

GOOD INDUSTRY PRACTICES

Guide to Good Industry Practices

LPG Consumer Safety



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1.0 Background

The WLPGA is committed to providing independent advice to LPG stakeholders to ensure safety in the operation of LPG equipment. The two WLPGA publications – *Guidelines for Good Business Practices* and *Guidelines for Good Safety Practices* - have been used extensively during the last two decades, all over the world, to provide guidance across key areas of the LPG industry.

These two Guidelines have been designed to provide general advice to all stakeholders on good industry practices throughout the supply and distribution chain.

Following the success of these Guidelines it was decided to develop and publish more detailed advice in certain areas of the LPG business that are considered more critical and where more prescriptive advice would be helpful.

The first of these was the *Guide to Good Industry Practices for LPG Cylinder Management*, which addressed the life cycle of an LPG cylinder from acquisition through to disposal. Others Guides that followed included various topics including *Guide to Good Industry Practices for LPG Cylinder Filling* and *Guide to Good Industry Practices for LPG Cylinders in the Distribution Channel*.

This latest *Guide to Good Industry Practices for Consumer Safety* examines the important issue of ensuring the consumer who is using LPG, either through cylinders or a piped metered supply, does so safely and with minimum risk.

Almost 50% of the total global demand for LPG is consumed in the domestic sector where it is used as a primary fuel for cooking, and water and space heating. Many reported LPG incidents occur at the end user side which is invariably traced to lack of safety awareness.

Minor incidents can lead to tragic consequences if end users are ignorant of emergency handling procedures. This Guide focuses on describing the key safety messages are need to be delivered, and how LPG suppliers and distributors can communicate those safety messages to the domestic, or residential consumer. The Guide also includes a section on how to deal with emergencies if they occur.

The Guide includes a description of the important physical properties and characteristics of LPG that have an impact on the safe storage, handling, distribution and use of the product, and the critical messages that need to be communicated to the consumer.

The information in this document, which was drafted in 2020 during the COVID-19 pandemic, has been adopted from globally recognised LPG Standards and Codes of Practice, as well as using best practices from major LPG distributors and LPG equipment manufacturers.

It is recommended that the guidelines included here be applied in conjunction with any local laws or regulations to enhance the overall safety performance of the LPG business.

This document is a guide and not a standard. This guide does not supersede any code, standard or regulation that has been adopted by any country or local jurisdiction. However, the information in this guide may be useful to individual countries or companies where such codes, standards or regulations do not already exist. In those cases, consideration may be given to making some of this advice mandatory.

2.0 Objectives of the Guide

The LPG industry has a long history of being safe. From the oil and natural gas well heads and crude oil refineries, where the LPG is produced, through the entire distribution channel where it is ultimately delivered to the consumer in cylinders, or through a metered supply.

Small LPG cylinders are commonly made from steel containing LPG in liquid form. If the LPG were visible the consumer would see something that resembles water inside the container. Once the valve on the appliance is opened the pressure drops, the liquid boils, and produces energy in an invisible, gaseous form.

For a consumer who has been used to using traditional fuels - like wood, charcoal, and coal – the switch to using an invisible gas could not be more different.

The objectives of this Guide are to describe the consumer proposition for domestic LPG and provide a toolbox of information and materials to support suppliers and distributors of LPG in the domestic sector with everything they need to ensure the safety of the consumer when they use LPG.

The Guide includes some facts about how LPG is being used in the global domestic sector. The properties and characteristics of LPG are explained, particularly those that have an impact on the safe storage, handling, distribution and use of the product, from supplier, through the distribution chain to the consumer. The key characteristics of the domestic sector are described, especially in the context of who owns, and is responsible for, the assets. Examples of how the safety messages are communicated are provided.

Typical equipment that is used in the LPG domestic sector - cylinders, valves, regulators, hoses, and appliances - are also described, together with the most important safety features that protect the consumer. Basic information on how to care for the equipment is also included.

There is a section on the different ways LPG is received by the consumer including home delivery, metered supply, consumer collects and 'pay as you go' using smart meters.

Checklists are included that describe the do's and don'ts for the consumer together with advice on what to do if there is an emergency.

Finally, there are links to, and examples of, material that has been used to target the consumer at the point of sale that provides advice to both delivery personnel, and the domestic LPG consumer. Where it is available, this material is included in a format that enables copying and use across global markets.



LPG cylinder, regulator, hose and appliance – Lanka Gas, Sri Lanka

3.0 LPG as a Domestic Fuel

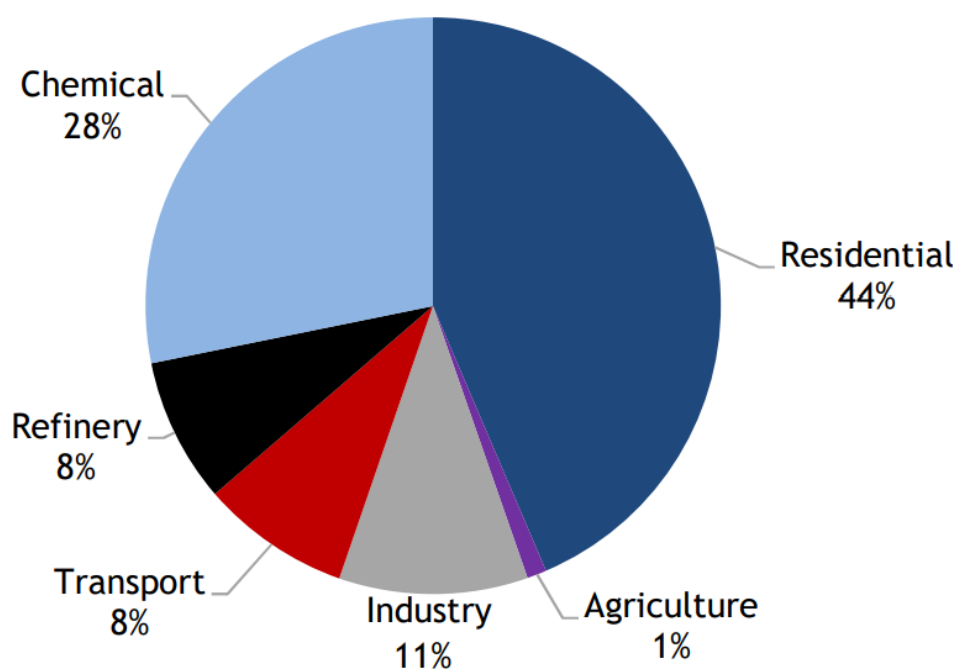
3.1 LPG – The Global Picture

LPG is a by-product from oil and natural gas production and the crude oil refining process. LPG supplies have been growing at around 3 to 4%/year over the last decade and now exceed 320 million metric tonnes (MT)/year. Even during the COVID-19 pandemic demand for LPG in the domestic sector has been resilient demonstrating the essential nature of the product.

LPG also has hundreds of applications across the industrial, commercial, agricultural, transport and chemical sectors but it is in the domestic or residential sector where it is used most. Nevertheless, the messages contained in this guide can be applied in other sectors, particularly the commercial sector.

LPG is ideally suited for use as a cooking fuel. It is portable and burns with a hot, and easily controlled, flame. The low carbon footprint of LPG allows it to burn with low emissions, and virtually no particulate matter (PM - black carbon or soot). Unlike cooking with wood, utensils are left free of any soot deposited underneath when used over an LPG flame.

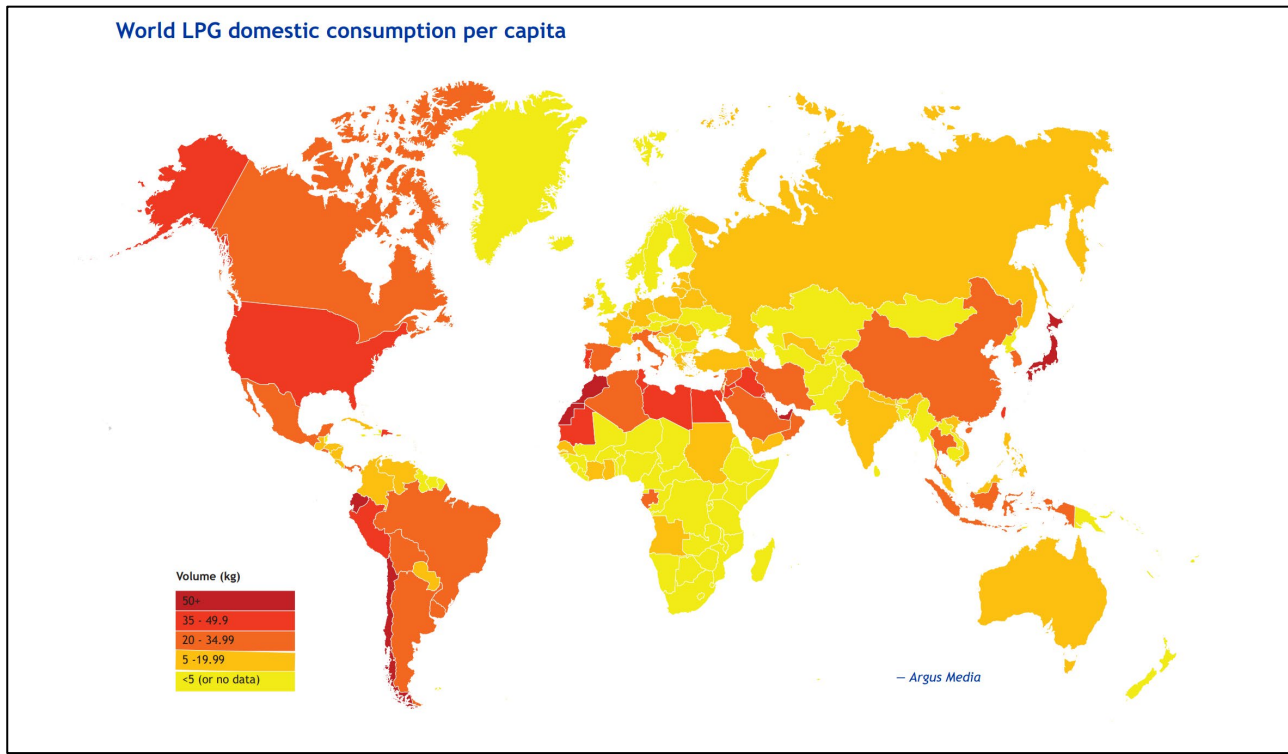
LPG consumption by sector, 2019



Global LPG demand by sector - WLPGA Global Statistical Review of LPG 2020, courtesy - Argus Media

The total demand for LPG in the domestic sector is around 44% of total global demand. One of the common measurable parameters of LPG usage is the per capita domestic consumption per year in kilograms. On a country basis this varies from virtually nil to over 60kg per person per year.

