

LPG Association Code of Practice

LPGA COP No 2

Installation and maintenance of twin 45kg LPG cylinder systems

Issue by

***LPGA*Association**

OF NEW ZEALAND (INC)

FOREWORD

The performance of LPG cylinder installations is a critical element in ensuring that gas is supplied to appliances reliably and safely. This Code of Practice has been compiled with advice and input from across the industry in New Zealand and from international authorities. The Code of Practice captures the latest knowledge and design features gained from operating experience and investigative work conducted by the LPG Association.

The purpose of this Code of Practice is to
Assist with the reduction of phthalates from LPG systems.
Assist with the removal of condensate at the regulator.
Assist with the selection of suitable equipment and fittings.
Assist with recommendations on equipment maintenance.

It should be read in conjunction with NZS:5261 2003 . Sections of this Standard covering LPG cylinder storage are reproduced in sections 4.1 to 4.8 of this code.

It is intended that gas fitters will use this Code as a best practice guide for the installation and maintenance of domestic and commercial twin pack installations.

1. SCOPE, INTERPRETATION, DEFINITION AND GENERAL

1.1 Scope

This Code of Practice sets out the requirements for installation and servicing of domestic and commercial 45Kg twin cylinder LPG installations.

1.2 Definitions

For the purposes of this code the following definitions shall apply:

- Accessible:** Access can be gained without hazard or undue difficulty for repairs, testing, maintenance, renewal or operational purposes.
- Breather vent:** An orifice or opening designed to permit atmospheric pressure to act on the diaphragm of a regulator.
- Condensate:** The liquid that separates from the gas down stream of any regulator due to the reduction in temperature resulting from pressure reduction.
- Condensate trap (also known as a drip leg or tailpipe)**
A device installed in a gas line to trap the condensate liquid
- Enclosure:** A compartment, an enclosed area or a partitioned-off space primarily used for the installing of a gas cylinder meter, or gas pressure regulator.
- ERMA:** Meaning the" Environmental Risk Management Authority, establish under HSNO.
- Gasfitting:** Has the same meaning as in the **Plumbers, Gasfitters and Drainlayers Act 1976.**
- Gas load:** The total gas consumption of all downstream appliances.
- Gas Pressure Regulator:**
A device that automatically regulates the outlet pressure of the gas passing through it to a predetermined value.

Automatic Change-Over Regulator:

Combination valve / first stage gas pressure regulator, fitted to a LPG multiple-cylinder installation which will automatically change over from a cylinder in use to a reserve cylinder at a predetermined pressure. May be included in a one piece automatic changeover valve assembly comprised of automatic changeover valve, first and second stage regulators and may incorporate pressure relief or over pressure shut off capability.

HSNO: Hazardous Substances and New Organisms Act 1996.

LAB number: Number allocated by OSH when a cylinder is approved.

Lock-up pressure:

The maximum pressure in an installation when the regulator has closed and all appliances are shut down.

Non Return Valve:

A valve designed to operate automatically to prevent reversal flow in a pipe or fitting.

Phthalates: Plasticisers mainly DOP (DiOctyl Phtalates) predominantly found in hose inner liners.

POL fitting (Prest-O-Lite):

The common name given for a standard union with left hand thread, used for connection to a 45 Kg cylinder.

Pigtail: A short length of flexible tube or copper pipe completed with end couplings. Use for connecting the cylinder to the manifold or the changeover valve.

Pressure: Pressure as measured above atmospheric pressure, also called gauge pressure.

Twin cylinder installation:

A cylinder installation where the cylinders are connected separately to the system. Each cylinder is connected to a change over valve that can be operated manually or automatically, to change over the cylinder which is supplying LPG to the installation. Connection may be made using flexible rubber or copper pigtails, or pipe fittings.

REFERENCED DOCUMENTS.

Standards New Zealand (2003) 'Installation of Gas Burning Appliances and Equipment' NZS 5261:2003. Standards New Zealand, Wellington, New Zealand.

AS/NZS 1596 2002. The storage and handling of LPG.

AS 1869 1996.

UL144,

UL252,

AGA 205,

NF M 88-769

SECTION 2: SELECTION CRITERIA FOR LPG CYLINDERS, PIGTAILS, CHANGE-OVER VALVES AND REGULATORS

2.1 Cylinders

- (a) All cylinders must comply with the requirements of the Authority*.
- (b) Cylinders filled for use in LPG installations must be stamped with an LAB number and a current test date.
- (c) Consideration should be given to ensure that the demand of the appliances to be connected to the system can be supplied by a 45kg cylinder. As a guide a 45kg cylinder is capable of supplying a duty cycle of 1kg/50MJ over the period of 1 hour. The instantaneous demand can exceed this rate for short periods.

