contribute to local, regional and global air pollution.

In late 2009, the Protection of the Environment Operations (Clean Air) Amendment (Vapour Recovery) Regulation 2009 made substantial changes to Section 5 of the Regulation.

The Regulation, as amended in 2009, now prescribes specific controls to minimise the emission of VOCs from petrol service stations.

1.3 Structure of this document

This document is structured as follows:

- sections 1 and 2 cover interpretation and definitions
- section 3 introduces the general principles of vapour recovery at petrol service stations
- section 4 gives an overview of the regulatory requirements for vapour recovery at petrol service stations
- section 5 sets out the mandatory requirements required by the Regulation
- section 6 sets out best practice guidelines for the design and operation of vapour recovery systems.

2. Interpretation and definitions

Where the Regulation and this document differ on any point, the Regulation prevails. Terms used in this document have the same meaning as set out in the Regulation, unless otherwise stated.

3. General principles of vapour recovery at petrol service stations

This section presents a general overview of the principles of vapour recovery at petrol service stations.

3.1 Stage 1 vapour recovery

Stage 1 vapour recovery (VR1) at petrol service stations limits the emissions of volatile organic compounds (VOCs) that result from unloading petrol from a road tanker into petrol service station storage tanks.

When petrol is transferred from a delivery tanker to an underground storage tank, a slight pressure build-up occurs in the underground storage tank, which displaces vapour. VR1 systems return displaced vapour back to the delivery tanker by means of a vapour-tight connection line. A simple VR1 system is shown in Figure 1.

To minimise vapour loss from the underground storage tank through the vent during filling, the vent pipes are fitted with a 10-millimetre orifice. A pressure vacuum relief valve (PV valve) is fitted in parallel, to prevent hazardous pressures or vacuums building up. The PV valve should remain closed except under adverse conditions.

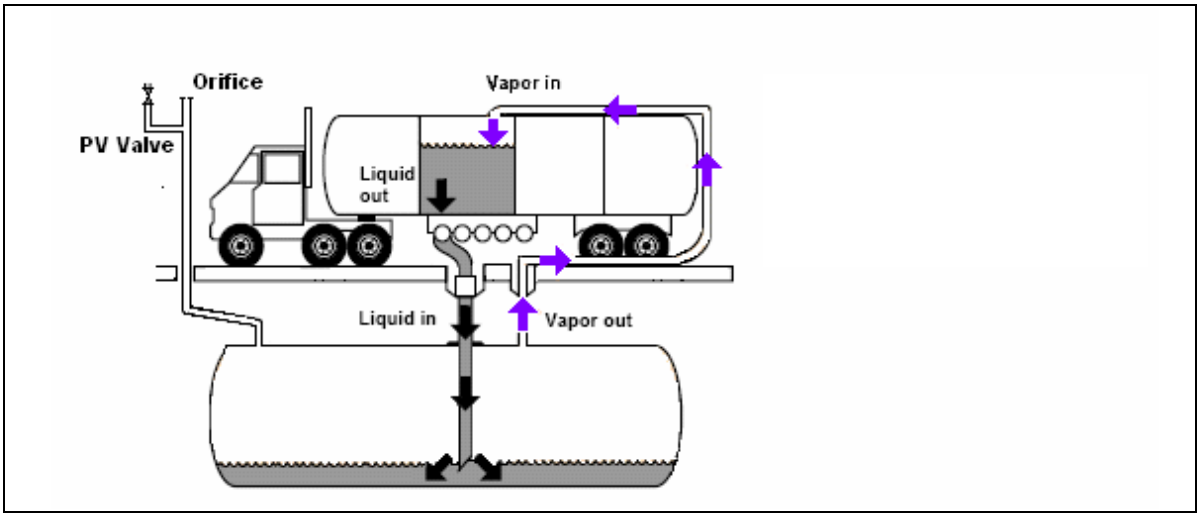

Figure 1: Stage 1 vapour recovery

3.2 Stage 2 vapour recovery

When vehicles are refuelled at petrol service stations, the vapour in the vehicle fuel tanks is displaced by the fuel. Stage 2 vapour recovery (VR2) equipment is designed to capture the displaced vapour and return it to the underground fuel storage tank or other appropriate vessel.

Usually, the fuel dispenser hose contains both fuel and vapour return lines. The vapour is drawn through the vapour return line by a vacuum pump. VR2 systems are intended to limit the emissions of fuel vapour when vehicles refuel by recovering at least 85% of the displaced vapour. Figure 2 shows the principles of operation of VR2.

Vapour recovery equipment needs to be properly maintained so it is vapour-tight and operates as specified by the manufacturer. VR2 systems need to be tested regularly. System testing includes monitoring the effectiveness of vapour recovery at the dispenser and the vapour containment in the underground storage tank, pipe work and fittings.

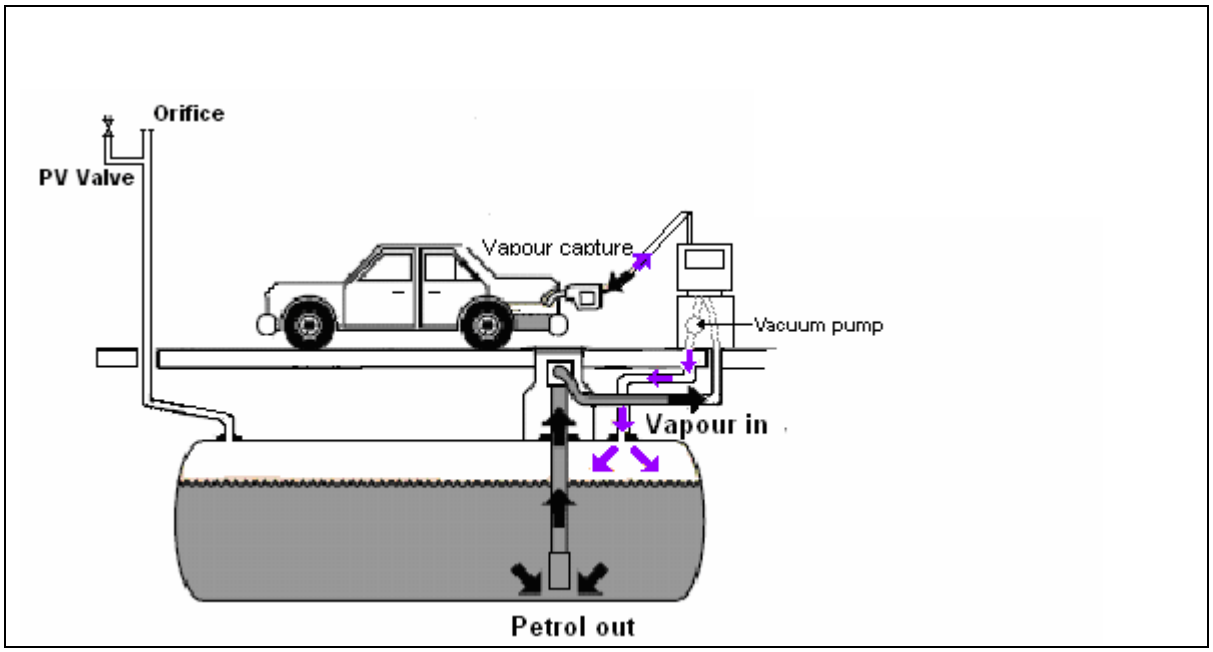

Figure 2: Stage 2 vapour recovery

4. Overview of the Regulation

This section summarises the vapour recovery provisions of the Regulation as amended by the Regulation in 2009. This is a summary only, so refer to the Regulation to assess individual legal obligations.

The Regulation provides for various prescribed control equipment and techniques to reduce the emission of petrol vapour at petrol service stations from:

- the unloading of petrol from road tankers into underground storage tanks
- the storage of petrol
- the dispensing of petrol into vehicle petrol tanks.

The requirement to fit vapour recovery equipment depends on the quantity of petrol dispensed per annum (petrol throughput). If a service station's petrol throughput decreases, the vapour recovery systems must still continue to operate.

4.1 VR1 requirements

Some Stage 1 vapour recovery controls have been progressively introduced from 1986 in Sydney (the inner red shaded region in Figure 3 on the next page). Since the 2009 amendments to the Regulation, existing and new or newly modified petrol service stations in the Sydney, Central Coast, Illawarra and Lower Hunter regions (blue and brown regions in Figure 3) are required to progressively introduce more stringent VR1 controls, based on petrol throughput and the local government area in which they are situated. The prescribed equipment is designed to achieve a capture efficiency of 97% of petrol vapour. Appendix 3 contains a comprehensive listing of prescribed control equipment for VR1.

In the expanded VR1 area:

- from 1 July 2010, new and modified petrol service stations that dispense more than 0.5 million litres of petrol per year are required to fit and operate the VR1 prescribed control equipment
- from 1 January 2014, all petrol service stations that dispense more than 0.5 million litres of petrol per year must fit and operate VR1 prescribed control equipment.

Petrol service stations that were required to have vapour recovery equipment in compliance with clause 65 of the Regulation, before the amendments in 2009, must continue to comply with the obligations under clause 65 until they commission and fit the new VR1 control equipment prescribed under clause 69.