A heat map produced by Argus Media illustrates this well, with countries having near zero consumption per capita shown in yellow (most of sub-Saharan Africa), through to pink and red (the Americas and North Africa), where the figures can exceed 50kg per person per year.



Global heat map showing per capita LPG consumption by country – courtesy Argus Media

Parts of Asia also have very low levels of per capita consumption but some of the Asian countries, such as China and India, have very large populations, creating enormous opportunities for growth.

Penetrating these low consumption countries with LPG necessitates displacing some of the dirtier traditional fuels such as wood, charcoal, coal (briquettes), animal waste and kerosene. This presents its own challenges, not least to educate consumers that have been used to using these traditional fuels to transition safely to a gaseous fuel with totally different igniting and burning characteristics.

It is not just for these billions of potential consumers of LPG that this guide has been developed, it is also for the billions of existing domestic users of LPG that need to be vigilant to ensure LPG continues to be used safely.

3.2 Key Properties and Characteristics of LPG

Some Key Properties and Characteristics of LPG

- LPG in gaseous form is twice as heavy as air and any leaks will fall to the ground
- LPG in liquid form is half the density of water and so a full LPG cylinder will float in water
- LPG cylinders must always be carried and stored in an upright position
- When released, LPG in liquid form can cause severe cold burns to the skin
- LPG leaks may be ignited some distance from the point of escape
- LPG leaks can be detected by a 'rotten egg' smell
- The flame can travel back to the source of the leak
- An LPG flame is extremely hot
- LPG appliances require good ventilation for complete combustion
- Empty LPG cylinders may still contain LPG vapour and be potentially dangerous
- LPG is not poisonous but can cause asphyxiation

LPG consists of Propane or Butane or mixtures of the two. Propane has a much higher vapour pressure and therefore all Propane pressure vessels are built to a higher specification. The vapour pressure of LPG increases with temperature and although LPG cylinders are designed to withstand high pressures they should be protected from extreme heat.

LPG in its natural state is colourless and odourless. An odourising agent is added before distribution to give it its characteristic smell.

In liquid form LPG has a density of around half that of water. Because of the density difference a full LPG cylinder will float in water. This is an important characteristic if LPG cylinders are being used in flood prone areas because they will float away if not secured properly causing serious damage to the hose connecting the regulator to the appliance.

Valves must always be closed when the cylinder is not in use to prevent accidental leaks from appliances and hoses or tubing.

LPG vapour is heavier than air so any leaks will fall to the ground and not dissipate into the air like natural gas. LPG should not be stored in cellars or basements where leaks will be unable to be dispersed. When storing LPG cylinders care must be taken to allow for any leaks to dissipate at low level. Avoid locating any ignition sources (electrical switches power outlets) at low level in the event of leakages.

Another important characteristic of LPG is its ability to store large amounts of energy in liquid form. When LPG in liquid form boils and produces vapour the amount of vapour is more than 270 times greater than in its liquid state. This enables large amounts of energy to easily be transported to reach remote rural areas. This characteristic also means liquid leaks of LPG are more dangerous than vapour leaks and must be handled accordingly.

LPG cylinders must always be stored in a vertical position to avoid the liquid contents being in contact with the valve which is located on top of the cylinder. Because LPG cylinders are never filled to capacity (liquid full) any leak around the valve thread, pressure relief valve or the valve itself will be limited to a vapour leak if the cylinder is in an upright position.

One of the properties of LPG is that it burns in a very narrow fuel/air range. The flammable limits of LPG in air are between 2% and 10%. If the concentration of LPG is outside of these limits it will be difficult to ignite. This requires an appropriate design of ignition (e.g. a piezo electric igniter, or a match, when igniting the flame manually). Consumers should be aware of this because repeated attempts to unsuccessfully ignite the flame may result in an accumulation of unburnt vapour. If this occurs the unburnt vapour should be dispersed before trying to ignite the gas again.

At typical ambient temperature (i.e., around 15 degrees Celsius), Propane and Butane exert the following approximate pressures on the pressure vessel. Commercial Propane 7 bar (100psig), and commercial Butane 2 bar (28psig). Although this demonstrates that LPG is not a high-pressure gas, consumers must be aware that LPG cylinders are pressurised containers.

3.3 Important Consumer Safety Messages

During the early stages of the COVID-19 pandemic in 2020 the World Health Organisation (WHO) confirmed there was a risk the virus could remain on surfaces for up to 72 hours. With LPG cylinders in circulation there was concern that contaminated cylinders could transmit the virus between households and the filling plants. The WLPGA issued the following guidelines in the form of a Good Industry Practices advisory notice (<https://mailing.marmailade.com/t/ViewEmail/r/981386D98DB58F072540EF23F30FEDED/0F493FDE6A53B18540EE66FE10287772>).

COVID-19 – WLPGA Good Industry Practice Advisory Notice

Issued during April 2020

LPG cylinders circulated between LPG filling plants and consumers during the COVID-19 pandemic, exposing personnel, including consumers, to infection.

The virus spreads mainly from person to person who are in close contact with one another via inhalation of respiratory droplets produced when an infected person coughs or sneezes.

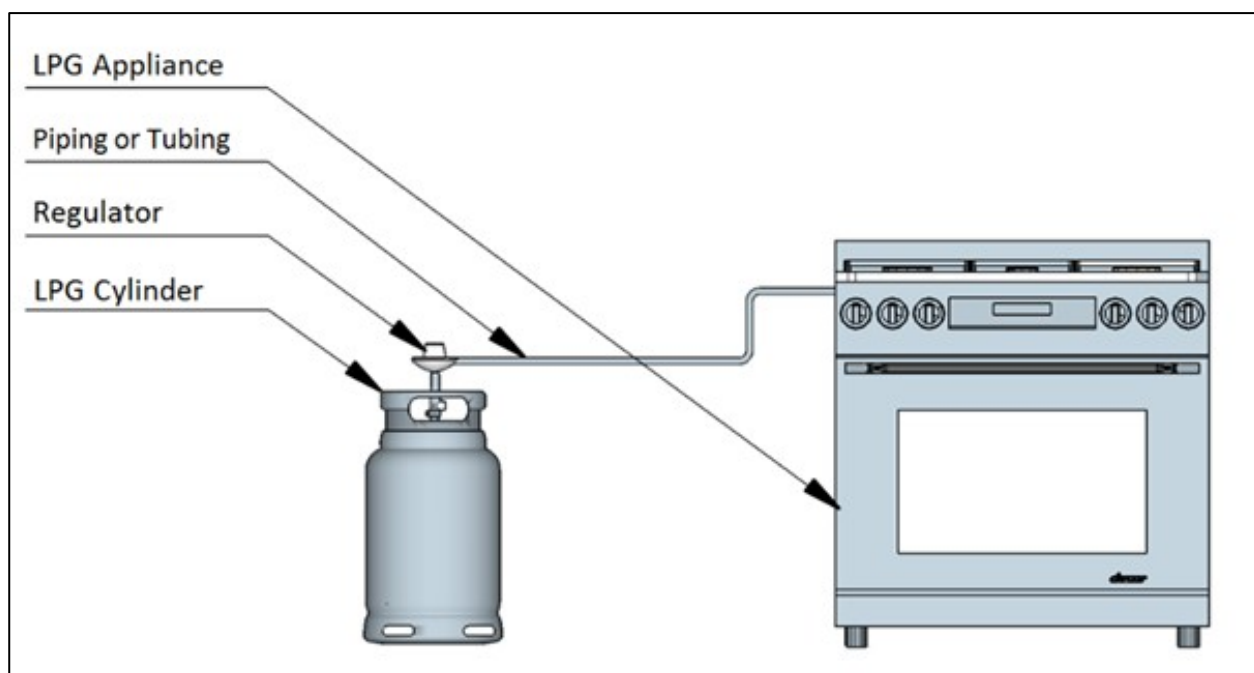
It can also be transmitted by direct contact by touching a contaminated surface or object, but that is not considered as the main pathway of transmission.

The nature of the LPG cylinder business presents challenges because of the risk of the virus remaining on contaminated LPG cylinders (particularly on handles) during their distribution.

The advisory notice contained specific advice for filling plant operatives, but the following general advice was aimed at distribution channel personnel and the consumer.

- Drivers and delivery personnel should carry masks - equivalent to N95, FFP2 or FFP3 - and alcohol-based hand sanitisers with them in the vehicle to use when necessary
- Keep two-metre distance from each other. Masks should be used if distancing is not possible because of the nature of the work
- If possible, delivery personnel should disinfect customers' returned cylinders by wiping the handle before bringing the cylinders back to the work base
- Clean and disinfect personnel transporters (e.g. buses) and cabins of vehicles used for transporting cylinders, before and after journeys.
- Maintain a clean work environment and sanitise regularly often with cleaning agents where necessary

The basic LPG domestic consumer proposition consists of an LPG cylinder (or meter), valve, regulator, piping, or tubing (hose) and appliance.



Basic LPG components in the domestic proposition – Metered supplies will replace the cylinder

The LPG cylinder should remain the property of the LPG marketer/distributor who will then ensure that appropriate checks are done to maintain it in a safe and fit for purpose condition. These will include visual inspections, maintenance, and requalification. All these checks will be carried out at the LPG filling plant by trained personnel. Cylinders that are owned by consumers will generally remain in their possession and not receive any thorough inspections and so this business model is not recommended.

The consumer does have some responsibilities for the LPG equipment. It is the consumers' responsibility to ensure that the LPG equipment is kept in a safe and well ventilated location, and away from any ignition sources, is used according to instructions, and in the event of any emergency, the consumer understands what to do and how to react.

Depending on different local regulations, some of the safety information may be mandatory with requirements on how to display that information.

There may be more flexibility in the way other information is communicated. Companies have developed different ways to do this to prevent operational challenges, without compromising the main objective of getting the messages across to the consumer.

The consumer will meet their obligations through instructions provided by the marketer/distributor. These instructions should be conveyed by safety messages in the form of leaflets, stickers, and other means.

Sometimes the cylinder will be used to convey these safety messages by carrying the relevant information directly to the point of application.



Stickers on an LPG cylinder body being used to carry some key safety messages

Stickers on the body of the cylinder can be an effective mechanism to communicate key safety messages but the disadvantage with stickers is they must be replaced when they become illegible, or when the cylinder is repainted.

Another effective method is to use plastic tags which are hung over the valve. The information is often detailed and, instead of printing the wording on the sticker or tag, some companies are using bar codes or QR codes, which can be scanned, and the information downloaded by the consumer using smart devices.

Key information such as the cylinder owner and emergency telephone number can be displayed prominently though.