*Note: currently cylinders have to comply with the requirements of the Dangerous Goods Regulations and the Guide to Gas Cylinders. From 1 April 2004 the Requirements will be stipulated in the HSNO Regulations.

2.2 Pigtails

All pigtails should:

- (a) Have maximum extractable materials of no more than 2%,
- (b) Be manufactured to an appropriate Standard, such as AS 1869.
- (c) Be labeled as having "low extractable matters" if of flexible rubber construction
- (d) Be no longer than 1M

Pigtails may include an excess flow valve and/or a partial or full non-return valve

2.3 Changeover Valves

- (a) Changeover valves can be manual or automatic, and may include a non-return valve on each pigtail connection. The valve must comply with the requirements of the Authority.
- (b) Changeover valves may be comprised of a first & second stage regulator system in a single body, or as a combination of separate component items.

2.4 Regulators.

Regulators should be designed to cope with the presence of condensate found in small quantities in the LPG. This design can include such things as the specification of the material used for the components in the regulator and the serviceability of the regulator. Some regulators may consist of a separate first and second stage. For this type of system a condensate trap should be installed between the first and second stage regulator as described in 2.6.

2.5 First Stage Regulator

- (a) The first stage regulator can be part of the change over valve, or can be fitted separately.
- (b) The regulator must comply with one of the following standards: UL144, UL252, AGA 205, NF M 88-769, or other internationally recognized standard.
- (c) The regulator must comply with the requirements of the Authority.
- (d) The regulator and pigtails must be installed so that they are protected from weather and to prevent water ingress to the vent.
- (e) The vent terminal of the regulator should have provision to prevent the entry of any material that could cause a blockage.
- (f) A provision may be provided to connect a condensate trap down stream of the first stage regulator, where the first and second stage regulators are separate items (see 2.6 below).
- (g) Consideration must be given to the total expected gas load when sizing the regulator.

2.6 Condensate Trap

Condensate traps remove condensate and prevent transfer downstream of most condensates present in the LPG. A condensate trap should be installed between the first and second stage regulator if they are separate items. If the regulator is the combined type then a condensate trap should be installed immediately after the regulator.

- (a) Condensate traps must have a vertical limb in a direct line to the first stage regulator and be of a minimum volume of $V=N \times 5.5$ where:
V- The volume of the vertical limb in Milliliters (ml)
N -The number of 45kg cylinders.
- (b) The trap must have a plug or other means of removing the condensate.

Examples of length of condensate trap tube for 10 and 13 mm pipe and various numbers of cylinders.

Number of 45 kg cylinders	Length 10 mm pipe	Length 13 mm pipe
Two	140 mm	88 mm
Four	280 mm	180 mm
Six	370 mm	240 mm
Eight	560 mm	350 mm

2.7 Second Stage Regulator

- (a) The regulator must comply to an internationally recognized standard.
- (b) The vent terminal of the regulator should have provision to prevent the entry of any material that could cause a blockage.
- (c) The regulator can be fitted immediately after the condensate trap, or downstream (outdoors) closer to the first appliance.
- (d) Any incorporated pressure relief valve should start to discharge when the outlet pressure of the regulator rises at least 1kPa above set point. The relief valve should be of sufficient capacity to maintain a maximum downstream pressure in accordance with the requirements of NZS:5262 2003. The discharge capacity of the pressure relief valve on the full range of the inlet pressures should not be less than that calculated by the formula $Q= 6.5 DP$.

Where:

Q = Pressure relief valve discharge in liters per hour of air.

D = Diameter of regulator orifice in mm or 3, which ever is the greater.

P = Inlet pressure to the relief valve in kPa above the start to discharge pressure setting.

- (e) The lock-up pressure should not exceed 1.5kpa above the declared outlet pressure of the regulator.
- (f) The regulator must be able to be serviced in accordance with the manufacturers recommendations..

2.8 Over Pressure Shut Off (OPSO)

An OPSO device uses pressure containment as an alternative to pressure relief, to protect downstream equipment from hazardous pressures, or the failure of a regulator.

- (a) Any OPSO device must comply with an internationally recognized standard, and should isolate the gas supply in the event of an over-pressure situation being detected.
- (b) The OPSO device may be installed upstream of either the first or second stage regulators, and will protect downstream equipment from excess outlet pressure from the second stage regulator.