Stage 1 vapour recovery systems must return displaced vapour to the delivery tanker via a vapour return line or to a vapour processing unit. The Regulation requires each underground storage tank to have:

- **vapour return lines or a transfer system** that return all vapour displaced from the storage tank to the delivery tanker or vapour processor
- **vapour tight couplings on the vapour line** that close automatically when disconnected
- **liquid tight couplings** on the liquid transfer hoses
- **incompatible liquid and vapour couplings**
- **spill containment** enclosures for the storage tank fill connection point
- **secure seals** on tank filling pipes and vapour return pipes that minimise vapour leaks when the pipes are not in use

- **submerged fill pipes,** so they terminate below the suction inlet used for pumping petrol out of the storage tank
- **overfill protection devices** (float vent valves) fitted to shut off the petrol flow at the level advised by the tank manufacturer
- for new petrol service stations, **overfill prevention devices** (mechanical, electrical or electronic) that decrease delivery of petrol into the storage tank as the level in the storage tank approaches the design fill level – the devices should be positioned to stop the petrol flow before the float vent valve operates
- **secure seals** on any dip hatch openings
- a **pressure vacuum valve and a 10-millimetre orifice** in parallel fitted to the storage tank vent pipe. Similar devices are permitted, but will only be accepted by the Environment Protection Authority (EPA), the agency that is administering these provisions, where they are shown by an independent certifier to perform the same duty.

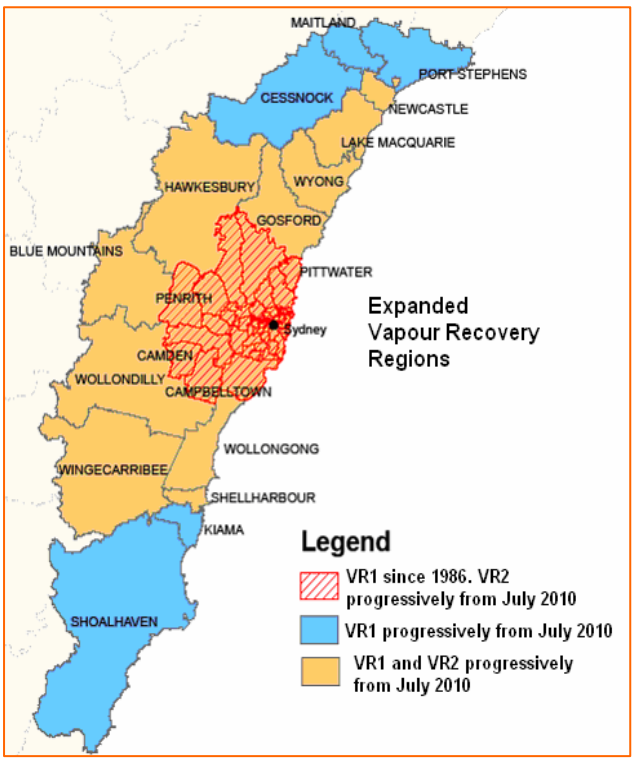

Figure 3: Regions in which vapour recovery is required

A vapour processing unit may also be fitted but must be certified as meeting the hydrocarbon capture efficiency criteria specified in section 5 of this document.

The Regulation also requires that the covers on all access points to storage tanks must be kept closed whenever they are not in use.

Petrol vapour return lines should not be connected to diesel or other non-petrol storage tanks. If vapour recovery systems are connected to an E85 installation – the term 'E85' means a blend of ethanol and petroleum with the ethanol comprising around 85% – or ethanol rich fuel where the ethanol component is greater than 50%, the safety risks should be considered as advised in section 6.3 of this document. Until the risks have been further studied, ethanol rich fuel tanks should not be connected to VR2 systems.

Before VR1 prescribed control equipment is fitted, the tank must be tested for liquid leaks. After installation, the VR1 system must be tested for vapour leaks (vapour containment testing):

- every three years
- whenever components required to ensure vapour containment integrity are opened for repairs or modifications.

See section 5 of this document for details.

VR1 systems need to be regularly inspected to avoid vapour return pipes, fittings or vents becoming blocked. The orifice and pressure vacuum valve must be inspected every year.

Use of **automatic pressure monitoring is highly recommended** as in this instance the yearly inspection of the orifice and pressure vacuum valve and the three-yearly test for vapour containment are not required.

4.2 VR2 requirements

Stage 2 vapour recovery (VR2) controls will be required progressively from July 2010 for petrol service stations in the Sydney, Newcastle, Wollongong and Central Coast metropolitan areas. These areas are known as VR2 areas (the brown areas in Figure 3). Controls must recover at least 85% of the displaced vapour when vehicles refuel.

In the VR2 areas:

- from 1 July 2010, new and newly modified petrol service stations supplying more than 0.5 million litres of petrol per year are required to have VR2 controls fitted and operating
- from 1 January 2014, the remaining petrol service stations supplying more than 12 million litres of petrol per year must have VR2 controls fitted and operating
- from 1 January 2017, the remaining petrol service stations supplying more than 3.5 million litres of petrol per year in the Sydney Metropolitan Area – B (as defined in the Regulation) must have VR2 controls fitted and operating.

The VR2 prescribed control equipment is required to capture 85% or more of displaced vapour. Generally, displaced vapour is captured by ensuring that the fuel dispensing nozzle and hose incorporate a vapour return line connected to a vacuum. The volume of air recovered can then be controlled either by using a proportional valve or a variable speed vacuum pump. The vapour rich air can then be returned to the petrol storage tank. Section 6.2 provides more details on typical VR2 systems. Appendix 3 contains a comprehensive listing of prescribed control equipment for VR2.

Petrol service stations with an annual throughput of more than 7 million litres must install an automatic monitoring system to monitor vapour system recovery performance. The automatic monitoring system must monitor for recovery performance faults and also look for faults in its own function. It must post warnings when faults are detected and shut down the dispenser(s) if the fault is not fixed after 7 days.

Petrol service stations with less than 7 million litres throughput may use manual or automatic monitoring. Those with throughputs of less than 3.5 million litres are not required to install VR2 prescribed control equipment unless they are newly installed or modified, and can then monitor the system using manual or automatic monitoring.

The VR2 system must be tested for vapour system recovery performance:

- before commissioning
- whenever components required to ensure the integrity of the system are removed and replaced, for example, during maintenance.

Since VR2 upgrades are likely to occur in conjunction with VR1 upgrades, the VR1 tests are then also required as part of the process. Sections 5.3 and 5.4 of this document set out the testing requirements in detail.

Periodic testing requirements depend on the way in which vapour system recovery performance is monitored. Systems that are automatically monitored for vapour system recovery performance need only have the ratio of volume of petrol vapour recovered measured against the volume of liquid petrol dispensed, calculated over the duration of the filling operation (V/L ratio) tested every three years. .

Where manual monitoring is used, weekly system checks are required and vapour system recovery performance must be tested every six months.

Note: Automatic monitoring systems for vapour system recovery performance must detect the following faults, as specified in the Regulation:

- a fault exists when the V/L ratios are less than or equal to 85% or more than 115% for at least 10 consecutive filling operations, where the V/L ratio is averaged over at least 20 seconds during which the minimum rate of petrol dispensed is at least 25 litres per minute
- a fault exists in the automatic monitoring system if a fault in the V/L ratio would not be detected.

Records of the date and type of fault of the last one hundred faults and the last one year's operational data must be retained in the monitoring system and must be easily accessible to operators or inspectors.

4.3 Record keeping and reporting

Record keeping

A log book must be kept that stores any relevant information relating to prescribed control equipment. Examples of relevant information are:

- equipment certificates
- test results
- details of repairs and maintenance
- descriptions of incidents involving faults in or malfunctions of the vapour recovery system.

If manual monitoring is used, the weekly results must also be recorded.

The Regulation requires the following items to be stored in the log book:

- the name, address and contact details of the person with overall responsibility for the petrol service station vapour recovery system
- a description of the installed prescribed control equipment, including types, serial numbers (if any) and the manufacturer's or supplier's equipment certificates
- the name and address of the person with overall responsibility for installing and commissioning the vapour recovery system
- a description of the testing of the operation of the prescribed control equipment including the type of test, all test results and the name and address of the person with overall responsibility for carrying out the test
- details of repairs and maintenance, including the name and address of the repairer

- a description of any incidents involving faults with or malfunction of the vapour recovery system, and the measures taken to investigate and respond to the fault
- the date of the last report to the EPA.

If manual monitoring is used, the log book must also record the weekly check results.

Details of anything done before the amendments to the Regulation commenced do not need to be recorded.

Records need to be kept for three years by the responsible person, even if the petrol service station is decommissioned.

If the petrol service station has a log book for the purposes of other legislative obligations, that same log book should be used for vapour recovery records as well. If the records are kept off-site, an on-site record of the location of the log book and the name(s) and contact details of the person(s) responsible are required.

Reporting

Reporting is required within one month of commissioning new or modified vapour recovery systems on the form provided in Appendix 1.

Annual reporting, within one month of the end of the financial year (by 31 July), is then required **only if there have been significant failures** of the vapour recovery system in the preceding twelve months.

'Significant failures' specified in the Regulation (clause 75) are:

- failure of the vapour containment system that requires opening the forecourt for repairs
- any results of tests of the vapour system recovery performance of a manually monitored petrol dispenser and prescribed control equipment that show vapour system recovery has fallen below 85%
- repeated warnings generated by automatic monitoring systems – more than two warnings is considered a significant failure.

The information submitted to the EPA will be used to:

- assess the cost and effectiveness of the vapour recovery requirements
- assist in determining levels of compliance
- inform any adjustments to improve operability or limit costs of vapour recovery.

Signage

Each petrol dispenser that is fitted with VR2 control equipment must display a sign stating VR2 equipment is present. If every petrol dispenser is fitted, a sign indicating that vapour recovery equipment is in use must also be attached to the petrol service station premises.

4.4 Enforcement

Note that the EPA may use the following procedures to investigate compliance:

- random inspections of petrol service stations
- random inspections of log books
- inspection and audit of petrol service stations based on the profiling of EPA records and other sources of information and data.

