

AIR POLLUTION CONTROL (PETROL FILLING STATIONS)
(VAPOUR RECOVERY) REGULATION

(Made under section 43 of the Air Pollution Control Ordinance (Cap. 311) after consultation with the Advisory Council on the Environment)

1. Commencement

This Regulation shall come into operation on a day to be appointed by the Secretary for Planning, Environment and Lands by notice in the Gazette.

2. Interpretation

In this Regulation, unless the context otherwise requires---

"certificate" (證書)---

(a) means a certificate issued under section 5;

(b) includes a copy of such a certificate;

"competent examiner" (合資格檢驗師) means a registered professional engineer in the building services, gas, chemical, environmental, marine and naval architecture or mechanical discipline under the Engineers Registration Ordinance (Cap. 409);

"existing petrol filling station" (現存油站) means a petrol filling station which was in operation immediately before the relevant date;

"existing regulated vehicle" (現存受管制車輛) means a regulated vehicle which was registered under Part IV of the Road Traffic Ordinance (Cap. 374) immediately before the relevant date;

"latest certificate" (最新近的證書), in relation to a regulated vehicle or petrol filling station, means the most recent certificate---

(a) issued in respect of the vehicle or station, as the case may be; and

(b) received by the owner of the vehicle or station, as the case may be;

"operator" (操作員) means a person who is engaged in the unloading of petrol from a regulated vehicle to a petrol storage tank;

"owner" (擁有人), in relation to a petrol filling station, includes a person who owns part of the station;

"petrol delivery tank" (運油缸) means a tank in a regulated vehicle from which petrol is unloaded into a petrol storage tank;

"petrol filling station" (油站)---

(a) subject to paragraph (b), means premises equipped with an installation designed or constructed to dispense petrol, either directly or through a separate container, into the fuel tank of a motor vehicle or a vessel;

(b) does not include such premises served by barges;

"petrol storage tank" (貯油缸)---

(a) subject to paragraph (b), means a storage tank in a petrol filling station into

which petrol from a regulated vehicle is unloaded, whether in the form of a bulk storage tank or 2 or more storage tanks;

(b) does not include such tanks which store petrol for a specified process;

"pressure/vacuum valve" (調壓排氣閥) means a dual purpose valve---

(a) with pressure settings in accordance with the manufacturer's specifications; and

(b) which allows relatively small pressure increases or decreases to occur within a petrol storage tank or pipe to which it is connected without allowing vapour venting to the atmosphere or air in-breathing into the tank or pipe;

"regulated vehicle" (受管制車輛) means a motor vehicle which is constructed or adapted primarily for the delivery of petrol and is used to deliver petrol to a petrol filling station situated in Hong Kong whether for retail or not;

"relevant date" (有關日期) means the day appointed under section 1;

"vapour recovery system" (汽體回收系統) means a system by which petrol vapour displaced from a petrol storage tank receiving petrol is recovered in the petrol delivery tank from which petrol is being unloaded.

3. Vapour recovery system to be installed

(1) Subject to section 8, no person shall own a regulated vehicle unless the regulated vehicle is equipped with a vapour recovery system which complies with the test requirements specified in Schedule 1.

(2) Subject to section 8, no person shall own a petrol filling station unless each petrol storage tank installed for the use of the station is equipped with a vapour recovery system which complies with the test requirements specified in Schedules 2 and 3.

4. Testing and examination

(1) The owner of a regulated vehicle or petrol filling station shall cause its vapour recovery system and all pipes connected therewith to be tested and examined by a competent examiner---

(a) upon the completion of the installation of the system and before the system is put into use for the first time;

(b) immediately after any modifications have been effected to the system and before the system is put into use again; and

(c) at least once every period of 12 months.

(2) A competent examiner shall carry out the test in accordance with---

(a) in the case of a regulated vehicle, the test requirements specified in Schedule 1;

(b) in the case of a petrol filling station, the test requirements specified in Schedules 2 and 3.

5. Registration of certificate

(1) When the competent examiner is satisfied that the vapour recovery system of a regulated vehicle or petrol filling station complies with the relevant test requirements as referred to in section 4(2), he shall deliver to the Authority--

(a) a certificate in a form specified by the Authority duly signed by him; and
(b) a certified true copy of the drawing of the vapour recovery system installed to the regulated vehicle or petrol filling station, as the case may be, indicating the locations and sizes of the inlets, vents, pressure/vacuum valves, safety valves and petrol storage tanks.