The material used is robust enough to withstand general wear and tear and withstand frequent visits to the cylinder washing machine at the filling plant, so it is not uncommon for this type of tag to last more than a few trips to the consumer.

For more detail on the type of information that can be stored on a QR code refer to Appendix Three.



*This circular plastic tag fits over the LPG cylinder valve
courtesy DCC*

4.0 The Domestic LPG Sector – Key Characteristics

4.1 General Description and Consumer Proposition

LPG is not a new fuel. It was first used over 100 years ago and is now one of the most popular forms of modern energy, especially in the domestic sector. However, over three billion people in the world still rely on traditional fuels as their primary energy source.

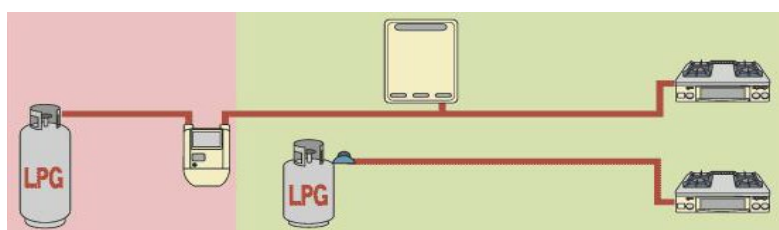
LPG is one of those products where the packaging costs more than the contents. Even the basic cost of a small domestic cylinder and valve will be greater than the 10kg or so of LPG product inside.

LPG marketing companies will likely demand a full deposit when issuing cylinders to consumers and so the title of the cylinder is retained by the marketer/distributor. A condition of the lease agreement to maintain the cylinder in good condition will encourage consumers to look after the assets.

But it is not just the cost of the cylinder and valve. To use LPG there is also the requirement of a regulator, hose and securing clips, and the cooking or heating appliance. The ownership of these typically remain with the consumer.



Three billion people are still relying on traditional fuels for their cooking



Schematic diagram showing metered and cylinder supplies

This financial outlay to enable consumers to switch to LPG can be prohibitive and acts as a barrier to change away from traditional fuels. Recent developments with smart meters have started to break down these hurdles.

However, the key challenge remains of educating consumers to use a gaseous fuel for the first time and to ensure it is done safely.

These consumers are likely to have been using traditional fuels - such as wood, charcoal, and kerosene – which are visible, easily handled, and any remaining stocks can be clearly seen.

Transitioning from traditional fuels to LPG - a totally different type of fuel which cannot be seen or touched - creates a challenge to ensure the consumer is fully aware of the issues surrounding the safe storage, handling and use of the new fuel.

The consumer proposition for LPG has changed little over the last century. The 20lb capacity cylinders that were exported from the USA before the 1960's still forms the basis of the domestic proposition today in many countries.



LPG meter inside a domestic apartment

More recently, the emergence of innovative designs has introduced colour, weight reduction and translucency to cylinders. Top loading, self-sealing valves have started to replace the old POL design which has inherent risks of being accidentally opened.

4.2 Ownership of Assets

The LPG cylinder and valve are important assets. It makes good business sense to look after the cylinder because not only is it important to keep the business safe, the cylinder is an asset that requires protection.

It is good practice for the LPG cylinder to be owned by the LPG marketer/distributor because the company has all the necessary equipment, and skilled personnel, to keep the cylinder in good condition and fit for purpose.

LPG cylinders are pressure vessels and, although the typical pressure inside a domestic cylinder of LPG at ambient temperature is not much greater than a bicycle tyre, they are manufactured to rigorous standards to ensure their safety in use. They must also be regularly inspected when in use and especially before and after they have been refilled.

This inspection includes checking for physical damage, appearance, leaks etc. Occasionally if repairs are needed, they are temporarily withdrawn from the market, and the faults rectified before being put back into service.

Irrespective of routine repairs and maintenance, LPG cylinders are required to be re-qualified periodically to ensure they are still fit for purpose. When this happens, they are taken out of service and a thorough inspection is carried out. This will also include a pressure test and before they re-enter service, they are date stamped to confirm they have been re-qualified.

If the LPG supply is through a meter, the title to the gas will transfer to the consumer at the meter outlet. Ownership and maintenance of the meter will be similar to the cylinder and something the supplying company will be primarily responsible for.

The LPG cylinder cycles between the consumer and filling plant. The other equipment is owned by and remains with the consumer. This includes the regulator, hose, clips and gas consuming appliance. In the case of metered supplies, it will also include any pipework and valves downstream of the meter.

The responsibility for caring for these assets, and for ensuring they are fit for purpose, lies with the consumer and they should be provided with the necessary guidance to enable them to comply with their obligations.

4.3 Areas of Risk

Most LPG cylinders are manufactured from steel and weigh as much as, if not more than, the contents. It is not unusual for a full domestic cylinder to weigh over 20kg which is more than many consumers would be capable of lifting easily, and safely.

The first area of risk for the consumer to address, relating to the supply of LPG, concerns physical injury during the lifting of cylinders. Section 6.0 discusses the different types of delivery including the 'customer collects' model.

Research conducted in China in the 1980's suggested the maximum weight a consumer could carry comfortably, and safely, was around 10kg because this was the weight of a bag of rice that was commonly carried home from the retailer. If the LPG cylinder is larger than 5kg capacity the gross weight of a full steel cylinder will likely exceed 10kg. The maximum contents of a composite cylinder could be around 7kg if it is to be less than 10kg when full.

When the cylinder contents are more than 5kg then the 'home delivery' model becomes more common. During the COVID-19 pandemic home delivery was introduced in some countries to overcome lockdown measures. The onus for correct lifting of the cylinder then falls onto the deliveryman who comes to the home and delivers the full cylinder and removes the empty one. This is also the delivery method for 'Pay as you go'.

Once the LPG cylinder has been delivered it is the consumers' responsibility to ensure it is kept safely stored, used, and maintained in a clean and fit for purpose condition.

LPG is released from the cylinder by opening the valve. The drop in internal pressure causes the liquid to boil and produce vapour. The on/off valve might be on the cylinder (in the case of a POL valve), the regulator (if it has a switch such as on the compact type valves) or on the appliance (in the case of a metered supply).

The boiling action creates LPG vapour, or gas, which moves from the cylinder, through the regulator and down the hose to the appliance.

When the appliance is not in use there should be no leak of LPG between the cylinder (or meter) and the appliance. This is achieved by using gas tight equipment and connections.

Metered delivery involves no lifting by the consumer because LPG supply is either from a central bulk storage tank, or cylinders located outside of the property which are accessed by the supplying company.

Metered supplies also eliminate the risk of damage to the building (floors and walls) caused by handling a cylinder in the household. Another advantage of a metered supply is the potential added value to the building and possible lower insurance premiums. Meters should always be installed in a well-ventilated position and in a location where they can be easily read.

The consumer can detect leaks by listening for a 'hissing' noise or by smelling for gas. Regular testing of all joints using soapy water will show where any leaks are by the appearance of soap bubbles. These joints will likely be around the top of the cylinder (bung) where the valve is fitted, the hose connections to the regulator and appliance and the appliance.

5.0 Consumer Equipment – Essential Parts & Maintenance

5.1 Basic Description

LPG that is supplied to domestic consumers originates from either a cylinder, or through a meter.

Metered LPG may be delivered to households through a reticulated system, where the LPG is stored in a bulk tank, or banks of cylinders, and

supplying several households, or a single dwelling where the meter is located outside of the property and fed from two cylinders, one active and one on standby.



Buried LPG tanks supplying a metered facility



Bank of 45kg cylinders supplying a metered facility

A series of regulators reduce the pressure of the LPG supply from the vapour pressure in the tank, or cylinders, to a level that is appropriate for the appliance being supplied. There may be up to three regulators reducing the pressure in stages down to the appliance pressure.

With a cylinder supply, the regulator is typically fitted on the cylinder valve and reduces the pressure of the LPG from the vapour pressure in the cylinder to the appliance pressure.

Flexible hoses deliver the LPG from the cylinder, via the valve and regulator, to the appliance or in the case of a metered supply – because the meter is a fixture – the hose may be replaced with a copper pipe. Common domestic LPG appliances include cookers and water heaters.

Ownership of the LPG equipment can vary but typically for a cylinder supply the consumer will retain title of the regulator, hose and appliance and be responsible for the safe and efficient operation of what they own. Because the consumer will not always have possession of the same cylinder (see below about exchanging cylinders) they will retain ‘virtual’ ownership of it and be responsible for looking after it. However, the responsibility for maintenance and requalification of the cylinder will be retained by the marketer/distributor. This maintenance and requalification are done when the cylinder is returned to the LPG filling plant to be refilled.



LPG flame in action

The practice of using mobile filling plants to refill cylinders may be an economically attractive option but it raises the question of cylinder integrity. Does the mobile filling facility have the equipment to provide the appropriate level of checks and maintenance on the cylinder, and do the personnel who operate the facilities have the same skill sets required to apply the correct procedures? Cylinders that circulate between the consumer and the mobile filling facility will deteriorate if either the equipment is not up to standard or the personnel do not have the skills to ensure procedures are followed. If cylinders are kept on the consumer’s premises there is an obligation for the consumer to be responsible for not only keeping them safe and fit for purpose but also about what to do in an emergency. The consumer is unlikely to have the skills or equipment to do this which is why this business model is not considered optimal.

5.2 Cylinder

Cylinders are pressure vessels and designed to withstand pressures well in excess of those expected during normal use. They are robustly made from steel or composite material, and manufactured to withstand rough handling during their journey through the distribution channel. Inevitably they will get damaged as they are transferred from filling plant to truck, and into storage, on their way to the consumer. When they are returned to the filling plant they will be inspected, washed, and repainted if necessary. Periodically, they will require a more rigorous inspection during requalification. This will vary from country to country but typically is every ten to fifteen years.

A feature of cylinder supplies is that the cylinder has to be re-filled when empty. This necessitates removing it from the household and returning it to the filling plant to be checked and re-filled. When LPG is supplied to consumers in cylinders, the consumer pays for the gas, and takes title of it, before using it (unless it is through a smart meter). Empty cylinders will be disconnected, and full ones reconnected, by the consumer and so safety instructions will need to include this.

Consumers must ensure the cylinder is protected from undue wear and tear when in their possession and that no uncontrolled leaks occur. General safety messages for the consumer will focus on the properties of LPG, the safe and proper storage of the cylinder, the awareness of looking for uncontrolled leaks, and what to do in an emergency.

5.3 Valve

Valves are fitted to cylinders after their manufacture and are designed to receive a pressure regulator which will be fitted by the consumer. Valves are also fitted to a cylinder to enable it to be refilled - either from the top or from the side. They are manufactured from brass, which is a soft material, and may be subject to damage if mishandled.