5. Requirements for the purposes of obligations under the Regulation

The Regulation contains a series of references to **mandatory requirements**. Table 1 sets out the clause in the Regulation containing each mandatory requirement with the section in this document where this clause is referred to. In the appropriate section, the Regulation clause number is quoted and prefaced by the words 'for the purposes of'.

This section should be read in conjunction with the Regulation. In the event of any inconsistency between the two, the Regulation will always prevail. Note that the instructions set out here are **mandatory** and **enforceable.**

Table 1: Regulation clauses and the sections in which they appear

Clause in Regulation	Section in this document	Clause in Regulation	Section in this document
Equipment for Stage 1 vapour recovery		**Equipment for Stage 2 vapour recovery**	
69(1)(d)(ii)	5.1.1	72(a)	5.2.1
69(1)(k)	5.1.2	**Testing Stage 2 vapour recovery systems**	
69(1)(k)(i)	5.1.3	72(c)	5.4.1
69(1)(l)	5.1.4	73(1)	5.4.2
Testing Stage 1 vapour recovery systems		73(1)	5.4.4
69(2)	5.3.1	73(1)	5.4.9
69(3)	5.3.2	73(2)	5.4.3
71(1)	5.3.3	73(2)	5.4.5
71(2)	5.3.4	73(2)	5.4.10
Reporting		**Monitoring Stage 2 vapour recovery**	
75(1)	5.5.1	74(1)(f)	5.2.2
75(2)	5.5.2	74(2)(a)	5.4.6
75(3)(c)	5.5.3	74(4)(a)	5.4.7
		74(5)(b)	5.4.8

5.1 Stage 1 vapour recovery prescribed control equipment

5.1.1 For the purposes of subclause 69(1)(d)(ii), if the overfill prevention device is electrically powered or contains electronic components, it must be constructed and installed in accordance with relevant safety and electrical standards.

5.1.2 For the purposes of subclause 69(1)(k):

- where a device similar to a 10-millimetre orifice is used in the vent line, it must have certification from a testing authority accepted by the EPA that it retains 97% of vapour in the proposed system
- where a device similar to a pressure vacuum valve is used, it must have settings that can:
  - provide emergency relief of excessive pressure or vacuum
  - vent sufficient volume flow rate to prevent exceedences of maximum tank design pressure or vacuum under adverse conditions

– provide a seal against leakage when the device is in the closed position with the same performance as that in the CARB TP201.1E leak test.

The device must be certified by a testing authority accepted by the EPA.

Note that subclause 69(1)(k) also requires that the device:

- is of a size and type, and possesses the safety features, that a duly qualified person has advised is suitable
- is installed in accordance with the advice of a duly qualified person.

Note: A 'duly qualified person' means a person who has such competence and experience in relation to the activity as is recognised in the relevant industry as appropriate to carry out that activity.

5.1.3 For the purposes of subclause 69(1)(k)(i), the pressure vacuum valve (or similar device) settings criteria are:

- the device must be sized and weighted to allow an emergency release of vapours at not more than 80% of maximum tank design pressure
- the device must be of a type that:
  - has been certified by the German TÜV, the United States Underwriters Laboratories, the California Environmental Protection Agency Air Resources Board or body of equivalent standing as conforming with any applicable standards published by Standards Australia, European Standards or United States Underwriters Laboratories (UL)
  - meets the pressure specifications and total leak rates set out in sections 3.5.1 and 3.5.2 of the California Environmental Protection Agency Air Resources Board Vapour Recovery Certification Procedure CP201 of May 25 2006
- in the case of a device installed at a new petrol service station, the device must be set to be closed when the pressure in the storage tank is between 1 kilopascal above, and 2 kilopascals below, ambient pressure.

5.1.4 For the purposes of subclause 69(1)(l), the vapour processing unit must, before commissioning, be certified by the manufacturer or supplier as having a hydrocarbon capture efficiency of at least 97% and being a vapour processing unit certified by:

- the German TÜV, in accordance with the provisions of the Ordinance on the Limitation of Hydrocarbon Emission Resulting from the Fuelling of Motor Vehicles – 21, BImSch V, section 3(6) [2002] (see Appendix 2), or
- the California Air Resources Board (CARB) as meeting the criteria established in Certification Procedure CP-201 and conforming to Vapor Recovery Test Procedure TP-201.2 (see Appendix 2).

5.2 Stage 2 vapour recovery prescribed control equipment

5.2.1 For the purposes of subclause 72(a), before commissioning**,** the vapour recovery system must be certified by the manufacturer or the supplier as being of the following type and hydrocarbon capture efficiency:

- type – a stage 2 vapour recovery system approved by the German TÜV with a visual indicator that the vacuum operates when fuel is dispensed. The approval must be in accordance with the provisions of Ordinance on the Limitation of Hydrocarbon Emission Resulting from the Fuelling of Motor Vehicles – 21, BImSchV (section 3, paragraph 6) [2002] (see Appendix 2)

- hydrocarbon capture efficiency – a hydrocarbon capture efficiency of not less than 85% vapour recovery to liquid dispensed by volume as measured using a test for active vapour recovery systems in Verein Deutscher Ingenieure (VDI) specification 4205 (see Appendix 2).

The certification obtained must certify that the VR2 system achieves at least 85% vapour recovery and must specify the test used.

5.2.2 **For the purposes of subclause 74(1)(f)**, the automatic monitoring system for vapour system recovery performance must be certified in the following manner:

- certification by the German TÜV in accordance with the provisions of Ordinance on the Limitation of Hydrocarbon Emission Resulting from the Fuelling of Motor Vehicles – 21, BImSch V (section 3, clause 5) [2002] with the exception that there must be seven days until the automatic system shuts off the flow. The test procedure for demonstrating the correct function of the automatic monitoring system is an automatic monitoring test in VDI specification 4205 (see Appendix 2).
- certification by an alternative testing authority which must be accepted, in writing, by the EPA. Before EPA can grant certification, the equipment manufacturer must supply sufficient evidence to demonstrate that the authority has similar competence and accreditations as the TÜV.

5.3 Stage 1 vapour recovery testing

Definitions used in testing requirements

A '**new**' storage tank is one that has not previously been used to store fuel and has been newly installed and connected to vapour recovery equipment following the introduction of this regulatory amendment.

An '**existing**' or '**modified**' underground storage tank is a storage tank that was used to store petrol in a petrol service station before the introduction of this regulatory amendment and is subsequently modified to include a vapour recovery system.

Before installing new Stage 1 vapour recovery equipment

5.3.1 **For the purposes of clause 69(2),** before any control equipment is fitted to an underground storage tank it must be tested in the following manner:

- it must be certified as being leak free in accordance with the provisions for equipment integrity testing specified in AS-4897: 2008, section 8.5 or a test procedure that is certified as being capable of detecting any leak in the liquid space of the underground petroleum storage system as defined in the NSW Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008, clause 14(1). If the tank has been certified to be leak free in the last three years, that leak free certification is deemed to satisfy this provision.

Before commissioning new Stage 1 vapour recovery equipment

5.3.2 **For the purposes of clause 69(3),** a storage tank that has been fitted with the prescribed VR1 control equipment must be tested for vapour containment integrity in the following manner before the equipment is commissioned:

Testing must either be conducted in accordance with:

- CARB Vapor Recovery Test Procedure 201.3 (TP-201.3), in the case of new storage tanks, with the orifice isolated or blocked, or

- Test Procedure 201.3A (TP-201.3A) in the case of existing or modified storage tanks, with the orifice isolated or blocked, or
- AS 4897–2008, by using a test on the dry portion of the tank and lines capable of detecting a gas leak equivalent to 0.38 litres per hour with a probability of detection of at least 95% and of false detection of 5% or less.

Periodic testing of Stage 1 vapour recovery equipment

5.3.3 For the purposes of clause 71(1), the prescribed control equipment and the petrol storage tank to which it is fitted must be tested according to the requirements in Table 2:

Table 2: Testing requirements for Stage 1 vapour recovery equipment

Test	Timing
The vapour containment integrity of the underground storage tank, fittings and lines must be tested in one of the ways specified in section 5.3.2.	Vapour containment testing must be undertaken: • following the removal or replacement of any of the components required to ensure the integrity of the containment system • at least once every three years if the station does not have an automatic pressure monitoring system certified by the German TÜV.*****
An inspection of orifice plates and pressure vacuum valves for extraneous matter, correct sealing and the presence of corrosion.	Must be conducted at least once a year if the petrol service station does not have an automatic pressure monitoring system certified by the German TÜV.*****
Pressure vacuum valves must be checked for correct functioning in accordance with CARB Vapor Recovery Test Procedure 201.1E (TP-201.1E) or equivalent procedure specified by the EPA (see Appendix 2).	Must be undertaken at least once every three years if the petrol service station does not have an automatic pressure monitoring system certified by the German TÜV.*****
*** Note**: where a properly functioning automatic pressure monitoring system, certified by the German TÜV, is installed and is fully operational during any filling of the underground storage tank, operators are not required to undertake any of the tests marked under 'Timing' with an asterisk.	

5.3.4 For the purposes of clause 71(2), the standard required is that the prescribed storage tank and any control equipment must pass the most recent tests undertaken as specified in sections 5.3.1, 5.3.2 or 5.3.3.

5.4 Stage 2 vapour recovery testing

Testing requirements before commissioning

5.4.1 For the purposes of subclause 72(c), the Stage 2 vapour recovery system must be tested in the following manner before commissioning:

- the Stage 2 vapour system recovery performance must be subject to a test which meets VDI specification 4205: Part 2 – Wet method or Part 3 – Dry method, or equivalent vapour system recovery performance test specified (see Appendix 4), and
- the VR1 system for vapour containment integrity must be tested in accordance with section 5.3.2.