(2) Where the Authority receives a certificate and drawing under subsection (1) from a competent examiner---

(a) the Authority shall---

(i) register the certificate by entering particulars of the certificate in a register kept by him for the purpose;

(ii) keep the drawing in the register;

(iii) endorse on the certificate that it has been registered; and

(iv) deliver the certificate as so endorsed to the competent examiner;

(b) the competent examiner shall issue the certificate to the owner of the regulated vehicle or petrol filling station to which the certificate relates within 14 days after the receipt of the certificate from the Authority.

6. Display of certificate

(1) The owner of a regulated vehicle or petrol filling station shall display the latest certificate showing his compliance with the requirements on testing and examination under section 4 at a conspicuous location on the vehicle or in the station, as the case may be.

(2) The owner of a petrol filling station shall not carry out, or cause or permit to be carried out, any unloading of petrol from a regulated vehicle to a petrol storage tank in the station unless there are the latest certificates displayed in respect of the vehicle and the station.

7. Operation

(1) An operator shall not carry out, or continue to carry out, the unloading of petrol from a regulated vehicle to a petrol storage tank if the vapour and liquid connections of the vapour recovery systems of the vehicle and the tank are not completely interconnected.

(2) Where any leakage of petrol occurs during the unloading of petrol from a regulated vehicle to a petrol storage tank, the operator shall stop the unloading as soon as is practicable and not recommence the unloading until satisfied that there will be no further leakage of petrol.

8. Exemptions

This Regulation shall not apply to an existing regulated vehicle or existing petrol filling station until the expiration of 12 months immediately following the relevant date.

9. Offences and penalties

(1) A person who contravenes section 3(1), or the owner of a regulated vehicle who contravenes section 4(1), commits an offence and is liable on conviction to a fine of \$200,000 and to imprisonment for 6 months.

(2) A person who contravenes section 3(2), or the owner of a petrol filling station who contravenes section 4(1) or 6(2), commits an offence and is liable on conviction to a fine of \$200,000 and to imprisonment for 6 months.

(3) The owner of a regulated vehicle who contravenes section 6(1), or the owner of a petrol filling station who contravenes section 6(1), commits an offence and is liable on conviction to a fine at level 5.

(4) An operator who contravenes section 7(1) or (2) commits an offence and is liable---

(a) on a first conviction, to a fine at level 5;

(b) on a second or subsequent conviction, to a fine at level 5 and to imprisonment for 3 months.

Consequential Amendments

Air Pollution Control (Motor Vehicle Fuel) Regulation

10. Refusal to sell unleaded petrol

Section 3(2) of the Air Pollution Control (Motor Vehicle Fuel) Regulation (Cap. 311 sub. leg.) is amended---

(a) in paragraph (e), by repealing "or" at the end;

(b) in paragraph (f), by repealing the full stop and substituting "; or";

(c) by adding---

"(g) a test was being carried out in accordance with section 4 of the Air Pollution Control (Petrol Filling Stations) (Vapour Recovery) Regulation (L.N. 379 of 1998).".

SCHEDULE 1 [ss. 3 & 4]

Static Pressure Performance Test for the Vapour Recovery

System of a Regulated Vehicle

1. General

This procedure applies to the determination of the five-minute static pressure performance of a vapour recovery system of a regulated vehicle by fluid mechanical principles.

2. Determination of compliance

2.1 The outlet of any vent pipe serving the vapour recovery system shall be fitted

with a pressure/vacuum valve.

2.2 For tests in sections 5.1 and 5.2, the following requirements shall be complied with the maximum allowable pressure change in 5 minutes for the petrol delivery tank of a regulated vehicle shall be as tabulated below which has been-

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- (a) pressurized to 4.48 kPa (457 mm water column, gauge); or
- (b) evacuated to -1.49 kPa (152 mm water column, gauge vacuum).