2.9 Non-return valves.

A non-return valve must be fitted either in each pigtail connection of the changeover valve, or as part of each pigtail. The non-return valve is to ensure that LPG cannot flow across the changeover system

2.10 Excess flow valves.

An appropriately sized excess flow valve must be fitted immediately after the outlet of each cylinder valve. The excess flow valve can be an integral part of the pigtail assembly.

SECTION 3: LOCATION OF CYLINDERS

3.1 Location of Cylinders

Cylinders and associated equipment should be installed external to buildings, except where AS/NZS 1596 permits.

3.2 Prohibited Locations:

Cylinders should not be installed in the following locations:

- (a) In an inaccessible location;
- (b) Under a stairway;
- (c) In a location where there would be no air movement across the cylinder;
- (d) Under a building, other than permitted in 4.5
- (e) In a position that would obstruct egress from a building;
- (f) Buried in the ground; or
- (g) Where damage is likely to occur, unless adequate protection is provided

3.3 Requirements for cylinder deliveries.

Cylinder installations should be located such that the delivery of gas can be made safely by one person without excessive manual handling or risk to customers property. In situations where the following conditions cannot be satisfied, other options such as locating the cylinders remotely and piping to the installation should be considered.

- (a) Cylinder installation must be designed to be capable of accommodating the size of cylinder intended for use.
- (b) A minimum distance of 600mm should be provided between front of the cylinder installation and other structures to allow adequate access for the cylinder delivery to be made.
- (c) The cylinder compound should be accessible by cylinder trolley.
- (d) Paths should have a minimum width of 600mm.
- (e) Steps should have a minimum of 2: 1 tread depth to tread rise. Maximum tread rise should be 125mm.
- (f) Steps should not exceed 1.5m total rise.
- (g) Paths should not exceed 20 deg gradients.
- (h) Total distance from cylinder delivery truck parking area and cylinder installation should not exceed 75m.
- (i) It must be possible to legally and safely park the truck while making the delivery.
- (j) Access route should be firm and compact even in wet conditions.
- (k) The access route should not be over delicate or decorative surfaces such as terracotta.

SECTION 4 INSTALLATION OF CYLINDERS

Clauses 4.1 to 4.8 taken from NZS 5261:2003, with permission of Standards New Zealand.

4.1 General

- (a) Cylinders shall be installed upright with the valve uppermost to ensure the inlet to the safety valve remains in the vapour space clear of the liquid content of the cylinder.
- (b) Clearances around cylinders shall comply with 4.6
- (c) Where two or more exchange cylinders are installed, a manual or automatic changeover valve shall be fitted immediately upstream of the regulator. This valve may be an integral part of an automatic changeover regulator.

4.2 Support

- (a) Cylinders shall not be supported by other cylinders.
- (b) Cylinders shall be installed on supporting bases that are firm, level, of non-combustible material, and with a finished surface that is drained and at least 50mm above the surrounding surface. Soil is not considered an acceptable supporting base.
- (c) All cylinders larger than 25L capacity shall be securely held in place by chains and brackets. The brackets shall be fastened to a wall or similar robust anchorage. The cylinder's fastenings must be capable of withstanding a steady applied load equal to four times the weight of the filled cylinder.

4.3 Cylinder Connection

- (a) Cylinders should be connected directly to the changeover valve assembly by copper or flexible rubber pigtails.
- (b) An excess flow valve shall be fitted immediately upstream of the piping or hose assembly. This excess flow valve may be an integral part of the POL fitting.
- (c) Pigtails connecting cylinders to changeover valves or manifolds should not exceed 1M in length.
- (d) A non-return valve must be fitted in the supply between each cylinder and the changeover valve, or in a manifold system, between each cylinder and its manifold connection.

4.4 Cylinders in an Enclosure or Recess

- (a) Where a cylinder is to be installed in an enclosure or recess, the enclosure or recess shall be designed to house cylinders and their associated equipment only and should;
 - (i). Allow free unimpeded discharge from each cylinder safety valve;
 - (ii). Ensure that water will not accumulate on the base;
 - (iii). Ensure the cylinder and its associated equipment is clear of the surrounding soil.
- (b) Enclosures of sheet metal or similar impervious construction shall have ventilation openings at the top and bottom, with each opening providing a free area of at least 20,000 mm² (200mm x 100mm) for every cylinder enclosed.

4.5 Cylinders under Buildings Supported on Piers

Where a cylinder is to be located under a building that is supported on a pier:

- (a) No part of the cylinder shall be more than 400mm inside the building wall perimeter;
- (b) The area between the piers shall be:
 - (i) open on at least three sides; or
 - (ii) enclosed by a construction through which cross-ventilation can occur (eg. slats or battens) on at least three sides; or
 - (iii) a combination of both items (i) and (ii) above

Where the area between piers is walled-in as a vapor-proof construction, the limitation of (a) still applies. See Figure 1 for further information.