Testing requirements following the removal or replacement of components required to ensure the integrity of the VR2 system

5.4.2 For the purposes of clause 73(1), the prescribed control equipment must be tested in accordance with the requirements in Table 3.

Table 3: Testing requirements for Stage 2 vapour recovery equipment

Test	Timing
Test the Stage 2 vapour system recovery performance with a test which meets VDI specification 4205: Part 2 – Wet method or Part 3 – Dry method, or equivalent vapour system recovery performance test specified (see Appendix 4).	Testing is required immediately after the removal or replacement of any of the components required to ensure the integrity of the vapour recovery system.

5.4.3 For the purposes of clause 73(2), the most recent vapour system recovery performance test result from sections 5.4.1 or 5.4.2 must demonstrate that the vapour recovery to liquid dispensed ratio is between 95% and 105% inclusive (see Appendix 2).

Periodic testing requirements for manually monitored VR2 systems

5.4.4 For the purposes of clause 73(1), the control equipment for a manually monitored system must be tested for vapour containment integrity and vapour system recovery performance in accordance with the requirements in Table 4:

Table 4: Testing requirements for manually monitored VR2 systems

Test	Timing
Test the VR2 system recovery performance with a test which meets VDI specification 4205: Part 2 – Wet method or Part 3 – Dry method or equivalent vapour system recovery performance test specified in Appendix 4.	Testing is required every 6 months, in the absence of a properly functioning automatic control system.
Test the vapour containment integrity of the underground storage tank, fittings and lines in the following manner: Either: • in accordance with CARB Vapor Recovery Test Procedure 201.3 (TP-201.3) in the case of new storage tanks, with the orifice isolated or blocked, or • in accordance with Test Procedure 201.3A (TP-201.3A) in the case of existing or modified storage tanks, with the orifice isolated or blocked, or • using a test on the dry portion of the tank and lines capable of detecting a gas leak equivalent to 0.38 litres per hour with a probability of detection of at least 95% and of false detection of 5% or less, in accordance with AS 4897–2008.	Every three years.

5.4.5 **For the purposes of clause 73(2),** a prescribed petrol dispenser must not be operated unless the most recent test results (of tests under clause 73(1)) meet the following standard:

- the vapour system recovery performance test found that the V/L ratio was between 95% and 105% inclusive (see Appendix 2)
- the vapour containment test result was a pass.

5.4.6 **For the purposes of subclause 74(2)(a),** the manual test of the functionality of the required control equipment must be carried out in the following manner:

- check the visual indicator on the vacuum during a dispensing operation to ensure the vacuum is functioning
- inspect for torn, flattened or kinked hoses and damaged seals on vapour recovery return hoses and lines
- enter the checks and findings in the petrol service station log book.

5.4.7 **For the purposes of clause 74(4)(a),** the test of functionality is passed if the hoses, lines and seals are not damaged and the vacuum is functioning properly as shown by the visual indicator on the vacuum during a dispensing operation.

5.4.8 **For the purposes of subclause 74(5)(b**), the person must be trained to check the prescribed control equipment in the following manner:

- they must be instructed in correctly identifying an operating vacuum as seen by the visual indicator on the vacuum during a dispensing operation
- they must be trained to fully inspect hoses and seals for flattened or kinked hoses and damaged seals on vapour recovery return hoses and lines

- they must be shown how to enter weekly checks in the petrol service station log book indicating if the vacuum is operational and whether hoses and seals are fit for the purpose.

Periodic testing requirements for automatically monitored systems

5.4.9 **For the purposes of clause 73(1),** the prescribed control equipment for an automatically monitored system must be tested in accordance with the requirements in Table 5:

Table 5: Testing requirements for automatically monitored VR2 systems

Test	Timing
Test vapour system recovery performance with a test which meets VDI specification 4205: Part 2 – Wet method or Part 3 – Dry method, or test with an equivalent vapour system recovery performance test specified in Appendix 4.	Every three years.
Note: vapour containment integrity testing of the VR1 system is not required where automatic monitoring is in place.	

5.4.10 **For the purposes of clause 73(2),** a petrol dispenser must not be operated unless the most recent test result meets the following standard:

- the vapour system recovery performance test found that the V/L ratio was between 95% and 105% inclusive (see Appendix 2).

5.5 Reporting requirements

5.5.1 **For the purposes of clause 75(1**), written notice to the EPA on commissioning must take the following form:

- complete and sign the form entitled **'**Commissioning of Stage 1 and/or Stage 2 vapour recovery' provided in Appendix 1.

The form must be submitted within one month of the commissioning of new and modified Stage 1 and Stage 2 vapour recovery systems.

5.5.2 **For the purposes of clause 75(2),** the annual report to the EPA of significant failures must take the following form:

- complete and sign the form entitled 'Significant vapour recovery system faults annual report' provided in Appendix 1.

The form must be submitted within one month of the end of the financial year.

5.5.3 **For the purposes of subclause 75(3)(c**), the number of warnings by an automatic monitoring system is more than **two**.

6. Advice on best practices for achieving compliance

This section provides recommendations to help petrol service station operators maximise vapour recovery. The recommendations are not mandatory, although voluntary compliance with them is recommended as industry best practice.

6.1 Stage 1 vapour recovery

Operational techniques

In addition to the requirements of clause 69(1*)*, the following VR1 operational control techniques should be used where VR1 equipment is installed:

- before a fuel delivery, connect the vapour return hose first to the road tanker and then the storage tank, and then attach the delivery hoses
- if storage tanks or road tanker compartments are dip-tested before delivery, close the dip openings and seal them securely before delivery
- close all road tanker compartment vents and discharge valves on completion of the delivery, unless it would be unsafe to do so
- on completion of unloading, discharge and disconnect the delivery hoses first, and then the vapour hose; disconnect the delivery hoses at the road tanker end first and the vapour return hose at the storage tank end first
- securely seal all connection points after delivery to prevent vapour loss
- if storage tanks or road tanker compartments are dip-tested after delivery, close the dip openings and seal them securely immediately afterwards to prevent vapour loss
- close access entry points to storage tanks and keep them securely sealed except in an emergency or when carrying out any maintenance, testing or tank gauging which require entry to the tank.

General

- All tank vents should be situated to not cause a hazardous or unsafe environment. For example, the position of window openings and air conditioning air intakes to any on-site or adjacent buildings should be considered. Consider all relevant Australian standards and codes in such circumstances.
- Overfill prevention devices reduce liquid spills and subsequent petrol vapour emissions. Overfill prevention devices are only prescribed control equipment for new petrol service stations but they are widely used internationally and should be considered industry best practice even for existing petrol service stations.

Automatic monitoring of tank pressure

This section refers specifically to automatic pressure monitoring rather than automatic monitoring for vapour system recovery. Whilst petrol service stations with an annual throughput of more than 7 million litres are required to install an automatic monitoring system, automatic **pressure** monitoring is not mandatory but is also recommended for **all** petrol service stations, **regardless of throughput**.

If a **certified** automatic pressure monitoring system is present, the Regulation allows periodic testing of vapour containment and inspections of the orifice and pressure vacuum valve to be avoided.

The Regulation requires that an automatic pressure monitoring system must detect faults in the proper functioning of the VR1 system and indicate faults to the operator. Such an automatic pressure monitoring system must also be able to detect faults in its own operation.

The underground storage tank and piping vapour containment system are considered to be functioning correctly when the pressure ranges between 1.85 kilopascals below ambient atmospheric pressure and 0.60 kilopascals above ambient atmospheric pressure. If the pressure readings vary by less than 0.04 kilopascals, the pressure detection may be faulty.

Technical guidance on requirements for certification of automatic pressure monitoring systems

To be certified, the automatic pressure monitoring system must be able to detect the following fault conditions in the underground storage tank and vapour piping vapour containment system:

1. **Vapour pressure, over a continuously moving 1-hour test period, exceeds 0.75 kilopascals above ambient atmospheric pressure or 2 kilopascals below ambient atmospheric pressure for at least 30 minutes**

   The monitoring system must post a warning alarm when the fault occurs at least once in a test day and recurs for seven consecutive days. The monitoring system should continue to post daily warning alarms if the fault persists and automatically cut off the flow of fuel if the fault is not rectified within 30 days.

2. **Vapour pressure, over a continuously moving 1-hour test period, exceeds 1.25 kilopascals above ambient atmospheric pressure or 2.5 kilopascals below ambient atmospheric pressure for at least three minutes**

   The monitoring system must post a warning alarm immediately when the fault first occurs. If the fault recurs, additional warning alarms must be posted each time. If the fault is present at least once during a test day, the monitoring system must also post a daily alarm summary. Where a fault of this kind is present and continues for consecutive days, the monitoring system must continue to post daily warning alarm summaries and automatically cut off the flow of fuel if the fault is not rectified within seven days.

3. **Vapour pressure over a continuously moving one-hour test period remains within ± 0.04 kilopascals or remains consistently above or below 0.00 kPa, relative to ambient atmospheric pressure**

   The monitoring system is required to post a warning alarm when the fault occurs for at least 23 out of 24 hours throughout a test day. Where a fault of this kind is present and continues for consecutive days, the monitoring system must continue to post daily warning alarms and automatically cut off the flow of fuel if the fault is not rectified within seven days.

Technical notes on automatic pressure monitoring

The automatic pressure monitoring system should be certified by German TÜV as meeting the conditions and criteria established in this section, and in accordance with the following specifications:

- pressure samples must be taken on average at least once every 30 seconds to be considered continuous monitoring
- a ‘test day’ is any 24-hour period starting and ending at a specified start time (e.g. 8:00 am)

- a ‘no test’ result may be issued if the pressure remains within ±0.05 kilopascals because the vapour containment system is not in use
- all test results and warnings must be available at the end of each test day except where immediate warning is required. Results for each test type must include at least a qualitative indication of ‘pass’, ‘warn’, ‘shutdown’, or ‘no test’. ‘Warn’ or ‘shutdown’ must also include a quantitative indication of the fault.
- The monitoring system must retain the date and type of the last 100 faults and one year of daily pressure data. The data must be easily accessible to operators or inspectors.