Capacity of a petrol delivery tank or a compartment (litres)	Allowable pressure change in 5 minutes per petrol delivery tank or compartment tested (kPa (mm water column, gauge))
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9 475 or more	0.127 (13)
5 685 to 9 474	0.186 (19)
3 790 to 5 684	0.245 (25)
3 789 or less	0.314 (32)

2.3 For tests in section 5.3, the maximum allowable pressure change in the vapour return line in 5 minutes (difference between initial and final pressures) shall be 1.25 kPa (127 mm water column, gauge).

3. Principle and summary of test procedure

The regulated vehicle is to be tested in a location where it will be protected from direct sunlight. The petrol delivery tank on the regulated vehicle is to be pressurized, isolated from the pressure source, and the pressure drop recorded to determine the rate of pressure change. A vacuum test is to be conducted in the same manner.

4. Test equipment

4.1 Source of air or inert gas capable of pressurizing tanks to 6.9 kPa (704 mm water column, gauge).

4.2 Low pressure (1.25 kPa (127 mm water column, gauge) divisions) regulator for controlling pressurization of tank.

4.3 Water manometer with 0 to 6.22 kPa (0 to 635 mm water column, gauge) range, with scale reading of 0.01 kPa (1 mm water column, gauge).

4.4 Test cap for vapour line with a shut-off valve for connection to the pressure and vacuum supply hoses. The test cap is to be equipped with a tap for connecting the manometer.

4.5 Caps for liquid delivery line.

4.6 Vacuum pump of sufficient capacity to evacuate tank to -2.49 kPa (254 mm water column, gauge vacuum).

4.7 Pressure and vacuum supply hose of 6.4 mm internal diameter.

4.8 In-line, pressure-vacuum relief valve set and checked to activate at 6.9 kPa (704 mm water column, gauge) and -2.49 kPa (254 mm water column, gauge vacuum) and with a capacity equal to the pressurizing or evacuating pumps.

5. Test procedure

5.1 Static pressure performance, positive pressurization

5.1.1 Static pressure performance measurement

- (a) Check all the pressure/vacuum valves serving the petrol delivery tanks to ensure that they are working properly.
- (b) Open and close the dome covers.
- (c) Connect static electrical ground connections to tank. Attach the delivery and vapour hoses, remove the delivery elbows and plug the liquid delivery fittings.
- (d) Attach the test cap to the vapour recovery line of the regulated vehicle.
- (e) Connect the pressure and vacuum supply hose and the pressure-vacuum relief valve to the shut-off valve. Attach the pressure source to the hose. Attach a manometer to the pressure tap.
- (f) Connect compartments of the petrol delivery tank internally to each other if possible.
- (g) Apply air pressure slowly, pressurize the tank, or alternatively the first compartment, to 4.48 kPa (457 mm water column, gauge).
- (h) Close the shut-off valve, allow the pressure in the petrol delivery tank to stabilize (adjust the pressure if necessary to maintain 4.48 kPa (457 mm water column, gauge)), record the time and initial pressure.
- (i) At the end of 5 minutes, record the final time and pressure.

5.1.2 Pressure change from 4.48 kPa (457 mm water column, gauge)

- (a) Calculate the pressure change from 4.48 kPa (457 mm water column, gauge) to the final pressure, and compare the pressure change to the requirements in section 2.2.
- (b) Repeat for each compartment if they were not interconnected.

5.2 Static pressure performance, negative pressurization

This procedure does not apply unless pressurized air lines or other equipment penetrate the petrol delivery tank headspace.

5.2.1 Static pressure performance measurement

- (a) Check all the pressure/vacuum valves serving the petrol delivery tanks to ensure that they are working properly.
- (b) Connect vacuum source to the pressure and vacuum supply hose.
- (c) Slowly evacuate the petrol delivery tank, or alternatively the first compartment, to -1.49 kPa (152 mm water column, gauge vacuum). Close the shut-off valve, allow the pressure in the petrol delivery tank to stabilize (adjust the pressure if necessary to maintain -1.49 kPa (152 mm water column, gauge vacuum)), record the

time and initial pressure. At the end of 5 minutes, record the final time and pressure.

5.2.2 Pressure change from -1.49 kPa (152 mm water column, gauge vacuum)

Calculate the pressure change from -1.49 kPa (152 mm water column, gauge vacuum) to the final pressure, and compare the pressure change to the requirements in section 2.2.