It is good practice for the consumer to remove the regulator from the cylinder/valve when the appliance is not being used and this is one of the safety messages that needs to be given.

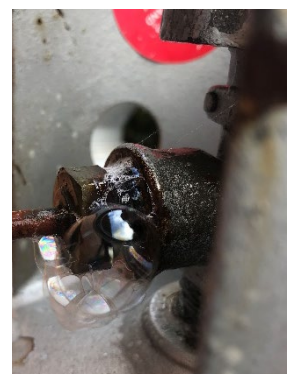
5.4 Hose

With cylinder supplies, the flexible hose is subjected to more movement and potential damage. Consumers should be given instructions to regularly check hoses for damage, especially where they connect with the regulator and appliance, and where there is regular movement.

These checks should also include possible cracking and damage from vermin attack. Foodstuff that is allowed to collect on hoses will attract vermin and could easily be bitten and holes created.

Periodically, flexible hoses will need to be replaced and this instruction should also be conveyed to consumers. It is good practice to replace flexible hoses at least every 10 years or more frequently if the conditions are severe.

The use of copper pipe may be used in more permanent fixtures but they too must be checked regularly for leaks (see photo opposite).



Soapy water locating a leak at the valve outlet

5.5 Regulator

The regulator is typically owned by the consumer and commonly fitted to the appliance, together with the flexible hose. The consumer should be made aware of the importance of keeping a gas tight fit when the regulator is fitted to the valve. The most common way to check for this is to use soapy water.

Some regulators have an internal on/off switch that is activated after fitting to the valve, others rely on the on/off tap on the valve. Consumers should be given clear instructions on how to safely fit the regulator to the cylinder valve.

An example of some guidance notes for regulators, issued by Liquid Gas UK, are included in Appendix Four (p44-46).

5.6 Meter

With metered supplies, there is no need to disconnect the supply of LPG at the regulator as it is a permanent fixture. In this case the consumer needs to be given clear instructions on checking for leaks. With both cylinder and metered supply there is a need for good housekeeping and for keeping everything clean and free from contamination.

LPG, when supplied to consumers through meters, avoids the need for cylinders to be stored within the household. Instead, households will have a meter located outside (or inside) the building and the consumer will pay for however much metered LPG has been consumed.

The LPG supply to the meter will be the responsibility of the marketer/distributor and this may be either from a cylinder (or a bank of cylinders) or a bulk tank. The transfer of title from the marketer/distributor to the consumer will take place at the meter. Unlike cylinder supplied LPG, metered supplies are continuous and any cylinder exchange or bulk tank replenishment is the responsibility of the marketer/distributor.



Meter located outside

Meters will be read on a regular basis (typically every month) and the consumer will be invoiced in arrears. If the meters are read manually the opportunity exists for communication between the marketer/distributor and the consumer on issues related to safety. If the meters are read remotely there may be opportunities to communicate safety messages to the consumer when the invoices are sent. Safety instructions however will still need to include the basic properties.

5.7 Appliance

Typical domestic LPG appliances includes cook stoves, ovens, water heaters, grillers, space heaters, etc. Appliances used should be manufactured to the appropriate standards and carry their own operating and periodic maintenance instructions. Other general advice on keeping appliances clean and tidy, and inspecting for uncontrolled leaks, will form part of the safety instructions to consumers.



An example of an LPG cook stove

If in doubt the appliance manufacture should be contacted about any specific instructions regarding safety.

One important message to consumers regarding appliances is the need to match the type of LPG being used. Propane has a higher vapour pressure than Butane and must only be used for Propane rated appliances.

The cook stove is the most common domestic LPG appliance around the world and below is a general guide on operating this appliance safely:

- Always place the cook stove in a well-ventilated location with adequate air circulation to support complete combustion and disperse products of combustion safely
- To turn the burner 'ON', first open the gas valve on the cylinder, or supply pipe if LPG is metered
- Then push the relevant knob and turn to the 'ON' position to ignite the burner
- For burners without a piezo igniter, light a match first and bring lighted match near burner before turning burner knob to the 'ON' position
- To turn the burner 'OFF', turn the stove knob to the 'OFF' position to extinguish the flame then close the valve on the regulator or supply pipe
- Do not tilt or shake the cylinder while using the stove
- Avoid any spillage on the stove when cooking as it can clog the burner holes
- Make sure to switch off the appropriate burner before removing the cooking pot
- Never dismantle or repair the gas valve or burner nozzle
- If the cookstove has a glass surface do not clean with a wet cloth (the glass may be hot and create a steam burn)

6.0 Supplying LPG to the Consumer

6.1 Home Delivery

The total weight of even a full small LPG cylinder can be more than 15 kg. For many domestic consumers lifting this can be a challenge. The proposition of a home delivery service is appealing because it not only eliminates handling of the LPG cylinder by the consumer it also facilitates direct communication between the deliver personnel and the consumer. Home delivery was introduced in several countries when lockdown conditions were imposed during COVID-19.

Home delivery creates the opportunity for the marketer/distributor to not only ensure the equipment is being used safely and is fit for purpose, it also allows key safety messages to be conveyed directly.

6.2 Consumer Collects

The alternative to home delivery is when the consumer collects the cylinder from the retailer. Options include a cylinder exchange programme, where the consumer takes the empty cylinder to a retail outlet to exchange it for a full one, and a facility where the empty cylinder is filled on site.

The cylinder exchange model is preferred because the empty cylinder is taken back to the filling plant for a series of rigorous checks. Where the same cylinder is refilled on site and taken back home by the consumer, there is risk that the same rigorous checks on the cylinder are not done.

In both cases the consumer is interacting at the point of sale where various safety messages can be displayed. Communication of these messages will not be constrained and can be done through flyers or placed on the cages where the cylinders are kept at the point of sale (see section 8.0).

6.3 Pay as You Go

The digital era has created innovative ways to provide LPG to consumers without having the financial barrier of buying all the equipment together with a full cylinder.

Smart meters now allow the cylinder to be kept at the consumer's premises on consignment with the consumer buying small amounts of product when they need it.



Several companies now offer a smart meter business model similar to the above courtesy PayGo Energy

This is done by linking smart devices (phones, tablets) to the smart meter, the LPG marketer/distributor and the consumer's bank. The consumer can order and pay for just a few hundred grams of LPG at a time using digital technology.

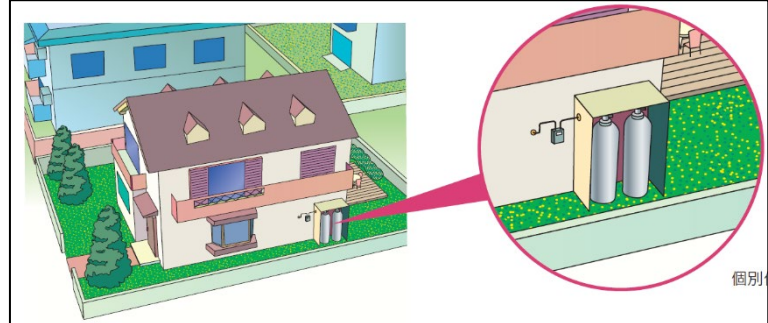
The same digital technology can be applied to the conveyance of safety messages and operation instructions.

6.4 Metered Supply

In some countries LPG is supplied to consumers through meters. Unlike cylinder supplies, the responsibility for replenishment lies with the marketer/distributor and consumers do not have the concern of disconnecting and reconnecting cylinders.



Metered LPG supply from cylinders



Metered LPG supply from cylinders

Telemetry technology now allows for the remote reading of cylinders and tanks. Consumers do not have to monitor the amount of LPG in their cylinders if this is being done by the supplier remotely.

Metered supplies will be read and invoiced on a regular (often monthly) basis and this presents an opportunity to remind the consumer of safety messages.

7.0 Consumer Safety Check List

7.1 Do's and Don'ts

The following basic guidelines when using LPG are important to ensure consumer safety. The laws and regulations of the jurisdiction where transporting and storing LPG is taking place should always be followed and take precedence over this document, which is provided as guidance in those areas where no laws or regulations are in place

Do's

- Always display safety and operating notices in the local language, using cartoons and diagrams in areas of varying literacy levels prominently
- Change, or store, cylinders away from naked flames or any other ignition source
- Store LPG cylinders in a well-ventilated area, preferably outdoors
- Transport LPG cylinders upright and with care and attention
- Check for leaks using a soapy water (liquid detergent/water) solution after fitting a cylinder
- Regularly inspect the LPG equipment for leaks by applying soapy water. Any leaks will be evident by bubbles, smell, and a hissing noise
- Use LPG appliances in well ventilated areas
- Consider replacing the regulator with a new one if it is more than five years old
- Always replace safety caps/plugs when the cylinder is empty or not in use
- Check hoses regularly. Ensure they are properly secured with hose clips. If hoses are damaged or showing signs of wear, replace them (using hoses of the correct quality)
- Understand how to connect and disconnect LPG cylinders - from the regulator and the appliance
- Know what to do in an emergency

Don'ts

- Never store or use LPG below ground level, as any leakage will collect at low levels
- Do not drop cylinders as this will cause damage to the cylinder and valve
- Do not roll cylinders on their side
- NEVER use a naked flame to detect leaks
- If at all possible, never store LPG cylinders indoors, including garages, vehicles, sheds or under the house
- Never lay LPG cylinders on their side or upside down, even when empty

- Don't store LPG cylinders near an ignition source or exposed to heat
- Don't store more than two LPG cylinders in a vehicle
- Don't use tools to operate cylinder valves

8.0 Communications Material

8.1 Point of Sale

Point of sale material includes information leaflets that can be made available at retail outlets or handed to consumers when the cylinder is being ordered or delivered.

The messages should be clear and simple and in the appropriate language of the recipient consumer. Diagrams and cartoon characters can make the subject of emergency procedures more engaging and less fearful.

Point of sale leaflets do not need to be produced with expensive paper quality material. The local LPG industry association could be used for producing generic product safety information to reduce artwork and printing costs and this also sends out consistent messaging.

Point of sale information can also be carried on the cylinder, on cages at retail outlets, and on other equipment. As the LPG cylinder is used in the household it is the obvious place to carry a message about safety. Typically, this is in the form of a message on the cage or sticker or tag on the cylinder body or handle.



Consumer information on LPG cages at point of sale

處理石油氣洩漏 
Emergency Procedures of Gas Leak

1. 熄滅所有火種 To put out all naked flames

熄滅一切火種
Extinguish all naked flames.

切勿開關任何電掣
Do not touch any electrical switches.

2. 將石油氣排出屋外 To disperse the gas

*由於石油氣較空氣重，注意石油氣有機會積聚地面上。
LPG is heavier than air, accumulates on ground level when leaks.

關掉所有氣體爐具及調節器
Switch off all gas appliances and regulator.