6.2 Stage 2 vapour recovery

Petrol service stations are not constrained in how they recover vapour during filling of vehicle petrol tanks, provided that the minimum hydrocarbon capture efficiency requirements are met and the provisions of the Regulation in relation to equipment type approval are adhered to.

The following is an example of control equipment and techniques that can be used. Regardless of the equipment used, in all cases it must be approved as prescribed in the Regulation. Automatic monitoring systems are recommended for all Stage 2 vapour recovery systems.

Open active vapour recovery system with return of vapour to underground storage tank

When petrol enters the vehicle fuel tank, an open active petrol vapour recovery system uses a vacuum pump to draw a proportional volume of vapour back into a storage tank. Typical components of an open active vapour recovery system include:

- a vapour recovery nozzle
- a coaxial hose through which vapour is collected, and a pipe through which the vapour is returned
- a vacuum pump, either multiple distributed units or a central unit
- a system to control the ratio of the volume of vapour recovered to the volume of petrol dispensed, which can be achieved by using a proportional valve controlled either hydraulically or electronically or by controlling the speed of the vacuum pump
- a vapour storage tank, i.e. the petrol storage tank.

6.3 Risk management

The occupier of a petrol service station must take all practical measures to manage the risk associated with the storage and handling of dangerous goods. For example, the NSW occupational health and safety legislation, the National Occupational Health and Safety Commission’s National Standard for the Storage and Handling of Workplace Dangerous Goods, and the National Code of Practice for the Storage and Handling of Dangerous Goods, as well as all other applicable laws, will be very relevant for the conduct of vapour recovery at petrol service stations.

Before a vapour recovery system is installed at a petrol service station, a thorough risk analysis for the site should be undertaken by a duly qualified person who has competencies and experience that are recognised as appropriate for the task by the industry. A duly qualified person includes personnel that have been trained, authorised and accredited by the manufacturer of the vapour recovery system.

All vapour recovery equipment used should be designed, installed and tested with reference to relevant Australian and international standards, national methods, codes of practice and industry guidelines that were in place when the equipment was installed, unless prescribed by the Regulation or this document. Some relevant reference documents are listed in Appendix 2.

Appendices

Appendix 1: Reporting templates

Send completed reports to:

Vapour recovery reporting
Air Policy Section
Office of Environment and Heritage
PO Box A290
Sydney South, NSW 1232

Report 1: Commissioning of Stage 1 and Stage 2 vapour recovery

General information required

1. Name and address of petrol service station

Name:
Address:
ABN (if applicable):

2. Details of person responsible for petrol service station

Name:
Email:
Telephone:

3. Annual petrol throughput of petrol service station (for new petrol service stations, show designed throughput). Tick appropriate box:

   ☐ less than 500 kL

   ☐ greater than or equal to 500 kL but less than 3.5 ML

   ☐ greater than or equal to 3.5 ML but less than 7 ML

   ☐ greater than or equal to 7 ML but less than 12 ML

   ☐ greater than or equal to 12 ML

4. Number of petrol dispensers: _____

5. Number of petrol-dispensing nozzles: _____

6. Petrol dispenser make and model

Make:
Model:

7. Date of inspection

Date (dd/mm/yy): ____/_____/_____

8. Name and contact details of service technician/tester

Name:	**Telephone:**
Email:	
Address:	

9. Reason for reporting. Tick appropriate box:

   ☐ Stage 1 vapour recovery commissioned (answer questions 10–14 and sign report at the end of the form)

   ☐ Stage 2 vapour recovery commissioned (answer questions 15–20 and sign report at the end of the form)

   ☐ Stage 1 and Stage 2 vapour recovery commissioned (answer all questions and sign report at the end of the form)

Stage 1 vapour recovery commissioning report

10. Stage 1 vapour recovery date of commissioning

Date (dd/mm/yy): ____/_____/_____

11. Pass date of pre-commissioning tank integrity test

Required test: Equipment integrity test in AS–4897: 2008, section 8.5 or liquid space leak test for NSW Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008 (UPSS) Divisions 3, clause 14 (1). A pass result in the last three years is acceptable.

Date (dd/mm/yy): ____/_____/_____

12. Is automatic pressure monitoring certified by German TÜV present?

☐ Yes

☐ No

13. Have the underground storage tank and vapour recovery pipes and components passed the vapour containment integrity test?

Required test:
(i) using a test on the dry portion of the tank and lines capable of detecting a gas leak equivalent to 0.38 litres per hour, in accordance with AS 4897–2008, or
(ii) for new tanks, CARB Vapor Recovery Test Procedure TP-201.3 with the orifice blocked or isolated, or
(iii) for existing/modified tanks, CARB Vapor Recovery Test Procedure TP-201.3A with the orifice blocked or isolated.

☐ Yes

☐ No

14. Vapour containment test results

Number of underground storage tanks			
Tank number		**Tank number**	
Capacity of tank		Capacity of tank	
Number of nozzles		Number of nozzles	
Fuel volume		Fuel volume	
Ullage		Ullage	
Initial pressure		Initial pressure	
Final pressure		Final pressure	
Allowable final pressure		Allowable final pressure	
Tank number		**Tank number**	
Capacity of tank		Capacity of tank	
Number of nozzles		Number of nozzles	
Fuel volume		Fuel volume	
Ullage		Ullage	
Initial pressure		Initial pressure	
Final pressure		Final pressure	
Allowable final pressure		Allowable final pressure	

Where additional tanks are present, please attach additional test results on separate sheet.

Stage 2 vapour recovery commissioning report

15. Name of Stage 2 vapour recovery system manufacturer: _____

16. Stage 2 vapour recovery compliance certificate number and issuer

Certificate number:
Issuer:

17. Type of Stage 2 vapour recovery monitoring (V/L ratio monitoring)

☐ Automatic

☐ Manual

18. Stage 2 vapour recovery date of commissioning

Date (dd/mm/yy): ____/_____/_____

19: Have all dispenser hoses passed a leak test?

☐ Yes

☐ No

20. If an automatic V/L ratio monitoring system is fitted, is it operating correctly?

☐ Yes

☐ No

21. Vapour recovered to petrol dispensed (V/L) ratio test results for each dispenser

Dispenser number	Dispenser side	Grade name	V/L ratio and fuel flow rate			
			Before adjustment		After adjustment (if applicable)	
			[%]	[L/min]	[%]	[L/min]
1	1	G1				
		G2				
		G3				
	2	G1				
		G2				
		G3				
2	1	G1				
		G2				
		G3				
	2	G1				
		G2				
		G3				

Dispenser number	Dispenser side	Grade name	V/L ratio and fuel flow rate			
			Before adjustment		After adjustment (if applicable)	
			[%]	[L/min]	[%]	[L/min]
3	1	G1				
		G2				
		G3				
	2	G1				
		G2				
		G3				
4	1	G1				
		G2				
		G3				
	2	G1				
		G2				
		G3				
5	1	G1				
		G2				
		G3				
	2	G1				
		G2				
		G3				
6	1	G1				
		G2				
		G3				
	2	G1				
		G2				
		G3				

Where additional dispensers are present, please attach additional test results on separate sheet.

Signature

It is an offence to supply any information to the EPA in this report that is false or misleading in material particular. The maximum penalty for the offence is currently $1,000 for a corporation or $5,500 for an individual.

Signed by the occupier or someone authorised to sign the report on behalf of the occupier:

Signature:

Name:

Position:

Date:

Report 2: Significant vapour recovery system faults annual report

Do not report unless significant faults occur

Report on significant failures in any financial year (1 July–31 June) at end of financial year.
Report by 30 July in the subsequent year.

A 'significant failure' has occurred when there are:

– vapour containment failures, where repairs required opening of the forecourt
– six-monthly tests of the V/L ratio in a manual monitored system that show vapour system recovery had fallen below 85%
– three or more warnings generated by an automatic system in any six-month period.

Date of report (dd/mm/yy): _____/_____/_____

1. Name and address of petrol service station

Name:
Address:

ABN (if applicable):

2. If the petrol service station annual petrol throughput has changed so that the petrol service station is now in a different category, please indicate the new category of throughput:

☐ not applicable

☐ less than 500 kL

☐ greater than or equal to 500 kL but less than 3.5 ML

☐ greater than or equal to 3.5 ML but less than 7 ML

☐ greater than or equal to 7 ML but less than 12 ML

☐ greater than or equal to 12 ML

3. Please list the type of fault occurring and date of fault in the vapour recovery system (attach additional pages if required).

Date	Type of fault (tick as appropriate)	What repairs were required? How long did repairs take?	Name and contact details of service technician/tester
	☐ Forecourt opened to repair vapour containment ☐ Measured V/L ratio below 85% ☐ System generated 3 or more warnings in 6 months		
	☐ Forecourt opened to repair vapour containment ☐ Measured V/L ratio below 85% ☐ System generated 3 or more warnings in 6 months		
	☐ Forecourt opened to repair vapour containment ☐ Measured V/L ratio below 85% ☐ System generated 3 or more warnings in 6 months		
	☐ Forecourt opened to repair vapour containment ☐ Measured V/L ratio below 85% ☐ System generated 3 or more warnings in 6 months		
	☐ Forecourt opened to repair vapour containment ☐ Measured V/L ratio below 85% ☐ System generated 3 or more warnings in 6 months		
	☐ Forecourt opened to repair vapour containment ☐ Measured V/L ratio below 85% ☐ System generated 3 or more warnings in 6 months		

Signature

It is an offence to supply any information to the EPA in this report that is false or misleading in material particular. The maximum penalty for the offence is currently $1,000 for a corporation or $5,500 for an individual.