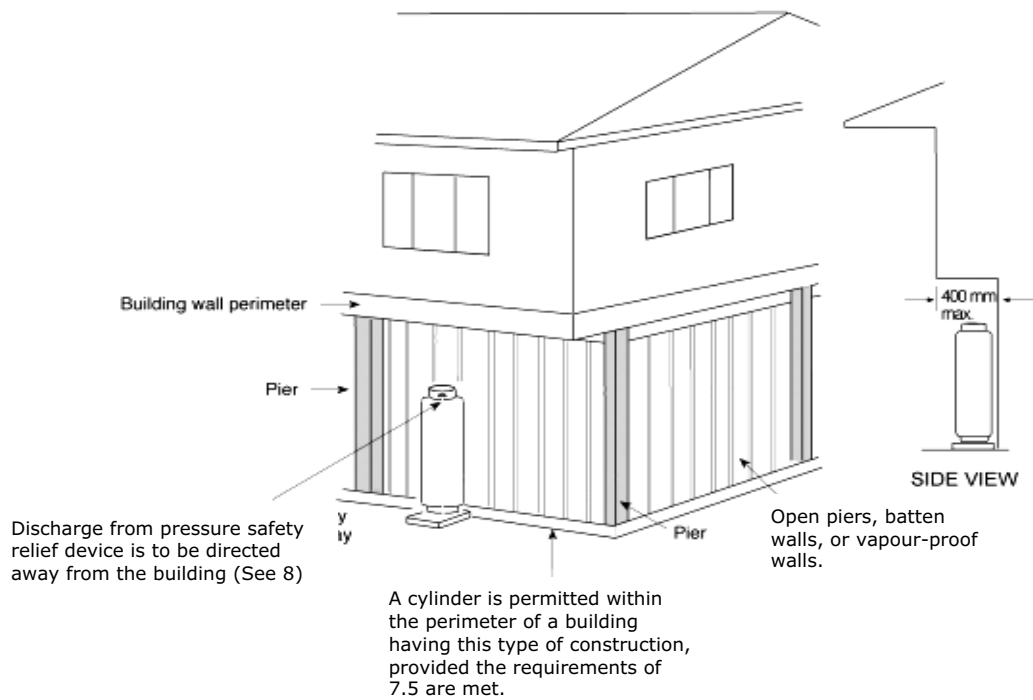
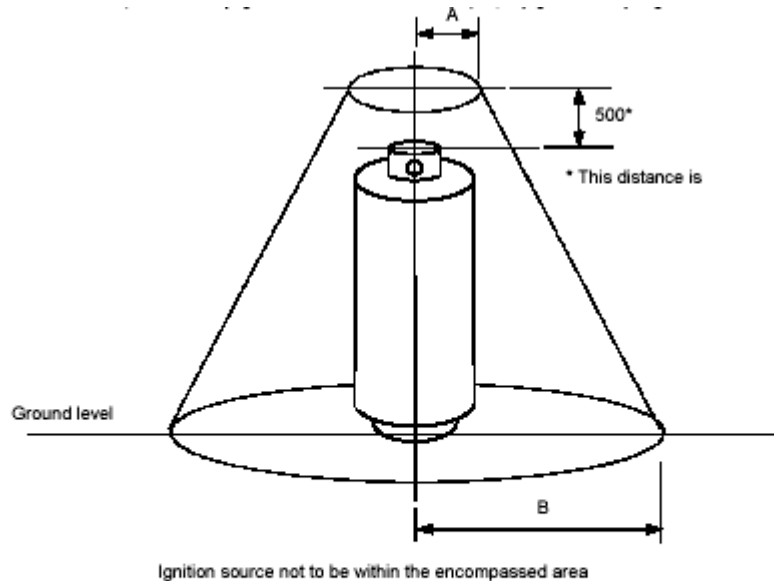


Figure 1 – Cylinder under a Building

4.6 Clearances around Cylinder

Cylinders should be installed with clearances complying with figure F2 and F3 and at least 1 metre from any readily ignitable material. Readily ignitable materials include paper, dry grass or oily substances.