5.3 Internal vapour valve performance, positive pressurization

5.3.1 Static pressure performance measurement

(a) After completing the pressure and vacuum tests, pressurize the petrol delivery tank as in section 5.1 to 4.48 kPa (457 mm water column, gauge).

(b) Close the petrol delivery tank's internal valve(s) including the internal vapour valve(s), thereby isolating the vapour return line and manifold from the petrol delivery tank.

(c) Relieve the pressure in the vapour return line to atmospheric pressure.

(d) Seal the vapour return line and after 5 minutes record the gauge pressure existing in the vapour return line and manifold.

5.3.2 Pressure change from 4.48 kPa (457 mm water column, gauge)

Calculate the pressure change from 4.48 kPa (457 mm water column, gauge) to the final pressure, and compare the pressure change to the requirements in section 2.3.

SCHEDULE 2 [ss. 3 & 4]

Pressure Decay Test for the Vapour Recovery System of a Petrol Filling Station

1. General

This procedure applies to the determination of the tightness of vapour recovery system of a petrol storage tank in a petrol filling station.

2. Determination of compliance

2.1 The outlet of any vent pipe serving the vapour recovery system shall be fitted with a pressure/vacuum valve and shall be located at least 3.75 m above the ground level.

2.2 The following requirements shall also be complied with---

Minimum acceptable remaining pressure after 5 minutes	Ullage* (litres)	Minimum acceptable remaining pressure after 5 minutes	Ullage (litres)
(kPa (mm water column, gauge))	(mm water column, gauge))	(kPa (mm water column, gauge))	(mm water column, gauge))

1 895	0.92 (94)	0 011 370	2.17 (221)
2 274	1.12 (114)	0 013 265	2.22 (226)
2 653	1.29 (132)	0 015 160	2.26 (231)
3 032	1.44 (147)	0 017 055	2.29 (234)
3 411	1.54 (157)	0 018 950	2.31 (236)
3 790	1.62 (165)	0 028 425	2.36 (241)
5 685	1.89 (193)	0 037 900	2.39 (244)
7 580	2.04 (208)	0 056 850	2.41 (246)
9 475	2.12 (216)	0 113 700	2.45 (250)

* For the intermediate values of ullage space, interpolation between values should be made as set out in section 6 for the calculation of the minimum acceptable remaining pressure.

3. Principle and summary of test procedures

3.1 The integrity of the vapour recovery system must be proven to ensure its proper operation. A system which will not hold pressure may permit the release of liquids or vapours. The pressure decay test is a low pressure testing method which is performed with all components connected to the piping.

3.2 Fuel dispensing must be suspended during the test since any fuel dispensed will cause a loss of pressure which may be erroneously interpreted as a leak. Vents and vapour processing equipment are plugged and each vapour-return piping run is pressurized with nitrogen to a pressure equal to 2.49 kPa (254 mm water column, gauge). The nitrogen source is then disconnected and the system is allowed to stand under pressure for a period of 5 minutes. The gauge is read to determine the extent of any pressure loss or decay. The results of the test are influenced by the volume of nitrogen in the system and the ullage in the tank.

4. Test equipment

4.1 Nitrogen cylinder and regulator

High pressure commercial grade nitrogen gas cylinder equipped with a two-stage pressure regulator and grounding device.

4.2 Pressure relief valve

Pressure relief valve set and checked to activate at 6.9 kPa (704 mm water column, gauge).

4.3 Pressure gauge or manometer

0 to 2.49 kPa (0 to 254 mm water column, gauge) pressure gauge or water manometer readable to 0.01 kPa (1 mm water column, gauge).

4.4 Vent plug

Threaded or friction-fit plug.

4.5 Test fitting

Test fitting for introducing nitrogen into the system and connecting a gauge.

4.6 Stopwatch

Stopwatch with accuracy to within 0.2 second.

5. Pretest procedures

5.1 Initial safety procedures. Blockade the work area. Eliminate identifiable sources of ignition, including electrical power to electrical devices associated with vacuum-assist systems, if installed.

