



FORKLIFT CYLINDER EXCHANGE

LPG guidelines

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Abbreviations	
AS/NZS:	Australia and New Zealand Standard
Cl:	Clause

Introduction

A leading Australian energy provider

In Australia, Origin is the largest energy retailer, offering customers market leading strengths and a depth of experience.

Origin LPG is a truly national LPG supplier, with significant operations in all states and territories. We also operate in New Zealand and the Asia Pacific.

Our network of LPG import facilities and seaboard terminals is unequalled by any other LPG supplier in Australia. Located from Cairns to Hobart, these facilities provide strategic points of supply to our customers.

Safety is our first priority

These guidelines have been produced by Origin to provide you with an overview of the common methods and procedures used for handling, storing and exchanging forklift cylinders.

The information in these guidelines can help protect the health and safety of yourself, your employees and your customers.

While this information is based on Origin's extensive experience in the LPG business it does not take precedence over any statutory requirement or company health, safety and environmental procedures. Although every care has been taken in compiling these guidelines, it is reliant on the information available to Origin at the date of this release. While Origin believes the information to be correct, it is not in a position to warrant its accuracy or to anticipate every circumstance in which the information might be used. In addition, the law and standards may have changed since the date of this release. Accordingly, you are cautioned to make your own determination of the veracity and suitability of these guidelines to your own circumstances and to obtain independent advice relevant to those circumstances.

These guidelines may be amended by Origin from time to time. They are not to be copied or modified without Origin's prior written consent. For additional details or clarification please contact your Origin Account Manager or call 134 GAS (134 427).

About these guidelines

The task of exchanging LPG cylinders for forklifts may be performed only by persons who are appropriately competent to do so. There are two types of cylinders fitted to forklifts, one is the permanently mounted type and the other, and more common, is the removable cylinder type.

These guidelines should be used in conjunction with AS/NZS 1596 and any other relevant instruction issued by regulatory authorities.

1.0 Safety precautions

1.1 General safety precautions for exchanging cylinders

Note: Filling of portable LPG cylinders at an automotive refuelling station is dangerous and prohibited (AS1596 CL11.12.5). Filling of forklift cylinders at automotive filling stations is restricted to cylinders that are installed on the forklift and are filled through an Automatic Fill Limiting (AFL) valve.

- 1.1.1 No smoking in the cylinder exchange area.
- 1.1.2 Turn off the ignition on the forklift. Turn off all electrical equipment (mobile phones, pagers, radios, etc.) as they may provide an ignition source.



- 1.1.3 Spare cylinders must be stored outdoors or in a well ventilated area.
- 1.1.4 When removing a cylinder from, or fitting a cylinder to, a forklift vehicle ensure that the LPG service valve on the cylinder is turned off before disconnecting or reconnecting service line.



- 1.1.5 Personnel handling LPG must wear:
 - thermal protective gloves when connecting or disconnecting LPG service line;
 - safety eye wear when connecting or disconnecting LPG service line;
 - long sleeved shirts and long trousers made from natural materials (non synthetic); and
 - appropriate closed-in footwear.



Note: All staff supplied with protective clothing and safety equipment have a responsibility to themselves and their fellow workers to use this equipment correctly and to keep it in an operative condition.



- 1.1.6 Forklift cylinders are not to be transported in enclosed vehicles.

Note: Enclosed vehicles include enclosed trucks, taxis, buses, and other public transport, private or business vehicles of any kind (whether windows are open or not) where the cylinder is not located substantially in open air.



1.2 Safety Data Sheets

- 1.2.1 Safety Data Sheets (SDS) provide the information needed for the safe handling of hazardous substances. These may be obtained from the Origin website at originlpg.com.au.
- 1.2.2 The SDS provides:
- information needed for the safe handling of a hazardous substance;
 - the physical description of the product;
 - health hazard information;
 - precautions for use;
 - personal protection information;
 - actions in the event of an LPG emergency including first aid information; and
 - contact information.

2.0 Product knowledge

2.1 Liquefied Petroleum Gas

LPG is derived principally from two sources. It is separated from crude oil or natural gas as it leaves the wells, or it is produced from crude oil distillation in the normal refining process. In Australia, LPG is usually propane or butane or a mixture of both. Propane is used for residential and commercial burners. Butane is also mixed with propane to produce Autogas. Butane is sometimes used for commercial/industrial purposes.

It is important not to use butane or Autogas on appliances designed to burn propane and vice versa, without obtaining expert advice on such items as jet sizes and regulator pressures, which may require replacement or adjustment.