打開所有窗戶，讓石油氣散發出來
Fully open the windows and doors.

3. 如情況不受控制 If the gas leak is serious

1 立即遠離現場。
Leave the scene.

2 到屋外致電報警。
24小時緊急熱線
2322 2000 或報警。

Immediately call our 24-hour Emergency Hotline **2322 2000** or 999 emergency hotline. Make this call from outside your home.

3 請清楚說明：姓名、地址、情況詳情。
State the information clearly: Name, Address, Situation.

4 如發現或懷疑鄰居洩漏石油氣，應敲門通知鄰居。
切勿按門鈴！
If LPG is detected or suspected to be leaking from an adjacent flat, **DO NOT PRESS** the doorbell.

Example of point-of-sale material – courtesy DCC

Although these stickers can effectively carry important instructions directly to the point of use, they can often become illegible because of damage in transit.

They can also be a challenge to remove when the cylinder is repaired or re-painted.

The amount of information that has to be conveyed also means the font size has to be small, and this can make it difficult to read.

To overcome this, the use of technology now makes it possible to utilise QR codes that can be scanned by the consumer using smart devices.

QR codes can contain much more detail as the following example from DCC Energy shows:



Cylinder neck tag with QR code – courtesy DCC

<https://www.dsg-energy.com/we-care/?lang=en>

The example shown here is a circular plastic information tag that carries the most important data such as the supplying company and their emergency telephone numbers.

This example of point-of-sale material can be fitted over the cylinder valve at the filling plant and is easily replaced if it gets lost or damaged. Appendix Three illustrates some of the more detailed information that can be accessed by QR codes.

8.2 Social Media

The use of social media for communicating to consumers about choice and information has become a feature of the digitalisation era and is an easy, quick and effective way to get messages across to consumers. Social media platforms such as Twitter, Facebook and LinkedIn allow soundbite messages to be conveyed in a very cost-effective manner.

The Propane Education and Research Council (PERC) in Washington DC, USA, use Twitter to carry safety messages to users of Propane equipment.

An example is a video consumer safety series 'If you suspect a gas leak'. The two-minute video illustrates some of the main messages for users of Propane (LPG) and in particular small bulk tanks supplying LPG to the domestic household.

Under the tweeted heading it explains '...everyone in your family should know what to do if they smell Propane (LPG). Here are a few steps to take in the event of a potential gas leak...'. The video highlights some of these steps.



PERC video on Twitter – What to do if you suspect a gas leak

Social media reaches a wide audience and can include the use of videos like this one. It is also a powerful tool to send out sound bites in a reactive or planned manner.

8.3 Videos

The introduction of digitalisation, and the use of smart devices with cameras, has allowed individuals to not only watch videos on smart devices but also produce videos. The ability to use video material to communicate to consumers is a powerful tool because smart devices have penetrated deeply into the global consumer market, even into households with limited disposable incomes.

The subject of safety is important and the option of presenting safety information to consumers in an appealing manner increases the chances of it being seen and understood.

Previously the cost of producing videos was prohibitive, especially for safety messages which had no tangible ROI. Today, simple videos can be produced with a very low budget to illustrate messages that might otherwise be difficult to get across in words and pictures.

The WLPGA has produced a simple five-minute video focusing on LPG properties that affect the safe storage and handling of LPG

(<https://www.youtube.com/watch?v=9X6EG3g8JHU>).

The video is designed to be used by all personnel in the distribution channel and is particularly suitable for consumers as it describes how LPG behaves in a domestic installation environment.

The messages are clear and simple and have been presented in a schematic style. The voiceover and subtitles are in English but they could be easily changed to any language.



WLPGA video describing LPG properties

There are many other videos available but this one has been produced by the WLPGA, with input from its members, and is recommended for all stakeholders, including the consumer, in the LPG distribution channel.

Cadent Gas Limited (UK) owns and manages four of the eight gas distribution networks in the UK: West Midlands, North West England, East of England, North London, supplying gas to around 11 million homes.

They have produced two short videos explaining what to do, and not to do, if there is a gas leak in the home.

<https://youtu.be/la3PWO5zthY>

<https://youtu.be/x3JamSaLAgy> (for deaf people)

8.4 Face to Face

When delivery personnel bring an LPG cylinder to a domestic household, they have the opportunity to explain to the consumer all aspects of using the product. This might include where to store the cylinder, how to safely connect and disconnect the regulator, how to check the equipment for wear and tear, damage and for leaks, and what to do in an emergency.

For metered supplies there will be opportunities, at the time the meter is being read, for distributor personnel reading the meter, to convey information about the safe use of LPG. This might include how to check the equipment for leaks and what to do in an emergency.

The opportunity for face to face dialogue with consumers is important and one that should be seized. In areas where LPG is



Reading of gas meter

being introduced for the first time the use of demonstrations is one of the best ways of communicating to consumers who previously have relied on traditional fuels which are more predictable in nature.

Examples of where face to face, hands on, demonstrations have taken place to explain not only some of the key safety messages – but also some of the key benefits of using LPG – are Indonesia and India.

In southern China in the 1980's, when coal briquettes were used extensively for domestic and commercial cooking, the introduction of LPG for cooking was demonstrated in an urban street alongside a coal briquette stove. This comparative demonstration highlighted some of the disadvantages of using traditional fuels as well as illustrating some of the key benefits of using LPG.



Demonstration of LPG usage in China

It was also a good opportunity to point out some of the safety messages associated with using gas. For consumers using traditional fuels such as coal briquettes, charcoal and wood, it is quite normal to have the stock of energy stacked in the corner of the kitchen. The fuel can be seen and handled, compared to LPG which is in the form of a steel cylinder that consumers have no knowledge as to what is inside.

When the LPG cylinder valve is opened, and the gas flows through the regulator, hose and finally to the appliance, it does so in a completely concealed condition, until it exits the burner head, still in an invisible state, and ignited as a flame. The senses of noise and smell replaced those of sight and touch.

In the street demonstration in China it was also possible to measure the efficiency of using LPG versus traditional fuels by comparing the time it took to boil a pot of water. An important part of this initiative was for consumers to be invited to use the LPG appliance, ignite the stove, and operate the appliance valve to turn the flame up and down.

In India, where the use of LPG was rolled out as part of the governments' initiative to switch much of the population away from wood, the concept of a hands on, face to face, programme was also used. This example was in a rural location where a small vehicle had been converted to a kitchen containing a domestic LPG application. Consumers were invited to see the facility and use the LPG stove.



Hands on training in India

During the demonstration of the LPG equipment, key safety messages were given to the consumers who were also given the opportunity to ask questions.

Another example of where hands on, face to face, demonstrations have been used is in Indonesia where most of the population has been successfully switched away from kerosene to LPG in a government driven programme which has lasted over a decade.

Domestic kerosene subsidies were costing the government billions of dollars until the LPG programme was introduced in 2007. Since then, most of the country's population of 270 million have switched to LPG supported by an intensive education programme.

The challenge in Indonesia was that the education programme also extended through the growing LPG equipment manufacturing and distribution channel. In the first few years of the programme indigenous LPG cylinder, valve, regulator and appliance manufacturing facilities emerged across the country. Almost overnight, the country went from a net importer of LPG equipment to being self-sufficient. This didn't happen without its challenges and the LPG education programme became an integrated project.

For many domestic consumers the use and habit of using kerosene has been entrenched through generations. Switching domestic consumers away from kerosene to LPG was supported by a comprehensive, hands on, face to face programme where the LPG cylinder/appliance package was brought into the domestic communities.



Hands on education in Sri Lanka

This allowed key messages about the safe operation of an LPG stove to be conveyed and supported by consumers being invited to use the LPG stove themselves. The design of LPG cylinder and stove in the government supported programme was consistent which allowed uniform safety messages to be conveyed.

One of the key success factors in running a face to face, hands on, demonstration is to have someone there who has already successfully used LPG and can act as a 'champion' or role model. This can often help to remove the degree of suspicion, doubt, or sometimes fear, of using LPG.

In some regions there is a perception that LPG is unsafe, despite its exceptional safety record compared to alternative domestic fuels. Burns from charcoal, and fires from spilt kerosene, are commonplace in households around the world where nearly three billion people rely on traditional fuels.

9.0 Emergency Response

Consumers must be aware of the basic steps to take in case of a LPG emergency. This will help avoid injuries and prevent escalation of a minor incident into a serious emergency which may have tragic consequences. Basic actions to take in case of a leak or suspected leak:

- Extinguish immediately all naked flames, do not smoke, strike matches or do anything which could cause ignition
- Turn off the gas supply (either at the cylinder, or close the valve by the meter by turning it 90 degrees)
- Open all doors and windows carefully to ventilate the property
- Do not use any electrical appliances or turn on/off any electrical switches
- If the gas leak is in a cellar or basement, do not enter and instead evacuate the building
- If there are any electrical security entry phones/locks, open doors manually
- If the leak is coming from the LPG cylinder, remove the cylinder and bring this out to an open and well-ventilated space

A pungent odourant is added to LPG to identify leaks. The smell of gas within a property can be alarming and should be treated seriously. There are several important things that need to be done if gas is present.

Immediately phone the local emergency contact telephone number at any time of the day or night.

Sometimes a gas leak can lead to physical symptoms such as dizziness, fatigue, nausea and headaches. These symptoms should ease when the consumer gets into fresh air but if the symptoms continue, they should visit their doctor as a precaution.

If the consumer has these symptoms but cannot smell any gas, it could be a sign of a carbon Monoxide leak. Appendix Five has more information about carbon Monoxide.

Always wait until the gas engineer has given the all-clear before returning inside your property.

Appendix One

LPG PROPERTIES, CHARACTERISTICS AND HAZARDS

Liquefied Petroleum Gas (LPG) - Comprises Commercial Propane and Commercial Butane, and mixtures thereof. They are hydrocarbon gases that can be changed into a liquid and changed back into a gas by the simple application and release of pressure

Density – LPG vapour is heavier than air and tends to gather at low areas such as drains, pits, cellars and other depressions. As a colourless liquid, LPG occupies around 0.4% of its vapour volume, but is about half the density of water and will float on water before vapourising

Cooling effect – LPG liquid vapourises and cools rapidly; it can therefore inflict severe cold burns if it comes in contact with bare skin.

Non-toxic – LPG is not toxic. However, it has an anaesthetic effect when mixed in high concentrations with air. The greater the concentration (i.e. as available oxygen declines), the greater the risk of asphyxiation.