Signed by the occupier or someone authorised to sign the report on behalf of the occupier:

Signature: ____________________

Name: ____________________

Position: ____________________

Date: ____________________

Appendix 2: References

Other standards and test methods

Verein Deutscher Ingenieure (The Association of German Engineers) (VDI)

The following VDI Stage 2 vapour recovery equipment standard test methods are available at www.vdi.de/index.php?id=301:

- VDI 4205: Measurement and test methods for the assessment of vapour recovery systems on filling stations:
  - Part 1 – Fundamentals (as adopted July 2003)
  - Part 2 – Wet method (as adopted July 2003)
  - Part 3 – Dry method (as adopted November 2003)
  - Part 4 – Measurement and test methods for the assessment of vapour recovery systems on filling stations: System test for active vapour recovery systems (as adopted August 2005)
  - Part 5 – Measurement and test methods for the assessment of vapour recovery systems on filling stations: System test of automatic monitoring systems of active vapour recovery systems

German Federal Ordinance

Twentieth Ordinance of the Implementation of the Federal Immission Control Act (Ordinance on the Limitation of Hydrocarbon Emission Resulting from the Fuelling of Motor Vehicles – 20, BImSch V) of October 1992 amended 27 May 1998, visit bundesrecht.juris.de/bundesrecht/bimschv_20_1998/gesamt.pdf

Twenty-first Ordinance of the Implementation of the Federal Immission Control Act (Ordinance on the Limitation of Hydrocarbon Emission Resulting from the Fuelling of Motor Vehicles – 21, BImSch V) of October 1992, as amended on 6 May 2002, visit thttp://bundesrecht.juris.de/bundesrecht/bimschv_21/gesamt.pdf

California Air Resources Board (CARB)

The following CARB vapour recovery certification and test procedures are available at www.arb.ca.gov/testmeth/vol2/new2006vol2.htm:

- CP-201: Certification Procedure for Vapor Recovery Systems at Dispensing Facilities (as adopted 25 May 2006)
- TP-201.1E: Vapor Recovery Test Procedure for Leak Rate and Cracking Pressure of Pressure/Vacuum Valves (as adopted 8 October 2003)
- TP-201.2: Vapor Recovery Test Procedure for Efficiency and Emission Factor for Phase II Systems (as adopted 8 October 2003)
- TP-201.3: Vapor Recovery Test Procedure: Determination of 2 Inch WC Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities (as adopted 17 March 1999)
- TP-201.3A: Vapor Recovery Test Procedure: Determination of 5 Inch WC Static Pressure Performance of Vapor Recovery Systems of Dispensing Facilities (as adopted 12 April 1996)

References and further reading

Australian Standards

AS–1940	The storage and handling of flammable and combustible liquids
AS–3000	Electrical installations
AS–3800	Electrical equipment for explosive atmospheres
AS–4897:2008	The design, installation and operation of underground petroleum storage systems
AS–2381.1:2005	Electrical equipment for explosive gas atmospheres – selection, installation and maintenance
AS–2229	Fuel dispensing equipment for explosive atmospheres

Other relevant documents

Department of Environment and Climate Change 2009, *Guidelines for implementing the POEO (Underground Petrol Storage Systems) Regulation 2008*, visit www.environment.nsw.gov.au/resources/clm/ 09156upssglines.pdf

NOHSC 2017, National Occupational Health and Safety Commission 2001, *National code of practice for the storage and handling of workplace dangerous goods*, visit www.safeworkaustralia.gov.au/NR/rdonlyres/3A7DC2C2-F183-40FA-9062-5DD46D2466B3/0/NOHSC20172001_COP_pt01.pdf

NOHSC 1015, National Occupational Health and Safety Commission 2001, *National standard for the storage and handling of workplace dangerous goods*, visit www.safeworkaustralia.gov.au/NR/rdonlyres/B157A229-4D9B-4648-B462-A06EA18E2A93/0/NOHSC10152001_STANDARD.pdf

PEI RP 300, US Petroleum Equipment Institute, *Recommended practice guide 300: Installation and testing of vapor recovery systems*, visit www.pei.org/Publications Resources/RecommendedPracticesExams/RP300/tabid/101/Default.aspx

PICA RP 001, Petroleum Industry Contractors Association (Australia) 2004, *Recommended practice for installation of underground liquid storage systems*, visit www.pica.net.au/

UL 971, Underwriters Laboratories (United States of America), *Standard 971: Non-corrodible flexible piping*, visit http://resource.pei.org/surveys/UL971/

WC01354 Workcover 2005, *Storage and handling of dangerous goods: Code of practice*, visit www.workcover.nsw.gov.au/formspublications/publications/Documents/storage_handling_dangerous_goods_code_of_practice_1354.pdf

Appendix 3: Collated regulatory requirements

Stage 1 vapour recovery prescribed control equipment

Table 6 sets out the prescribed control equipment for Stage 1 vapour recovery.

Table 6: Prescribed control equipment for Stage 1 vapour recovery

Equipment	Specification	Regulation reference
vapour transfer system	Trucks used to supply petrol to petrol service stations must be equipped with vapour return lines to which the petrol service station vapour transfer system is connected.	subclause 69(1)(a)
coupling for the vapour return line	A coupling on the vapour return line that makes a vapour-tight connection with the vapour return hose on the delivery tank and that closes automatically when disconnected	subclause 69(1)(b)
fill pipe	A submerged fill pipe that terminates below the lowest point of any suction inlet used for the pumping of petrol out of the storage tank	subclause 69(1)(c)
overfill prevention device	A new petrol service station must have an overfill prevention device installed in the tank fill piping or a supply system that slows delivery of petrol into the storage tank to prevent overfilling.	subclause 69(1)(d)(i)
	If the overfill prevention device is electrically powered or contains electronic components, the overfill prevention device must meet the following standards: • it must be constructed in accordance with relevant safety and electrical standards • it must be installed in accordance with relevant safety and electrical standards.	subclause 69(1)(d)(ii)
storage tank overfill protection	Storage tank overfill protection, comprising a float vent valve positioned: • above the highest point of any overfill prevention device when in the closed position • so the valve shuts off the flow into the storage tank at the level advised by the manufacturer of the storage tank or, if no level is advised, at 95% of the storage tank's capacity.	subclause 69(1)(e)
connection points and seals	Spill containment enclosures for all storage tank fill connection points.	subclause 69(1)(f)
	A coupling on the storage tank's fill pipe that makes a liquid-tight connection with the delivery tank's liquid transfer hose	subclause 69(1)(g)
	Secure seals on connection points of tank filling pipes and vapour return pipes that minimise vapour leaks when those pipes are not in active use	subclause 69(1)(h)
	Secure seals for the apertures for the use of a dipstick, if dip hatches are provided on the storage tank	subclause 69(1)(i)
incompatible fittings	Fittings on the petrol delivery lines and hoses must be incompatible with the fittings on the vapour return lines and hoses to prevent misconnection or the accidental discharge of liquid petrol into the vapour return lines or pipes	subclause 69(1)(j)

storage tank vent pipe	A pressure vacuum valve and a 10 millimetre orifice in parallel fitted to the storage tank vent pipe. Similar devices are permitted where they can be shown by an accepted certifying agency to achieve the same requirements.	subclause 69(1)(k)
	Pressure vacuum relief valves must achieve the following: • the settings criteria are: – the device must be sized and weighted to allow an emergency release of vapours at not more than 80% of maximum tank design pressure – the device must be of a type that conforms with any applicable standards published by Standards Australia, European Standards or United States Underwriters Laboratories (UL) and have certification by UL or the German TŰV or meet the criteria established in California Air Resources Board Certification Procedure CP201 of May 25 2006, section 3.5. • is of a size and type and possesses the safety features that a duly qualified person has advised is suitable • is installed in accordance with the advice of a duly qualified person • in the case of a device installed at a new petrol service station, the device must be set to be closed when the pressure in the storage tank is between 1 kilopascal above, and 2 kilopascals below, ambient pressure.	subclause 69(1)(k)(i) subclause 69(1)(k)(ii) subclause 69(1)(k)(iii) 69(1)(k)(i)
	A 'duly qualified person' means a person who has such competence and experience in relation to the activity as is recognised in the relevant industry as appropriate to carry out that activity.	clause 59
	Where a device similar to a 10-millimetre orifice is to be used in the vent line, it must have certification from a testing authority accepted by the EPA that it retains 97% of vapour in the proposed system.	subclause 69(1)(k)
	Where a device similar to a pressure vacuum valve is used, it must have settings that can provide emergency relief of excessive pressure or vacuum and vent a sufficient volume flow rate to prevent exceedences of maximum tank design pressure/vacuum under adverse conditions. When the device is in the closed position, it must provide a seal against leakage with the same performance as that included in the CARB TP201.1E leak test. The device must be certified by a testing authority accepted by the EPA.	subclause 69(1)(k)
vapour processing unit	Where a storage tank is fitted with a vapour processing unit, it must be, before commissioning, certified by the manufacturer or supplier as being of the following type and having a hydrocarbon capture efficiency of at least 97%: • a vapour processing unit certified by the German TÜV, in accordance with the provisions of the Ordinance on the Limitation of Hydrocarbon Emission Resulting from the Fuelling of Motor Vehicles – 21, BImSch V, section 3(6) [2002] (see Appendix 2), or • a vapour processing unit certified by the California Air Resources Board (CARB) as meeting the criteria established in Certification Procedure CP-201 and conforming to Vapor Recovery Test Procedure TP-201.2 (see Appendix 2).	subclause 69(1)(l)

Stage 2 vapour recovery prescribed control equipment

Table 7 sets out the prescribed control equipment for Stage 2 vapour recovery.