	Exchange cylinder	In Situ Fill Cylinder
A	500	1500
B	1500	3500

Figure F 2 — Minimum Clearance to Ignition Sources (mm)

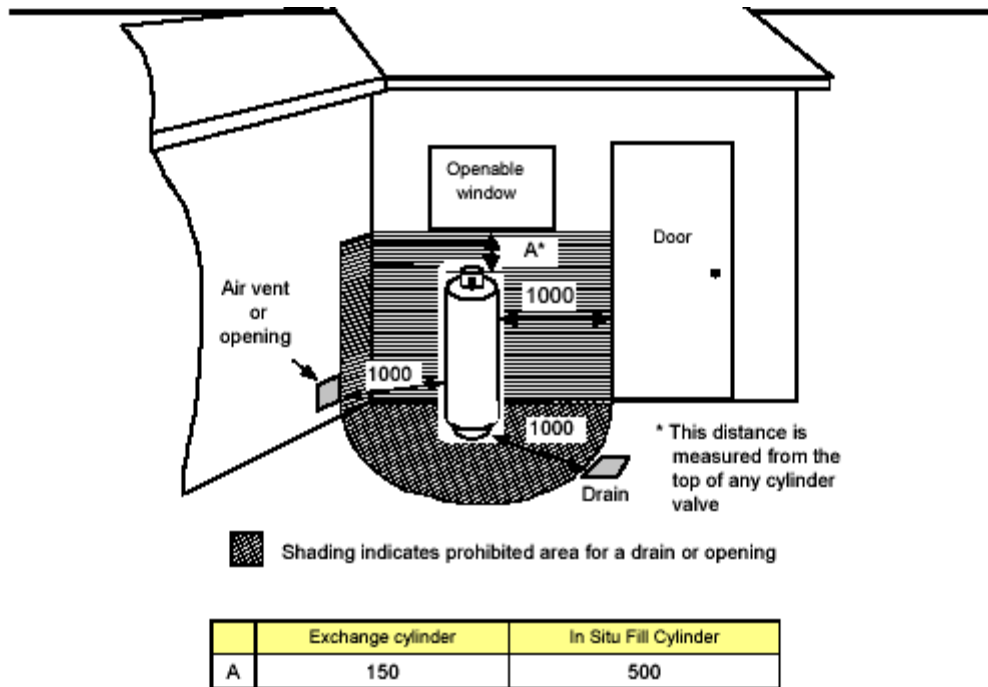


Figure F 3 –Minimum Clearance to a Drain or Openings into a Building (mm)

Taken from NZS 5261:2003, with permission.

4.7 Cylinder Safety Valve Discharge

The discharge point of the cylinder safety valve shall be directed away from any other cylinder, piping, building, drain and any opening into or under a building.

4.8 Regulators

First and second stage regulators should be located outside buildings, except where an indoor location is permitted by AS/NZS 1596.

First stage regulators should be:

- Rigidly fixed to an adequate support independent of the cylinder and mounted with the diaphragm vertical or horizontal and the vent pointing vertically downwards;
- Connected to the cylinder by pipe-work or pigtailed in accordance with NZS 5261 and 4.3.
- Protected from the entry and accumulation of water (eg. sprinkler water, rainwater etc) and other foreign matter.
- The minimum height of the first stage regulator above the cylinders valves should be 75mm.

4.9 Test Points

A pressure test point should be installed immediately downstream of each second stage regulator. Such test point may be an integral part of the regulator.

SECTION 5 MAINTENANCE OF TWIN LPG CYLINDER INSTALLATIONS.

5.1 Cylinders

Cylinders should not be filled unless they have been tested and certified within the last ten years.

5.2 Pigtails

- (a) Pigtails should be inspected visually for cracks and deterioration every time the cylinder is exchanged or filled.
- (b) Pigtail connections should be checked with a soapy solution every time the cylinder is changed or filled.
- (c) Pigtails should be replaced every five years.

5.3 Change-over Valves

Changeover valves should be checked for correct operation in accordance with manufacturers recommendations or in the absence of any recommendation, at least every ten years.

5.4 First Stage Regulators

- (a) The first stage regulator to be checked for correct operation in accordance with the manufacturers recommendations, or in the absence of any recommendation at least every ten years.
- (b) The condensate trap to be drained by removing the drain plug provided) at intervals not exceeding two years, and at every visit of the Gas fitter

5.5 Second Stage Regulators

The second stage regulator to be checked for correct operation in accordance with the manufacturers recommendations, or in the absence of any recommendation, at least every ten years. The rubber diaphragm and rubber seat must be inspected for deterioration and replaced if necessary.

5.6 Condensate Traps.

Condensate traps should be emptied whenever any work is carried out on the installation and at least every 2 years. **NOTE** For the quantities of residue expected to be found in the condensate traps, between 2 to 3 ml maximum, use disposable gloves when emptying the residue into absorbent material. The used absorbent material and the gloves can then be disposed of in general waste.