Smell - What people know and recognise as the ‘LPG smell’ is usually added to LPG before distribution. This smell can be detected if the LPG content of air is as little as 0.4% (or just 20% of the lower limit of flammability). However, odour is not the only means of detection. Large leaks will also be obvious through hissing or condensation or frosting around the leak; small leaks will show up as bubbles if detergent mixed with water is applied to the suspected leak area. **NEVER try to detect leaks with a naked flame or other kinds of ignition**

Flammability – LPG can ignite when it forms between 2% and 10% of a vapour/air mixture, so the risks associated with poor handling, storage or usage should be obvious. Uncontrolled ignition of LPG can cause serious fires or explosions (i.e. if ignited within a confined space). A fire started some distance from an LPG leak can very quickly travel back to the source of the leak itself. An LPG cylinder involved in a fire may overheat and rupture violently. The power and intensity of an LPG fire or explosion should never be underestimated.

Liquid Expansion – LPG liquid has a high coefficient of expansion. Tanks, cylinders, pipelines and equipment must be protected against the high pressure resulting from liquid expansion with temperature rise.

The following table shows some typical physical properties and characteristics of LPG.

TABLE OF CHARACTERISTICS FOR LPG

Typical Characteristics of Propane and Butane PHYSICAL PROPERTY	COMMERCIAL PROPANE	COMMERCIAL BUTANE
Litres/tonne of liquid at 15°C	1,965 – 2,019	1,723 – 1,760
Litres/ton of liquid	1,996 – 2,051	1,750 - 1788
Litres/kg of liquid	1.96 - 2.02	1.72 - 1.76
US barrels/tonne	12.4 – 12.7	10.8 – 11.1
Relative density (to water) of liquid at 15°C	0.50 - 0.51	0.57 - 0.58
Ratio of gas to liquid volume at 15°C and 1015.9 mbar	274	233
Relative density (to air) of vapour at 15°C and 1013.25 mbar	1.40 - 1.55	1.90 - 2.10
Volumes of gas/air mixture at lower limit of flammability from 1 volume of liquid at 15°C and 1015.9 mbar	12,450	12,900
Boiling point °C	Minus 45	Minus 2
Vapour pressure at 0°C barg	4.5	0.9
Vapour pressure at 15°C barg	6.9	1.93
Vapour pressure at 38°C barg	14.5	4.83
Vapour pressure at 45°C barg	17.6	5.86
Upper limit of flammability, % v/v	10.0	9.0
Lower limit of flammability, % v/v	2.2	1.8
Gross calorific value MJ/m ³ dry	93.1	121.8
BTU/ft ³ dry	2,500	3,270
MJ/kg	50.0	49.3
BTU/lb	21 500	21 200
Net calorific value MJ/m ³ dry	86.1	112.9
BTUu/ft ³ dry	2,310	3,030
MJ/kg	46.3	45.8
BTU/lb	19,900	19,700
Latent heat of vapourisation kJ/kg at 15 °C	358.2	372.7
Latent heat of vapourisation BTU/lb at 60 °F	154	160

Appendix Two

TRANSPORTING LPG CYLINDERS

Although these requirements do not specifically apply to the transport of LPG cylinders by domestic consumers, the basic requirements should be followed:

- Any vehicle used to transport LPG cylinders should:
 - o Be suitable for the task, of adequate strength and in good condition
 - o Permit the cylinders to be transported in the upright position
 - o Be open (preferred) or have adequate ventilation
- Smoking is not permitted in or near any vehicle that is being loaded or unloaded with or transporting LPG cylinders. All means of ignition, i.e., cigarette lighters, lanterns, portable cooking stoves, etc., are not permitted to be carried or operated on or in the vehicle
- LPG appliances may be carried as long as they cannot be operated whilst they are on the vehicle and their carriage does not present a risk of ignition. Appliances that are boxed or packaged would comply with this requirement
- Closed vehicles (e.g. as vans) should not be used for transporting LPG cylinders

A maximum of four LPG cylinders may be transported in closed vehicles if the following requirements and restrictions are applied:

- Cylinders should be loaded in a single layer and secured to prevent movement
- The cylinders must be upright, with the valve at the top (the outlet connection should be fitted with a gas tight cap or plug)
- A flammable gas danger warning diamond should be displayed on both sides, and the rear, of the vehicle

If there is a smell of gas, do not move the vehicle until the source of the leakage has been found and the vehicle has been declared safe by a competent person. Increase the load compartment ventilation by fully opening all doors and vents. Do not turn on any electrical equipment.

The regulations governing the transport of dangerous goods vary from country to country according to what dangerous goods are being transported, how much is being transported and the gross weight of the vehicle.

Appendix Three

EXAMPLE OF SAFETY INFORMATION USING A QR CODE

Note: The QR code shown here on this valve tag (shown also in 3.3) contains a great deal more information than could be illustrated on the tag itself (also shown in the link below):



[We Care - Keep everyone safe and satisfied. - DSG \(dsg-energy.com\).](http://dsg-energy.com)

The use of QR tags to disseminate safety information should always be checked with the local authorities. This example has been provided by DSG Energy (DCC).

‘...Safety is a core value for DSG Energy. We maintain appropriate safety management systems reflecting the nature and complexity of the risks in the business. Safety leadership and employee engagement are key focus areas to promote positive behaviours such as intervening when a situation is unsafe, recognising positive safety standards and more importantly, educating our customers to use our product in a safe manner. We promise to work to continuously improve performance through risk assessment, procedural and engineering controls, training, learning from events and safety culture promotion to our customers...’

LPG is kept as a liquid under pressure in specially designed cylinders

Safe Storage

- Store in a well-ventilated place
- Do not store in a cellar or in a closed area – the gas is heavier than air and will ‘flow’ into low points and collect causing a flammable mixture
- Never store the cylinders near to a heat source or in direct sunlight

Connecting Safely

- Always use a hose designed for use with LPG. The hose should have a maximum length of 2m with clamps at both ends. Hoses should be checked frequently and replaced every three years or as indicated on the hose since they deteriorate over time
- When in use, all cylinders must be equipped with pressure regulators designed specifically for either Propane or Butane, which will regulate the pressure when temperatures change. Use the correct regulator for the type of gas
- Always follow the instructions supplied when connecting the pressure regulator to the cylinder and do not open the cylinder valve or regulator tap until the pressure regulator is securely attached
- Never smoke while connecting the equipment and do not check for leaks with a flame
- Look at the washer of the pressure regulator or valve before connecting each new cylinder. If the rubber looks worn or damaged replace it or contact your supplier.

Using LPG Safely

- Regularly check your hose for signs of damage or cracking
- Make sure the cylinder is upright

- When the appliance is not in use, turn off the valve or regulator tap
- Do not let children handle the cylinders or appliances
- Arrange safety checking and maintenance of your LPG appliances and installation every 18 months.

Empty Cylinders

- Turn off the taps of the connected appliance, then close the cylinder valve or regulator tap
- Always return your empty cylinders to your supplier

Appendix Four

EXAMPLES OF CONSUMER SAFETY INFORMATION

處理石油氣洩漏

Emergency Procedures of Gas Leak

- 熄滅所有火種 To put out all naked flames**
熄滅一切火種
Extinguish all naked flames.
切勿開關任何電掣
Do not touch any electrical switches.
- 將石油氣排出屋外 To disperse the gas**
*由於石油氣較空氣重，注意石油氣有機會積聚在地面上。
LPG is heavier than air, accumulates on ground level when leaks.
關掉所有氣體爐具及調節器
Switch off all gas appliances and regulator.
打開所有窗戶，讓石油氣散發出外
Fully open the windows and doors.
- 如情況不受控制 If the gas leak is serious**
 - 立即遠離現場。**
Leave the scene.
 - 到屋外致電報警或石油氣 24小時緊急熱線 2322 2000 或報警。**
Immediately call our 24-hour Emergency Hotline 2322 2000 or 999 emergency hotline. Make this call from outside your home.
 - 請清楚說明：姓名、地址、情況詳情。**
State the information clearly: Name, Address, Situation.
 - 如發現或懷疑有石油氣洩漏，應關門通知鄰居。**
If LPG is detected or suspected to be leaking from an adjacent flat, DO NOT PRESS the doorbell.

更換石油氣瓶

STEPS to Exchange LPG Cylinder

- 熄滅附近所有火種，不可吸煙。Extinguish all nearby flames and do not smoke.
- 關掉氣體用具。
Switch off gas appliances.
- 關掉並拆卸調節器，然後更換用過的石油氣瓶。
Switch off and disconnect the regulator. Then replace the used LPG cylinder.
「拆接」三步曲 Disconnection 3 Steps
 - 關掉調節器 (或水平方向)
Switch off the regulator (horizontal)
 - 反時針方向轉動
Turn the regulator anti-clockwise.
 - 向上拉
Remove it.
- 小心地將調節器接回原位並檢查是否有漏氣的氣味或聲音。Re-connect the regulator carefully and firmly and check whether there is smell/sound of gas leaking from the cylinder connection.
「接接」三步曲 Installation 3 Steps
 - 關掉調節器 (或水平方向)
Switch off the regulator (horizontal)
 - 向下按
Press the regulator down onto the cylinder valve.
 - 請時針方向轉動
Turn clockwise.
- 開啟調節器，然後檢查氣體用具是否操作正常。
Switch on the regulator, and check our gas appliances for proper operation.

於「接接」或「拆接」調節器前必須確保所有調節器及爐具均已關妥。
Before "Installation" or "Disconnection" of regulator, must switch off all regulator and gas appliances.

安全檢查

Regular Safety Check

為確保家居安全，所有石油氣爐具必須定期檢查及維修，而報殼石油氣的客戶均可享每18個月一次的免費定期安全檢查服務。報殼特許分銷商均為註冊氣體工程承辦商，聘有合資格氣體技師為客戶提供專業檢查及服務。如欲安排檢查石油氣爐具及相關裝置，請致電以下分銷商預約。

To ensure that all LPG appliances are checked and maintained periodically, Shell Gas provides safety checking service to all customers every 18 months. All Shell Gas Distributors are Registered Gas Contractors and possess Registered Gas Installers to provide professional advice and service in LPG usage. Contact our distributors for any inquiries regarding your LPG appliances.