2.2 Characteristics of LPG

2.2.1 Physical properties

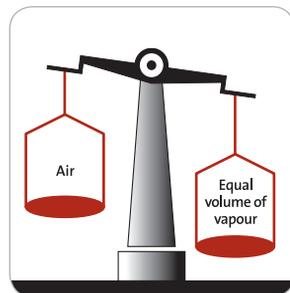
LPG is a colourless liquid when stored under pressure. It is odourless in its natural state. Odourant is added as a safety measure to give the liquid and vapour the characteristic gas smell to aid in the quick detection of leaks.

Other physical properties are printed in the LPG Safety Data Sheet (SDS). Refer to Section 1.2.

2.2.2 Vapour density of LPG

Propane has a vapour density of 1.5 compared to air which has a vapour density of 1.0. LPG vapour is heavier than air and, therefore, any LPG escape will flow downwards and may accumulate in low-lying area and be slow to dissipate without ample ventilation and air movement.

If an LPG vapour or liquid leak occurs, the greatest danger is at or near ground level, where the vapour will gravitate to all the lower levels, particularly downwind of the leak. LPG liquid is approximately half the density of water and, therefore, any escape may flow across water before vaporising.



2.2.3 Toxicity

LPG is not poisonous or toxic but vaporised LPG when released into confined spaces can cause mild anaesthesia, headaches, nausea or dizziness. Avoid breathing vapours and mists. It can cause asphyxiation due to the exclusion of oxygen. Deliberate misuse can adversely affect the central nervous system, including confusion and a lack of coordination. All LPG filling installations are required to be well ventilated by being open on at least 2 sides.

2.2.4 Freeze burns

Propane or butane liquid in contact with the skin can cause serious freeze burns (see Section 3 – First aid). Approved thermal protective gloves, safety eye wear, non synthetic long sleeved shirt, trousers and appropriate closed-in footwear must be worn when handling LPG to protect against freeze burns.

2.3 Pressure and temperature influences on LPG

LPG vapour, when compressed sufficiently, will change from a vapour to a liquid. Similarly, when vapour is cooled at atmospheric pressure to below its boiling point of -42 Degrees Celsius it will also liquefy.

As the temperature of the LPG in the cylinder varies in line with changes in ambient temperature the pressure inside the cylinder also varies. Temperature increases will cause the pressure to increase, decreases in temperature will cause the pressure to decrease. As vapour is drawn from the cylinder, the resultant lowering of the pressure in the cylinder causes any remaining liquid to give off more vapour to restore the pressure in the cylinder.

The expansion ratio of LPG is 1:270. This means that one litre of liquid, if vaporised, will occupy a volume 270 times greater than one litre of its liquid state.

Note: Leaking liquid is extremely hazardous due to its large and sudden expansion to vapour.

2.4 Equipment freeze

As LPG liquid expands to vapour it can cause surrounding temperatures to drop rapidly. This temperature drop can cause water vapour present in the air to form ice on an open valve, causing it to freeze over and may even close off the valve opening, thus giving a false impression of the state of the system.

2.5 LPG vapour cloud

On vaporisation, LPG itself is invisible. However, the escape of LPG liquid promotes condensation of water vapour from the air, and this makes the resulting vapour cloud adjacent to the discharge point visible. Consequently, on very hot dry days the vapour cloud from a liquid escape might not be so readily visible.

2.6 LPG flammability

LPG vapour, which is heavier than air, can combine with up to 50 times its own volume of air to form a flammable mixture.

LPG vapour / air mixtures ranging between 2 and 10% concentration of LPG are flammable. If such a mixture of LPG and air is ignited, it will flash back to the source of escape; and if ignited in a confined space it will explode.

2.7 Characteristics of LPG storage cylinders (vessels)

LPG is stored as a liquid under pressure in specially designed cylinders.

An important characteristic of all LPG cylinders is that they are designed to never be completely full of liquid. They must **never** be over-filled (see paragraph 2.8). An adequate vapour space must always be maintained above the liquid. This vapour space allows for expansion of liquid caused by temperature change, such as occurs when the cylinder is exposed to strong sunlight. The pressure is not affected by the amount of liquid in the cylinder, as long as there is adequate vapour space, but is affected by the temperature of the liquid within the cylinder. The maximum standard filling level for propane cylinders is 80%.

LPG exchange cylinders for forklifts are fitted with a liquid level/bleeder valve.

The liquid level/bleeder valve:

- indicates when the liquid level in the cylinder reaches 80%; and
- releases the vapour from the cylinder to allow the flow of liquid when filling by decanting.