5.2 Determine the tank ullage by deducting the fuel in each tank from the tank's capacity. There must be a minimum ullage of 30% of the tank capacity, but not less than 1 895 litres for an acceptable test. Vent pipes may be manifolded during the test to achieve the required minimum ullage.

5.3 Check all the pressure/vacuum valves serving the petrol storage tanks to ensure that they are working properly.

5.4 Remove all dry-break caps.

5.5 Install the test fitting at an accessible point in the vapour-return system downstream of any vapour check valve.

5.6 Install the pressure relief valve.

5.7 Secure the nitrogen cylinder and attach the grounding device to the tank or piping. Connect the nitrogen supply to the test fitting.

5.8 Plug the vents.

6. Test procedures

6.1 Open the nitrogen cylinder and regulate the delivery pressure to not more than 135 kPa. Pressurize the vapour recovery system. Maintain the flow of nitrogen until the pressure and flow stabilize, indicating that the temperature and vapour pressure in the tank have stabilized.

6.2 When the pressure reaches 2.49 kPa (254 mm water column, gauge), close the nitrogen cylinder valve and start the stopwatch.

6.3 At the end of each minute, record the gauge pressure.

6.4 At the end of 5 minutes, record the final test pressure.

6.5 Compare the final test pressure to the requirements in section 2.2.

To determine the minimum acceptable remaining pressure (P) for the intermediate values of the ullage space, interpolate between values in the table. For example, to calculate the minimum acceptable remaining pressure (P) for 4 500 litres ullage, use the values for 3 790 litres and 5 685 litres ullage, as follows---

(4 500 -- 3 790)

$$P = 1.62 + \frac{\quad}{(5\ 685 - 3\ 790)} \times (1.89 - 1.62)$$

(5 685 -- 3 790)

$$= 1.72 \text{ kPa}$$

Therefore, the minimum acceptable remaining pressure for 4 500 litres ullage is 1.72 kPa (175 mm water column, gauge).

7. Concluding the test

7.1 Carefully unplug the vents and allow any remaining pressure to escape.

7.2 Remove the test fitting.

7.3 Disconnect the nitrogen cylinder grounding device.

SCHEDULE 3 [ss. 3 & 4]

Effectiveness Test for the Vapour Recovery System of a Petrol Filling Station During Unloading of Petrol

1. General

This test procedure is used to determine the effectiveness of vapour recovery system in a petrol filling station by monitoring any petrol vapour released from the vent pipes during unloading of petrol from a regulated vehicle to a petrol storage tank.

2. Determination of compliance

The following requirements shall be complied with---

(a) any pressure readings recorded in sections 6.4 and 6.5 shall be lower than the pressure setting of the pressure/vacuum valves;

(b) any measured maximum vapour concentration in section 6.6 shall not exceed 100% of the lower explosive limit.

3. Principle and summary of test procedures

During petrol unloading from a regulated vehicle to a petrol storage tank, the pressure at the vapour side of the petrol storage tank is measured. To assess the effectiveness of vapour recovery, the measured values are compared with the setting of the pressure/vacuum valves installed in the system. Vapour leakage is monitored to ensure no leakage from the system.

4. Test equipment

4.1 Pressure gauge or manometer

Pressure gauge or manometer capable of measuring 0 to 7.84 kPa (0 to 800 mm water column, gauge), or the highest pressure setting of the pressure/vacuum valves installed in the system, whichever is higher, with scale reading of 0.01 kPa (1 mm water column, gauge).

4.2 Test fitting

Test fitting for connecting the pressure gauge or manometer to the vapour recovery system shall be installed at a position on the vapour side of the vapour recovery system between the petrol storage tank and the pressure/vacuum valve fitted to the vent pipe of the petrol storage tank. The position of the test fitting shall

be so selected to represent the highest pressure variation in the system.

4.3 Stopwatch

Stopwatch with accuracy to within 0.2 second for timing the measurement intervals.

4.4 Combustible gas detector

A portable hydrocarbon gas analyser with associated sampling line and probe using catalytic oxidation to detect and measure concentrations of combustible gas in air.

4.4.1 Safety

Personnel shall assume that the combustible gas detector will be operated in an explosive atmosphere and comply with all pertinent regulations.

4.4.2 Range

Minimum range of 0 to 100% of the lower explosive limit expressed as propane (0 to 21 000 ppm).