Table 7: Prescribed control equipment for Stage 2 vapour recovery

Equipment	Specification	Regulation reference
vapour recovery system	A vapour recovery system is to be fitted to the petrol dispenser. Before commissioning**,** the vapour recovery system must be certified by the manufacturer or the supplier as being of the following type and hydrocarbon capture efficiency: • type: a Stage 2 vapour recovery system approved by the German TÜV; the approval must be in accordance with the provisions of Ordinance on the Limitation of Hydrocarbon Emission Resulting from the Fuelling of Motor Vehicles – 21, BImSchV section 3, paragraph 6 [2002] (see Appendix 2) • hydrocarbon capture efficiency: a hydrocarbon capture efficiency of not less than 85% vapour recovery to liquid dispensed by volume as measured using a test for active vapour recovery systems in VDI specification 4205 (see Appendix 2) • the certification obtained must certify that the Stage 2 vapour recovery system achieves 85% vapour recovery and must specify the test used.	subclause 72(a)
	Is installed in accordance with the manufacturer's specifications by a duly qualified person.	subclause 72(b)
	Before commissioning, is tested by a duly qualified person in the manner specified in section 5.4.1.	subclause 72(c)
	A 'duly qualified person' means a person who has such competence and experience in relation to the activity as is recognised in the relevant industry as appropriate to carry out that activity.	clause 59
automatic monitoring system (mandatory for petrol stations with an annual throughput of more than 7 million litres)	The automatic monitoring system must be certified by the German TÜV in accordance with the provisions of Ordinance on the Limitation of Hydrocarbon Emission Resulting from the Fuelling of Motor Vehicles – 21, BImSch V (section 3, clause 5) [2002] with the exception that the number of days until the automatic system shuts off the flow is to be seven days. The test procedure for demonstrating the correct function of the automatic monitoring system is VDI specification 4205. Automatic monitoring systems must provide a visual indication of the operational status of each fuelling point.	subclause 74(1)

Log book requirements

Any relevant information relating to the prescribed control equipment or its installation, necessary for its correct and efficient operation and management, must be recorded in a log book.

Clause 77 (3) requires the following items to be recorded or stored in the log book:

- the name, address and contact details of the person with overall responsibility for the petrol service station vapour recovery system
- a description of the installed prescribed control equipment, including types, serial numbers (if any) and the manufacturer's or supplier's equipment certificates
- the name and address of the person with overall responsibility for installing and commissioning the vapour recovery system
- a description of the testing of the operation of the prescribed control equipment including the type of test, all test results and the name and address of the person with overall responsibility for carrying out the test
- details of repairs and maintenance
- weekly check results for manual monitoring
- a description of any incidences involving faults with or malfunction of the vapour recovery system and the measures taken to investigate and respond to the incident
- the date of the last report to the EPA.

Details of anything done prior to commencement of the amended Regulation do not need to be recorded. The records need to be kept for three years, even if the petrol service station is decommissioned.

Appendix 4: Vapour system recovery test method for determining the vapour to petrol recovery efficiency of Stage 2 vapour recovery systems

This method is used for checking the recovery performance of vacuum assisted vapour recovery systems in petrol service stations in NSW.

The ratio of vapour captured to petrol dispensed (V/L) needs to be tightly controlled in Stage 2 vapour recovery (VR2) systems. If too little vapour is recovered, petrol vapours are emitted at the point of refueling. If too much vapour is recovered, pressure builds up in the underground tank, causing emissions of petrol vapour through the vent.

During the vapour system recovery test, the volume of vapour recovered and fuel dispensed are simultaneously measured. To measure the vapour recovered, a tight fitting adaptor is fitted to the spout of the vacuum assist nozzle so all vapour collected passes through the adaptor. The adaptor is connected to a gas flow meter, to determine the volume of gas collected.

Measurement of vapour recovery through petrol dispensers may be undertaken using a 'wet method' where petrol is dispensed, or using a 'dry method'. In the latter method, the V/L ratio electronic controller is sent a signal that simulates the signal it would normally receive while petrol is dispensed, so that the vapour recovery system operates and the vapour recovery rate can be measured. The wet method is used as the reference method. However, the inconvenience of the amounts of fuel dispensed and resultant hazardous environment precludes routine use of the wet method, so the dry method has been more widely used.

Prior to measuring the V/L ratio, the system must have passed a vapour path leakage test conducted in accordance with manufacturer's instructions. For pre-commissioning tests, the vapour recovery system installation must be completed to the standard recommended by vapour recovery system manufacturer prior to testing.

Prior to conducting the vapour system recovery test procedure, the technician must have the necessary competency and training in the operation of the dispenser, the vapour recovery equipment and the vapour recovery test equipment on petrol service station forecourts. The technician must have the appropriate training and accreditation from the equipment supplier before any adjustments or repairs are made to the vapour recovery equipment, calibration or K- factor settings.

Test equipment

The **measuring adaptor** connects the dispenser nozzle to the gas flow meter through a connecting hose. The nozzle adaptor must be compatible with the nozzles to be tested. The seals must be in good condition – no nicks, tears or defects. An appropriate grease may be used to ensure a vapour tight seal. The hose between the nozzle adaptor and the gas meter should be no more than three metres long with smooth inner walls and an inside diameter of at least 20 millimetres. A clear hose will allow any blockage to be readily visible but is not mandatory.

The **gas flow meter** is sensitive to small air flows. The gas flow meter must be able to read accurately from 15 litres per minute to 120 litres per minute, with a minimum readability of 0.25 litres.

- The **bellows type** should be checked every 6 months, or according to the manufacturers' recommendations, by a recognised testing authority to equal or exceed ± 2% at 40 litres per minute.

- The **impeller types** should be checked every 2 months, or according to the manufacturers' recommendations, by a recognised testing authority to equal or exceed ±1% at 40 litres per minute.
- **Other** types of meter should meet at least ±1% with calibration intervals advised by the meter manufacturer.

Gas flow meters should be marked with the last calibration date and test authority. Only gas flow meters that have been calibrated within the period specified above for that type of meter may be used. Other factors that affect the gas meter need to be considered:

- gas meters meet the specified accuracy only when used within the temperature range specified by the manufacturer and for which they have been calibrated
- for automated calculations, the gas flow meter needs a signal output (such as an electrical pulse)
- the calibration factor of the bellows-type gas meter is needed to calculate the measured volume from the generated signal.

Dry method

This method may be used to measure V/L ratio on vacuum assisted ('active') Stage 2 vapour recovery systems in NSW with simulated dispensing of fuel.

Additional dry method test equipment

Handheld control: an electronic device that can be adjusted to send and receive signals to and from the vapour recovery controller to simulate petrol from the dispenser nozzle, and to adjust the controller as required. The device should be programmed to simulate petrol flow for the VR2 controller to be tested. It must also use the correct calibration factor for the **bellows-type** gas flow meter in use.

This handheld control is typically supplied by the vapour recovery system supplier and must be approved by the manufacturer for use with supplied vapour recovery system. Follow the operation instructions supplied with the handheld controller.

For electronic systems:

$$\text{Correction Factor} = \frac{\text{Vapour Recovery Rate (Air)}}{\text{Vapour Recovery Rate (HC – Vapour)}}$$

All electronic test and calibration equipment used on petrol forecourts must be approved for the hazard zone in which it will be used. The measuring instruments must be periodically checked.

Pretest procedures

Place the measuring adaptor over the dispenser nozzle and connect it to the bellows-type gas flow meter. Ensure the adaptor does not leak and that the connecting hose does not leak or offer excessive resistance to gas flow. The connecting hose should be laid relatively flat, with no loops or kinks, to not cause bottlenecks in the flow path.

The equipment must be appropriately electrically grounded. If a vapour processor unit is present, check the manufacturer's instructions to determine whether the vapour system recovery test should be conducted with the processor on or off.

Connect the signal output of the bellows-type gas flow meter to the handheld control. Ensure that the calibration factor of the bellows-type gas flow meter is stored in the hand held control memory. Connect the handheld controller to the Stage 2 vapour recovery controller to be tested. Figure 4 shows the dry method test equipment set up for a dispenser with a self contained vacuum pump. If a central vacuum system is present, the dispenser will contain only the central vacuum control components.