報殼石油氣常用電話

Shell Gas Useful Hotline Numbers

24小時緊急熱線 24-hr Emergency Hotline :
2322 2000

客戶服務熱線 Customer Service Hotline :
2435 8388

網址 Website : www.shell.com.hk/lpg

如有任何疑問及需要維修，請與下列報殼石油氣分銷商聯絡。
For any inquiries or maintenance services, please contact the following Shell Gas Distributor:

報殼 瓶裝石油氣

安全資訊小冊子

Shell Gas Safety Leaflet (Cylinder)

報殼石油氣 是你信心保證
Shell Gas It's good to know someone's looking out for you

Example of Safety Leaflet for Cylinder Supply - courtesy DCC

處理石油氣洩漏

Emergency Procedures of Gas Leak

- 熄滅所有火種 To put out all naked flames**
熄滅一切火種
Extinguish all naked flames.
切勿開關任何電掣
Do not touch any electrical switches.
- 將石油氣排出屋外 To disperse the gas**
*由於石油氣較空氣重，注意石油氣有機會積聚在地面上。
LPG is heavier than air, accumulates on ground level when leaks.
關掉所有氣體爐具及石油氣
Switch off all gas appliances and the main valve.
打開所有窗戶，讓石油氣散發出外
Fully open the windows and doors.
- 如情況不受控制 If the gas leak is serious**
 - 立即遠離現場。**
Leave the scene.
 - 到屋外致電報警或石油氣 24小時緊急熱線 2322 2000 或報警。**
Immediately call our 24-hour Emergency Hotline 2322 2000 or 999 emergency hotline. Make this call from outside your home.
 - 請清楚說明：姓名、地址、情況詳情。**
State the information clearly: Name, Address, Situation.
 - 如發現或懷疑有石油氣洩漏，應關門通知鄰居。**
If LPG is detected or suspected to be leaking from an adjacent flat, DO NOT PRESS the doorbell.

中央石油氣保養服務

Piped LPG Monthly Maintenance Service

報殼石油氣提供保養服務，由營運商提供專業的檢查及維修服務，確保客戶之供氣設備及爐具運作正常。
Safety is of paramount importance in Shell Gas. We dedicate to provide a full range of professional check and maintenance services to ensure your home safety. Our maintenance covers:

- 免費檢查/ 維修石油氣爐具 (不包括零件費用) On-demand free LPG appliance check-ups and repair (spare parts & components will be charged only as the items are needed)
- 免費提供內置石油氣喉管檢查及壓力測試 (不包括泥水/ 建築/ 粉飾工程及更換喉管) On-demand free check-ups and pressure testing of internal LPG pipework (any construction works, renovations, decorations & pipe replacement are not included)
- 免費提供專業意見改善安全效益 Safety advices by registered gas technicians to ensure home safety.

所有檢測均由專業註冊氣體裝置技師負責。
All the check-ups and repair services are provided by professional registered gas technicians.

安全檢查

Regular Safety Check

為確保家居安全，所有石油氣爐具必須定期檢查及維修，而報殼石油氣的客戶均可享每18個月一次的免費定期安全檢查服務。報殼營運商均為註冊氣體工程承辦商，聘有合資格氣體技師為客戶提供專業檢查及服務。如欲安排檢查石油氣爐具及相關裝置，歡迎致電2435 8388預約。

To ensure that all LPG appliances are checked and maintained periodically, Shell Gas provides safety checking service to all customers every 18 months. Shell Gas Operators possess registered technicians to provide professional advice and service in LPG usage. Contact us for any inquiries regarding your LPG appliances.

報殼石油氣常用電話

Shell Gas Useful Hotline Numbers

客戶服務熱線 Customer Service Hotline :
2435 8388

24小時報讀熱線 24-hr Meter Reading Reporting Hotline :
2435 7787

24小時緊急熱線 24-hr Emergency Hotline :
2322 2000

網址 Website : www.shell.com.hk/lpg

如有任何疑問及需要維修，請與下列報殼石油氣分銷商聯絡。
For any inquiries or maintenance services, please contact the following Shell Gas Distributor:

報殼 中央管道石油氣

安全資訊小冊子

Shell Gas Safety Leaflet (Piped)

報殼石油氣 是你信心保證
Shell Gas It's good to know someone's looking out for you

Example of Safety Leaflet for Piped Supply - courtesy DCC

For safe and secure use



Liquefied Petroleum Gas Safety Commission
Ministry of Economy, Trade and Industry

Example from the Liquefied Petroleum Gas Safety Commission
Ministry of Economy, Trade and Industry - Japan

For safer usage

[☒] Safety check points to check on a daily basis

- Facilities between the LP gas cylinders and the gas meter outlet are called “supply facilities”, and the LP gas shop is responsible for inspecting, maintaining and controlling these facilities.
- Facilities between the gas meter outlet and your gas appliances are called “consumer facilities”, and you are legally responsible for managing and controlling these facilities. Daily inspections, maintenance and control must be performed by the LP gas consumers themselves.

Recommended steps to prevent snow damage

- A regulator or gas meter can be damaged by snow. Please use a snow fence or check the cylinder hut.
- When removing snow from a roof, pay attention to avoid damaging the LP GAS facilities.

- The installation site should be at least 2 meters away from any ignition source.

More than 2 meters

⚠ What is carbon monoxide (CO) poisoning!

If you use a gas appliance in an environment without sufficient air (oxygen), the appliance will generate carbon monoxide due to incomplete combustion. Carbon monoxide is extremely toxic. Inhaling even small amounts can cause headaches or nausea, and there is even the risk of death because a victim may become immobile before realizing that there is a problem. We recommend installing a CO alarm.

☒ Check ventilation

- Make a habit of ensuring ventilation when using gas appliances.

☒ Check the ignition ☒ Repeated ignition/ re-ignition ☒ Going out

- Accidents will occur if you forget to confirm proper ignition. Be sure to check visually!
- Accidents occur when gas accumulates in an appliance after repeated failures at ignition. Always be careful when attempting to ignite a gas appliance after failing the first few times.

※ Is the battery dead?
※ If it is difficult to light the appliance, contact an LP gas shop immediately to have the appliance checked.

◎ Please consult with your local LP GAS shop if you use a gas appliance with no safety device, or a water heater or bath heater with an exhaust pipe indoors.

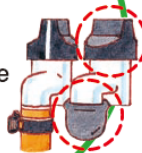
✓ Rubber hose

- Are there any burn marks or cracks?
- Does the hose reach the red line on the gas valve?
- Is the hose firmly fastened with a hose band?



✓ Unused gas valve

- Is the knob [Closed]?
- Is the gas valve covered with a rubber cap?



Warning to users of FF type heaters

✓ Combustion appliances which intake and exhaust directly outdoors

- Is the exhaust pipe detached?
- Is the exhaust port blocked?
- Is the end of the exhaust pipe set outdoors?



✓ CO alarm ✓ Gas leak alarm

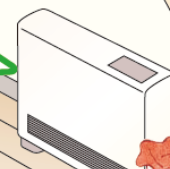
- Be sure to plug the alarm back in the plug outlet after using a vacuum cleaner etc.
- Is the plug detached?

※CO alarms should be replaced every 5 years.



To users of gas heaters and gas fan heaters

- Be sure to open a window to ventilate for a few minutes once or twice every hour.



✓ Always contact your local LP GAS shop when....

- Request an inspection from the appliance manufacturer or LP GAS shop immediately.
- Appliance inspections are free of charge, but if repairs or improvements are necessary, a fee may be required.



Flame

Flame is unstable

Flame is yellow

Flame is red

Operation

Flame goes out during use

Fire does not spread smoothly

Flame flares up or explodes on ignition

Difficult to ignite

Doesn't ignite

Appliance

Abnormal noise as the flame burns

A smell of gas

A smell of exhaust gas during operation

When your gas suddenly stops (Check for safety when using gas again)

- ✓ If there is a gas leak or you smell gas, do not use any gas. Contact your LP gas shop or emergency contact address.
- ✓ If a gas appliance is damaged, do not use it. Contact the appliance manufacturer for repairs.
- ✓ If the gas flow is shutoff, check the display on the gas meter and reset the meter.

※If the display says the gas shutoff was caused by a "pressure drop" or a "large leak," contact your LP gas shop for an inspection.

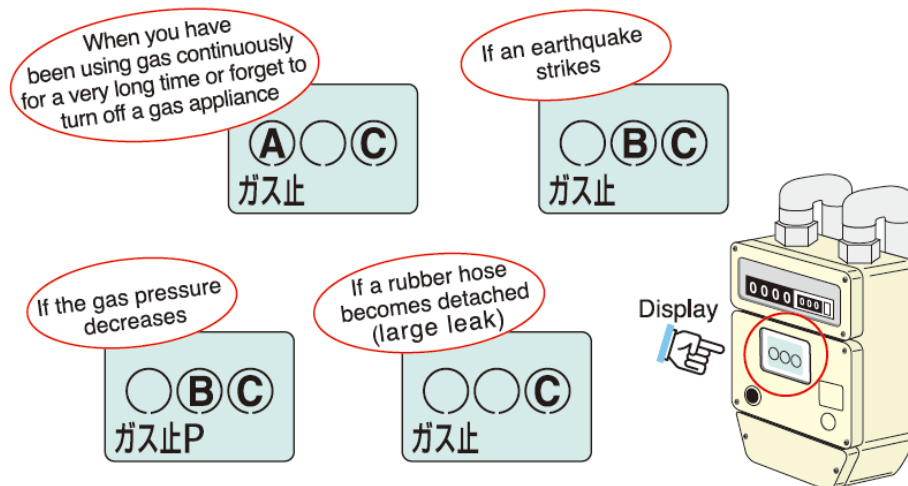
Gas meter (micon meter) functions and display

■ Gas shutoff function

- When you have been using gas continuously for a very long time or forget to turn off a gas appliance, the gas flow is shut off automatically.
- When a strong earthquake (5 or more on the Japanese earthquake scale) strikes while gas is in use, the gas meter shuts off the gas flow automatically. However, if gas was not in use and there was no abnormal condition, the gas meter's shut-off function will not start.
- If a large flow of gas due to a damaged pipe or a detached rubber hose is detected, the gas flow is shut off automatically.

■ Display when the gas flow is shut off

- If the gas flow, pressure or other condition is abnormal, the meter will automatically shut off the gas flow. The display will show the reason for the shutoff.

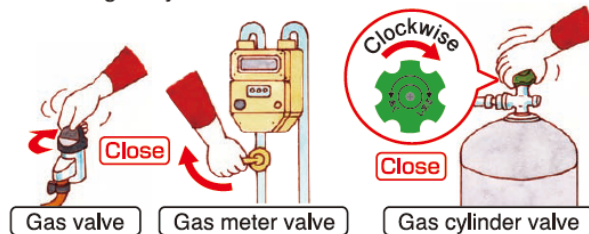


※If a gas alarm and gas meter are linked, when an alarm sounds the display will be the same when an earthquake gas shutoff has occurred.

In the case of an earthquake, fire or disaster

- Before evacuating or if you smell gas, do not use any gas. Close all appliance and other gas valves, the gas meter valve and gas cylinder valve.

In the event of
a gas leak or
before evacuating

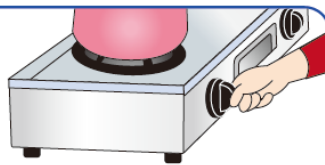


※Inspections will be conducted in sequence to check for gas leaks and inspect gas cylinders in areas where houses and buildings have been damaged. Please cooperate with these inspections.