The liquid level/bleeder valve is also known as:

- ullage gauge or valve;
- bleeder valve or screw; or
- fixed liquid level gauge.

Forklift cylinders fitted with AFL valves are intended to remain installed on the forklift and be filled by pump.

Most of the LPG storage cylinders used are designed for propane. Whilst butane can be stored in propane cylinders, propane must not be stored in cylinders designed for butane.

2.8 Dangers of over-filled LPG cylinders

When an LPG forklift cylinder is over-filled any rise in ambient temperature will cause the pressure in the cylinder to increase as the liquid expands. This increase could cause the cylinder pressure relief valve to discharge LPG if excessive pressure has developed in the container.

The relief valve will continue to discharge LPG until the pressure inside the cylinder drops to below the relief valve setting. This opening and closing action may occur many times before the liquid level falls sufficiently to provide adequate vapour space inside the cylinder for the existing temperature conditions. Ignition of the gas being discharged could cause a serious fire emergency or explosion.

3.0 First aid

This section outlines the actions to follow whenever someone comes into contact with liquid LPG.

Contact temperatures are usually below -30 Degrees Celsius and tissue contact at this temperature results in snap freezing of the affected area causing damage similar to a heat burn.

Contact with equipment at below zero temperatures can cause the skin to stick fast and the flesh may be torn. Direct bodily contact with LPG liquid must be avoided.

3.1 Immediate treatment

- 3.1.1 If possible, remove any affected clothing contaminated or splashed with liquid LPG not adhering to the skin, and place the injured person in a warm area.
- 3.1.2 Immediately bathe the affected area with large quantities of warm water for at least 15 minutes to bring the affected areas back to normal body temperature.
- 3.1.3 If possible have the injured person gradually move the injured area to re-establish / maintain circulation to assist in the re-warming process..
- 3.1.4 Seek immediate medical attention for all but superficial injuries, Advise the hospital / doctor of the injury (e.g. freeze burn, inhalation, etc.).

Note: If the affected area re-warms too rapidly, further damage may be caused to the tissue. Do not apply direct heat or cold such as heat lamps, hot water, or ice to affected parts. If warm water is not available, tap water will suffice, but be careful not to cause cooling.

- 3.1.5 In cases involving inhalation, remove the contamination source and move the injured person to fresh air. Ensure airways are clear. A qualified person should give oxygen through a face mask if breathing is difficult
- 3.1.6 Eyes: Immediately wash with clean luke warm water for 15 minutes.

Note: Record the incident in line with your internal company incident reporting system. For other advice, the Poisons Information Centre may be contacted on 13 11 26 (in Australia).

4.0 Storage requirements

4.1 Cylinder storage

(AS/NZS 1596: Section 4.5)

Cylinders that are empty but not gas freed and cylinders that have been refilled shall be stored in accordance with the following additional requirements:

- the outlet valve shall be kept closed or the cylinder opening plugged; and
- cylinder pressure relief valve must always be in the vapour space of cylinder. That is in the uppermost position when in the horizontal position in a rack or at the top when in the vertical position on the ground. Cylinders must not be stored in the up-ended position.

4.2 Minor storage requirements

(AS/NZS 1596: Section 2)

Indoor storage of gas cylinders shall be avoided wherever possible. Where it is impractical to provide outdoor storage, seek advice from your Origin Representative or a licensed gasfitter.

Minor storage limits for various types of building occupancy are set out in Table 2.1 of AS1596.

The following information on keeping cylinders indoors in factories and warehouse applications is for guidance only:

- The total capacity of gas in cylinders allowed shall include cylinders in use, spare cylinders not in use, and used cylinders awaiting removal.
- The total capacity of gases kept shall not exceed 45kg per 50m² up to a maximum total quantity of 180kg per occupancy.
- Cylinders shall be kept upright in a well-ventilated area, away from any flame or heat or other ignition sources (minimum distance to fixed ignition sources is 1.5 m).
- Cylinders shall be protected from excessive temperature rise.
- Cylinders shall be protected from physical impact, and from dislodgement.
- Cylinders stored indoors shall be stored upright and separated from other stored gases or dangerous goods by a minimum distance of 3 metres and kept clear of combustible matter and refuse for a distance of not less than 3 metres.
- Cylinders shall be stored with their valves closed when not in use.
- Where cylinders are kept inside a building or confined area, that building or confined area shall be adequately ventilated at both high and low levels relative to the floor by natural air movement or the equivalent.