4.4.3 Probe diameter

Sampling probe with internal diameter of 0.625 cm.

4.4.4 Probe length

Probe sampling line of sufficient length for easy manoeuvrability during testing.

4.4.5 Response time

Response time to 90% of the final stable reading of less than 8 seconds for detector with sampling line and probe attached. The detector response time shall be equal to or less than 30 seconds.

5. Pretest procedures

5.1 Acquire the factory certified pressure settings of the pressure/vacuum valves fitted to the vent pipes connected to the vapour recovery system and check to ensure that they are working properly.

5.2 Initiate safety procedure. Blockade the work area. Eliminate identifiable sources of ignition.

5.3 Install the test fitting to the vapour recovery system and connect the pressure gauge or manometer to the test fitting.

5.4 Connect all the liquid and vapour pipes for unloading of petrol from the regulated vehicle to the petrol storage tank. For manifolded storage tanks, the tank with the shortest pipe length to the corresponding pressure/vacuum valve shall be selected for the testing.

5.5 Perform a visual inspection to ensure that the vapour and liquid connections of the vapour recovery system of the regulated vehicle and the petrol storage tank are completely inter-connected.

5.6 The quantity of petrol to be unloaded to the petrol storage tank shall be

of a full compartment of the regulated vehicle.

5.7 The ullage of the petrol storage tank before unloading shall be at a level such that the tank can receive all the petrol to be unloaded.

5.8 Calibrate the combustible gas detector with 2.1% by volume (21 000 ppm) propane in air for 100% lower explosive limit response. Calibration gas shall be traceable to the Standard Reference Materials of the National Institute of Standards and Technology, U.S.A.

6. Test procedures

6.1 Stop petrol dispensing from the petrol storage tank(s) in the system at least 5 minutes before the test.

6.2 Record the pressure gauge or manometer readings just before the unloading operation.

6.3 Unload the petrol in the regulated vehicle to the petrol storage tank. Start the stopwatch when the unloading begins and stop the stopwatch at the conclusion of the delivery.

6.4 Record the pressure gauge or manometer readings every 30 seconds during the unloading operation. Record any sudden change of pressure readings.

6.5 Continue to record the pressure gauge or manometer readings every 30 seconds for a period of at least 5 minutes after conclusion of the unloading operation. Record any sudden change of pressure readings.

6.6 Monitor possible vapour leak from any point of the petrol unloading and vapour recovery system including the pressure/vacuum valves using the combustible gas detector during the entire testing period, in accordance with the following procedures:

(a) Probe distance

The detector probe inlet shall be 2.5 cm from the potential leak source. The distance can be maintained during monitoring by putting a 2.5 cm extension on the probe tip.

(b) Probe movement

Move the probe slowly (approximately 4 cm/s). If there is any meter deflection at a potential leak source, move the probe to locate the point of the highest meter response.

(c) Probe position

The probe inlet shall be positioned in the path of the vapour flow from a leak so as to maximize the measured concentration.

(d) Leak checks

Leak checks shall be performed individually with a fresh air purge between each leak check. Each leak check shall have a duration of less than twice the instrument

response time (typically, less than 16 seconds). Longer leak checks are invalid. The probe must be purged with fresh air for more than 2 instrument response times (more than 16 seconds) between individual leak checks.

(e) Wind

Attempt to block the wind from the area being monitored.

(f) Recording

Record the measured maximum vapour concentration with the location for each leak being monitored.

6.7 Petrol dispensing from the petrol storage tank(s) may be resumed after the measurement in section 6.5.

6.8 Disconnect all the testing instrumentation from the vapour recovery system after the testing.

6.9 Compare the pressure readings recorded in sections 6.4 and 6.5 and the measured maximum vapour concentrations recorded in section 6.6 to the requirements in section 2.1.

Patrick LAU

Acting Secretary for Planning, Environment and Lands

4 December 1998

Explanatory Note

This Regulation provides that vapour recovery systems are to be installed to petrol storage tanks in petrol filling stations and to regulated vehicles so as to recover petrol vapour displaced from the petrol storage tanks during petrol unloading. The Regulation also specifies the certification procedures and the testing requirements to be complied with.