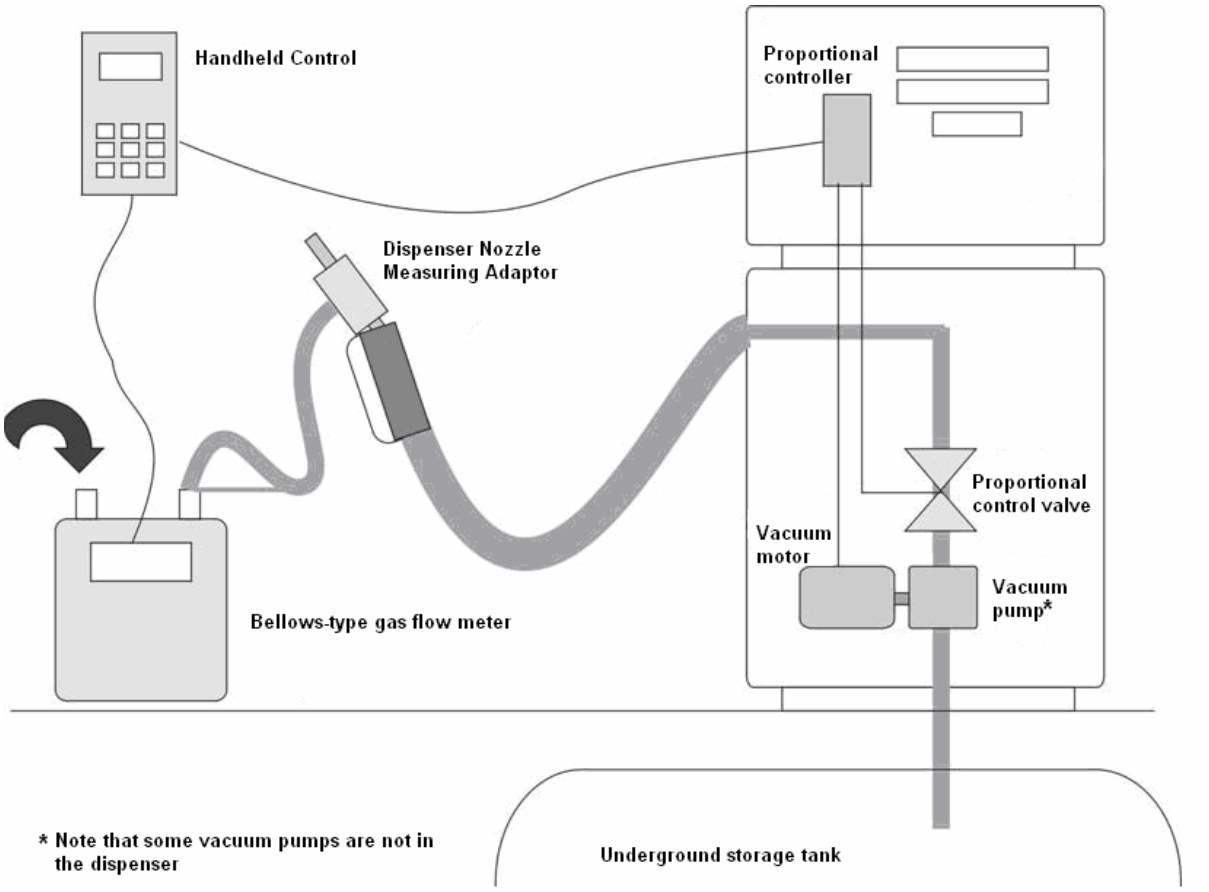

Figure 4: Typical dry method test equipment set up

Dry method measurements

1. Ensure all equipment is connected and switched on.
2. Start the simulated dispensing of petrol.
3. When sufficient simulated volume of petrol has been ’dispensed‘, stop the hand held controller.
4. The hand held controller will use the signal from the gas flow meter, the programmed calibration factor and the correction factor to calculate the V/L ratio. Record the V/L ratio measured.

If the nozzle fails the test by a small margin, do the test twice more. Average the V/L ratios for all three tests. If the V/L ratio is between 0.95 and 1.05, the nozzle passes.

Wet method

This method may be used to measure V/L ratio on vacuum assisted (‘active’) Stage 2 vapour recovery systems in NSW during dispensing of fuel.

Additional wet method test equipment

A suitable **portable fuel tank** is needed in which to dispense the fuel. The fuel tank must meet all applicable safety standards and be grounded, to avoid static discharge. The tank capacity must be large enough to receive 30 litres of fuel without triggering the automatic cut off in the fuel dispenser.

The dispenser flowmeter can be used to determine the fuel dispensed.

A **stopwatch** accurate to 0.2 seconds is needed to measure the test time.

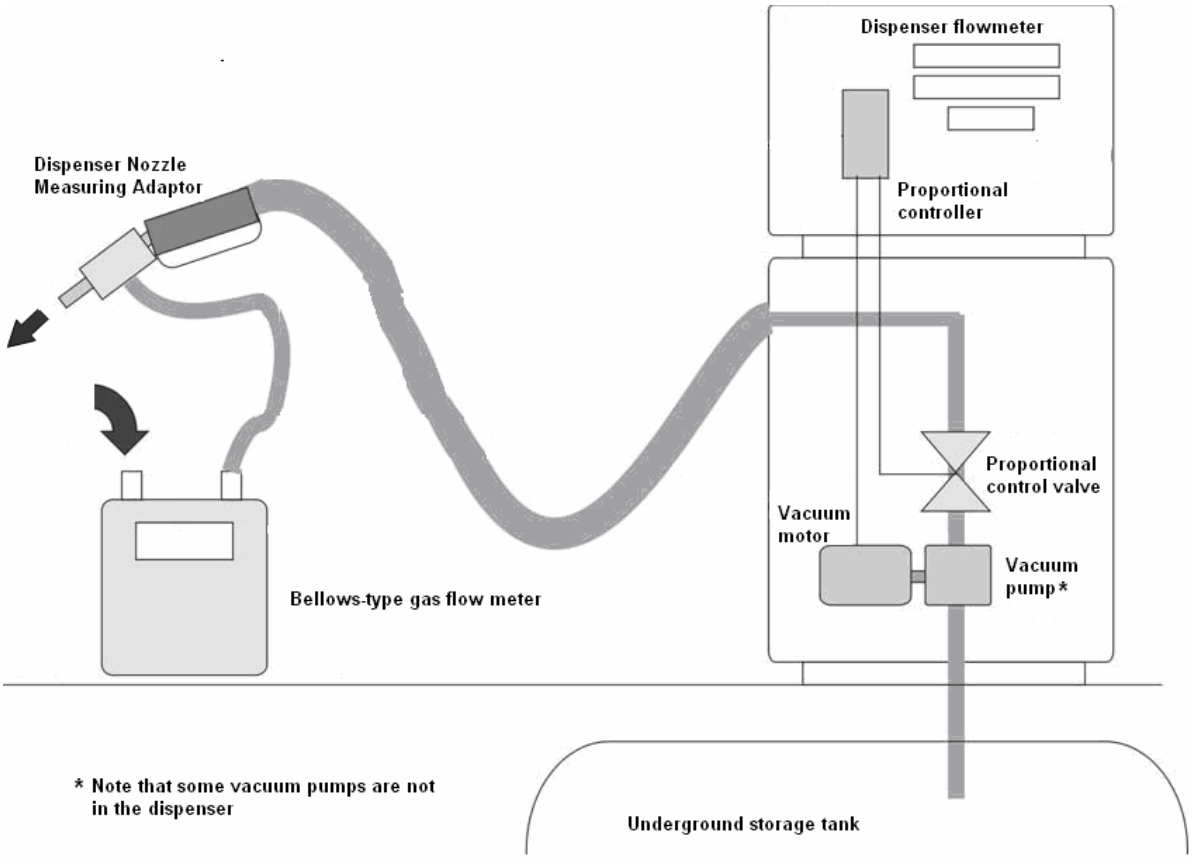

Figure 5: Typical wet method test equipment set up

Figure 5 shows the wet method test equipment set up for a dispenser with a self contained vacuum pump. If a central vacuum system is present, the dispenser will contain only the central vacuum control components.

Pretest procedures

Check the equipment certification of the equipment to be tested to determine the quantity of fuel to be dispensed during the test. This will normally be 28–30 litres.

Place the measuring adaptor over the dispenser nozzle and connect to the bellows-type gas flow meter. Ensure the adaptor does not leak and that the connecting hose does not leak or offer excessive resistance to gas flow. The connecting hose should be laid relatively flat, with no loops or kinks, to not cause bottlenecks in the flow path.

The equipment must be appropriately electrically grounded. If a vapour processor unit is present, check the manufacturer's instructions to determine whether the vapour system recovery test should be conducted with the processor on or off.

Wet method measurements

1. Ensure all equipment is connected and switched on.
2. Note the reading on the gas flow meter immediately prior to starting the test.
3. Make sure the petrol flow meter has been reset.
4. Reset the stopwatch.
5. Start the stopwatch and dispense the predetermined volume of petrol into a suitable receptacle.
6. Stop the stopwatch and the petrol dispensing at the same time.
7. Record the volume of fuel dispensed, time to dispense the fuel and the volume of vapour recovered.
8. The volume flow-rate of the fuel equals the volume dispensed divided by the time taken to dispense the fuel. Calculate the volume flow-rate and check it is greater than 25 litres/minute.
9. Record the test results.

The V/L ratio equals the volume of gas recovered, multiplied by the correction factor for the gas meter, divided by the volume dispensed. If the V/L ratio is between 0.95 and 1.05 inclusive, the nozzle passes the test.

If the nozzle fails the test by a small margin, do the test twice more. Average the V/L ratios for all three tests. If the V/L ratio is between 0.95 and 1.05, the nozzle passes.

Notes: If liquid enters the dispenser vapour piping, the nozzle has failed the test.

V/L ratio

The V/L ratio must fall between 95% to 105% for:

- the on-site pre-commissioning calibration
- the six monthly check for manual monitored systems
- the three-yearly check for automatically monitored systems.

When the Stage 2 vapour recovery system passes the test, the installer/system tester must complete a 'compliance certificate' of the complete system and supply the retailer with one copy for site records. The form at the end of the test method may be used for recording data during the test.

Vapour to petrol ratio (V/L) test results for each dispenser

Number on site	Side or hose number	Grade name	V/L ratio and fuel flow rate			
			Before adjustment		After adjustment (if applicable)	
			[%]	[L/min]	[%]	[L/min]
1	1	G1				
		G2				
		G3				
	2	G1				
		G2				
		G3				
2	1	G1				
		G2				
		G3				
	2	G1				
		G2				
		G3				
3	1	G1				
		G2				
		G3				
	2	G1				
		G2				
		G3				
4	1	G1				
		G2				
		G3				
	2	G1				
		G2				
		G3				
5	1	G1				
		G2				
		G3				
	2	G1				
		G2				
		G3				
6	1	G1				
		G2				
		G3				
	2	G1				
		G2				
		G3				