- Cylinders and their fittings shall be inspected for leaks when connected and prior to their first use e.g. by using a non-corrosive soap and water solution, detergent solution or leak detection fluid to detect leaks at all joints and fittings.

CAUTION: The ammonia present in some soaps and detergents can react with brass fittings and cause such fittings to crack after a short period of time. Caution should therefore be exercised when using soap solutions on brass fittings, and all connections should be rinsed thoroughly with fresh water as soon as possible after the application of the soap solution.

4.3 Separation distances

(AS/NZS 1596: Section 4.5)

Cylinders (other than minor storage) shall be stored in accordance with all relevant requirements (see section 4.5 in AS1596). Cylinders stored in the open shall be located at the distances as per the following requirements:

- in accordance with separation distances stated in Table 4.1 of AS1596.
- a cylinder shall be not less than 1 metre horizontally away from an opening into a building, and shall be outside of any building that is not used solely for storage of gas cylinders;
- a cylinder shall not be stored within 1.5m of a fixed ignition source. These include electrical equipment that is not certified for use within flammable zones;
- the distance between any cylinder and any above-ground LPG storage tank or flammable liquid storage that exceeds 250 litre capacity shall not be less than 3 metres; and
- cylinders shall not be stored within any compound (bunded area) for flammable liquid storages.
- in a location that is not liable to physical damage, tampering, or excessive temperature rise. (This does not prevent cylinders from being stored without shelter).
- the standing area shall comply with the requirements of clause 4.5.2 (b).

4.4 Fire Protection

Table 13.1 in AS1596 sets out the fire protection requirements for LPG cylinder storage.

4.5 Security

Forklift cylinders should be stored in a secure location to prevent unauthorised access.

4.6 Notices

Additional signage may be required dependant on the quantity of LPG stored. Check with your local State regulations for particular requirements.

5.0 Exchanging forklift cylinders

Note: Filling of portable LPG cylinders at an automotive refuelling station is dangerous and prohibited (AS1596 CL11.12.5). Filling of forklift cylinders at automotive filling stations is restricted to cylinders that are installed on the forklift and are filled through an Automatic Fill Limiting (AFL) valve

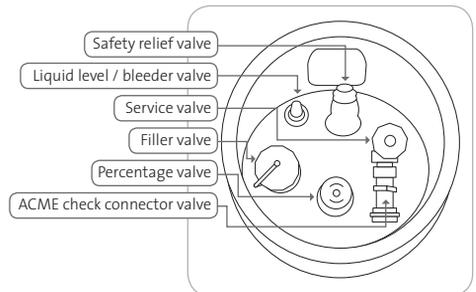
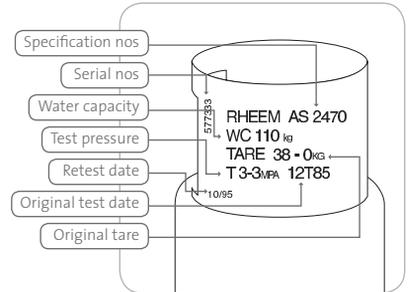
5.1 Inspection of cylinder before exchanging

5.1.1 Forklift cylinders must comply with the following requirements or they must not be used:

- the period from the last stamped test date must not be more than 10 years;
- the cylinder must appear to be in good condition and not have dents, gouges or be badly corroded. (If in doubt, leave segregated from other cylinders and request the supplier to pick up on next visit);
- cylinder valves must be in good condition; and
- safety relief valve (SRV) must not be damaged, corroded or blocked by foreign material.

5.1.2 Cylinders must comply with AS 2030.1, AS 2469 or AS 2470 and have the following markings:

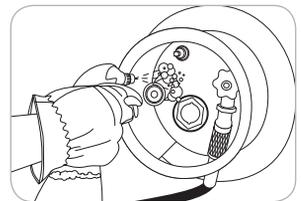
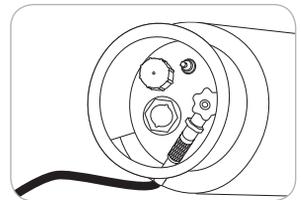
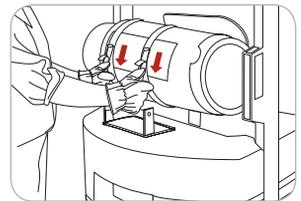
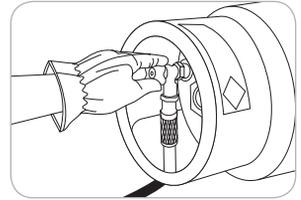
- manufacturer's mark/serial number;
- specification number;
- water capacity (WC);
- original tare mass;
- original, and any subsequent test date; and
- test pressure of 3.3MPa (480psi) or greater.



5.2 Exchange procedure

- 5.2.1 No smoking or naked lights within exchange area.
- 5.2.2 Switch off forklift ignition, apply handbrake and turn off all electrical equipment (mobile phones, pagers, radios etc.). Do not remain on the forklift or vehicle during the exchange operation.
- 5.2.3 Put on thermal protective gloves.
- 5.2.4 Turn off service valve and loosen the female ACME coupling from the service valve and carefully disconnect the forklift service hose from the cylinder. A small amount of liquid trapped between the two check valves will escape.
- 5.2.5 Unclip and remove the cylinder from forklift, using correct manual handling techniques (such as squatting or lowering the empty cylinder to the ground with one or two person lift as appropriate), and place on the ground or in a rack.
- 5.2.6 Using correct manual handling techniques, refit the full cylinder into brackets on forklift (with a two person lift or use mechanical assistance if available) and secure bracket clips. Ensure cylinder is in the correct alignment with the pressure relief valve in the uppermost position.
- 5.2.7 Ensure the service valve on the forklift cylinder is still turned off. Reconnect the forklift service hose by connecting it to the ACME check connector on the cylinder service valve.
- 5.2.8 Turn on service valve slowly.
- 5.2.9 Check for leaks around all the cylinder fittings with leak detection solution.

Note: Forklift cylinder exchange shall only be performed by trained operators.



5.3 Manual handling of forklift cylinders

It is recommended that the following steps be used to handle forklift cylinders, however, a site manual handling risk assessment should first be carried out for the task on the site to assess the suitability (and a record is to be kept).

Steps

Release the clamps holding the cylinder. Do not tilt the cylinder towards you before unlocking the clamps as the cylinder can fall out.

Position your body close to and facing the forklift to eliminate the need for twisting.

Unload the cylinder using safe manual handling techniques such as squatting or lowering the empty cylinder to the ground (one or two person lift as appropriate) or with one hand, while resting your free hand on your forward knee.

Keep your back straight.

To load a full cylinder on the forklift, it is recommended that two persons lift the cylinder into place or use mechanical assistance if available.



6.0 Emergency procedures

6.1 LPG leak

- 6.1.1 Shut all valves if possible.
- 6.1.2 Isolate electricity and ignition sources.
- 6.1.3 Keep bystanders and vehicles away.
- 6.1.4 No smoking – no naked lights.
- 6.1.5 No engine to be started.
- 6.1.6 Keep upwind of leak.
- 6.1.7 Use fire hose on fog pattern in the area of the vapour cloud to disperse the gas cloud. Note: stand upwind of the leak. Do not spray water on to the cylinder as this may increase the leak.
- 6.1.8 Phone the emergency services if necessary on 000 (if in doubt, phone the emergency services).
- 6.1.9 Telephone Origin on 1800 808 526.

6.2 LPG fire

Note: Do not extinguish the flames if the valves cannot be safely closed. If fire cannot be quickly extinguished, evacuate the local area and call the emergency services on 000.

- 6.2.1 Raise the alarm and keep bystanders and vehicles away
- 6.2.2 Shut all valves, if possible, and hose with water spray to keep tank or cylinders cool. Approach the cylinder from the upwind side.
- 6.2.3 Do not extinguish the fire unless by doing so you can shut valves to shut off fuel supply to the fire.

The basic rule for LPG fires, therefore, is to control the leak before putting out the fire.

The only time you would break this rule would be if putting out the fire first enabled you to control the leak. This would be done by using a dry powder extinguisher and only if immediate access to isolating valves can be gained to stop the LPG flow.

When sufficient water is not available to keep the cylinder cool, some warning of increased pressure may be noted from an increase in the volume of the fire or from an increase in the noise level of the discharge from the safety relief valve.

This should be a signal to consider withdrawal of all personnel to a safe area, i.e., at a distance of at least 70 to 200 metres from the site of the fire.

- 6.2.4 Telephone Origin on 1800 808 526.

7.0 How to contact Origin

Customer service e-mail **134 GAS (134 427) or call your account manager**
enquiry@originenergy.com.au
Postal address **GPO Box 1199, Adelaide SA 5001**



LPG orders
Telephone **133 LPG (133 574)**
Website **originlpg.com.au**

Emergencies or leaking gas 1800 808 526

Your Origin Representative: _____

Origin Representative phone number: _____

Date: _____

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