Resetting the gas meter

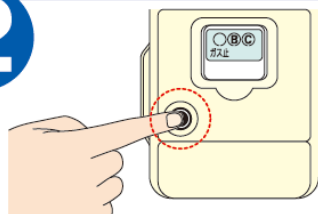
■ Follow these steps to begin using gas again.

1



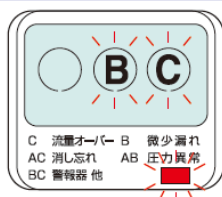
- Close all appliance valves.
- Check that all unused gas valves are closed.

2



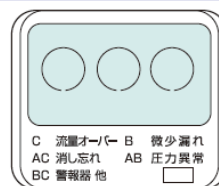
- Press the reset button on the left side.
- The “ガス止 (Gas Flow Stopped)” message goes out.

3



- Letters on the LCD and the lamp begin flashing.
- Wait for **one minute**.
- ※The reset button may have a lamp on some meters.

4



- The letters on the LCD and the lamp go out.
- Reset is complete.
- Gas can be used again.

※If your gas is not usable after you complete the reset steps (“ガス止 (Gas Flow Stopped)” is displayed again), do not repeat the reset procedure. Contact your LP gas shop for an inspection.



What do you do when you smell gas?

Never use an ignition source

- Never touch the switches of lights, ventilation fans, or other electrical appliances. These may spark and ignite fires.
- Electrical switches tend to spark when turned off. Never touch them if you smell gas.



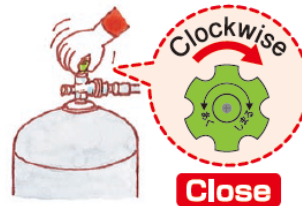
Fire ban

Clear out the gas from indoors

- Open doors and windows wide.
- Close all gas and appliances valves.
- Be sure to close the cylinder valve.



※ Check for gas accumulation at low places. Remember that LP GAS is heavier than air.



Report the gas leak immediately

- Call the number in the “**Emergency contact address**”.



Please give these information.

Your name
Your address
A landmark to find your house
The condition of the site

- Follow the instructions from the “**Emergency contact**” person.
- Do not use any gas until safety is confirmed.



○ Check the emergency contact address for your local LP GAS shop (for future reference).
○ Emergency contact or LP GAS shop receives calls 24 hours a day free of charge.

LP GAS Maintenance Services

Do you know about the various safety services available for LP gas?

As required by law, LP gas inspectors are dispatched on regular maintenance rounds to increase public awareness and to inspect and study safety conditions at consumer sites to promote safe usage of LP gas. Such activities are sometimes delegated by LP gas shops to certified maintenance organizations. Please cooperate with the inspectors from these maintenance organizations when they visit.

✓ Public awareness

- LP GAS shop regularly sends out guidelines on usage and tips on preventing accidents.



Once a year
(or every two years)

✓ Communication and handling in an emergency

- Prompt handling of gas leaks, etc.



LP GAS shop responds to all emergencies within 30 minutes free of charge.

Emergency contact is accessible 24 hours a day and on holidays.

✓ Inspection at the start of supply

- The inspector checks all LP gas facilities, including the consumer's gas appliances.



When starting up supply

✓ Supply facility inspection when changing a cylinder

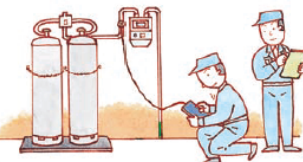
- Inspector checks the area around the cylinder to confirm that nothing nearby will knock the cylinder over, etc.



When changing a cylinder (or once or more a month).

✓ Regular inspection of supply facilities

- Inspector checks the supply facilities from the regulator to the gas meter to confirm safety, the absence of leaks, etc.



Every 4 years maximum

✓ Regular inspection of consumption facilities

- Inspector checks consumption facilities such as gas appliances, intake/exhaust, hoses and pipes.



Every 4 years maximum

◎ [Maintenance service] is provided free of charge. Fees will be charged for the repair or improvement of a [consumption facility].

Information

Do you know about the “LP Gas Safety System”? (Long-term usage product safety inspection system)

Since April 2009 an inspection system is provided for manufactured and imported “Specified Maintenance Products”.

When you purchase a specified maintenance product, be sure to **register as an owner**.



Products manufactured before April 2009 are not subject to statutory inspections, but a similar inspection can be performed **for a fee** if **requested by a customer**. Contact the appliance manufacturer.

Contact address for inspection or repair of combustion appliances (Fill-in form)

※ Check the contact address for inspection or repair in the instruction manual or on the website of the appliance manufacturer.

Product or appliance name	Manufacturer name	Date of purchase (year/month)	Contact for inspection or repair
①			☎
②			☎
③			☎
④			☎

Contact address for LP GAS emergencies!

Contact address



Emergency contact address is toll-free and available 24 hours a day.

LP GAS shop



Foreign language versions (English, Portuguese, Chinese, Korean, Spanish) are available on the LP gas websites.

For more details, visit the homepage of the Liquefied Petroleum Gas Safety Commission.

<http://www.lpg.or.jp/>

● Have the LP GAS shop fill in the emergency contact address.

● 緊急連絡先の欄は、LPガス販売店で記入してください。

(英語)



The following links are for two Guidance Sheets issued by Liquid Gas UK covering the subjects of regulator safety and the safe use of LPG. Copies of part of the guidance sheets (39 & 28) have been included as well but for more information please contact the association at mail@liquidgasuk.org.

[Consumer Guidance Sheet 39.pdf](#)

[CGS 28 - Safe use of Propane & Butane Cylinders and Cartridges.pdf](#)

Consumer Guidance Sheet 39

39

REGULATORS – SAFE USE

Introduction

Regulators are necessary to reduce the pressure of LPG in the cylinder or cartridge to the much lower pressure that is used by the appliance. Each country has their own settings for domestic applications, typically in the UK, butane regulators are pre-set at nominally 28-30 mbar and a propane regulator is pre-set to 37mbar, however for some touring caravan and motorhome applications designed and built to standard EN 1949 the regulators are installed by the manufacturer and pre-set at 30 mbar for both butane and propane. Regulators for other applications (such as plumbers torches) operate at higher pressures and are often fitted with adjustable regulators.

Regulators come in two basic patterns, screwed connectors and quick connect (clip-on) types. They are specific to the type of cylinder they can be attached to. Most screwed connections (except for special cylinders e.g. Camping Gaz, Calor 340 or Primus) use a left-hand thread and tighten in the opposite direction to a normal screw. Some connections require the use of a non-metallic sealing washer.

The regulator service life is specified by the manufacturer, if this is not known then the recommended service life is 10 years so long as it has been used correctly according to the manufacturer's instructions. Regulators marked BS 3016 are now over 10 years old and it is recommended that they are replaced.

When selecting a regulator, it is recommended that a model with a means of protecting the downstream hose, pipework and appliance from overpressure in the event of regulator malfunction is used.

Such devices are:

- A regulator incorporating an Over Pressure Shut Off (OPSO) – a requirement for most installations in residential and habitable properties in the UK and commercial activities covered by the Gas Safety In Use Regulations (GSIUR) and installation standard BS 6891;
- A two-stage regulator where the 1st stage restricts the pressure lower than 150 mbar - especially designed for and fitted to Touring Caravans and Motorhomes built to EN1949, which is universal across the EU;
- A regulator with an integral relief valve - often used in Touring Caravans and Motorhomes built to EN1949, marine use and large specialised Industrial or agricultural applications. This type of regulator is not suitable for use indoors.

Page 1 of 3

Consumer Guidance Sheet 39
August 2020

Camden House, Warwick Road, Kenilworth, Warwickshire CV8 1TH mail@liquidgasuk.org



For your safety, always:

- Use a qualified and registered Gas Safe Installer for gas installations covered by the GSIUR which covers all installed internal appliances and pipework to habitable and residential and commercial properties in the UK.
- Make sure that the outlet pressure of the regulator is the same as the inlet pressure requirement of the appliance(s) and ensure it is the correct size for the cylinder valve – never force onto one of the wrong size;
- Connect regulators to cylinders in accordance with the manufacturer's instructions;
- Always use the correct sized spanner to tighten any screwed connection, do not over tighten;
- Ensure new regulators are clearly marked BS EN 16129. This standard has progressively replaced standards BS EN 12864; BS EN 13785 and BS EN 13786, and regulators made to these standards may be still available for sale, therefore when purchasing a new regulator check that it is less than 3 years old from the date of manufacture;
- Make sure regulators, which are not fitted directly to the cylinder outlet, and any changeover valve is secured at a position higher than the cylinder outlet so that the hose/s from the cylinder slope downwards from the regulator to the cylinder valve;
- Make sure the vent on a regulator does not point upwards or is installed in a position allowing the ingress of water, either by; rain, snow or any trickling or pooling;
- Protect from sea water spray unless the regulator is otherwise designed for this environment or is suitably protected;
- Make sure the vent is not blocked by other contaminants e.g. mortar from building works;
- If a regulator is disconnected from its gas supply ensure it is stored correctly to ensure no contaminants enter and protected from water, with connections adequately plugged or capped;
- If a regulator fitted to a gas cylinder is not going to be used for long period of time, such as for outdoor appliances or when the premises are not occupied and the use is not essential for heating whilst unoccupied, it is recommended that the cylinder valve is turned off until required;
- Replace a regulator if it shows signs of wear, leakage or damage.

Page 2 of 3

Consumer Guidance Sheet 39
August 2020

Camden House, Warwick Road, Kenilworth, Warwickshire CV8 1TH mail@liquidgasuk.org



Liquid Gas UK

www.liquidgasuk.org

For your safety:

- Do not force a regulator onto the cylinder valve if it does not fit easily;
- Do not operate its mechanism using excessive force;
- Do not use regulators with US POL inlet fittings (designed for use on bulk storage vessels) with Cylinder valves (the threads may look the same, but they are different);
- Never tamper with regulators;
- Never try to adjust non-user adjustable regulators, they are pre-set by the manufacturer to control the gas supply at the correct pressure, unless you are qualified to do so;
- Do not purchase or use a second-hand regulator.

Status of Liquid Gas UK Consumer Guidance Sheet (CGS)

The Consumer Guidance sheets serve as guidance prepared and issued under the authority of Liquid Gas UK; the contents have the same status as a Code of Practice so members of Liquid Gas UK are expected to conform to the information provided. Liquid Gas UK guidance is sometimes written in collaboration with UK policy makers, therefore regulatory inspectors may choose to use the guidance to establish good practice and compliance.

Disclaimer of liability: Liquid Gas UK shall not be liable for any loss of business or profits, nor any direct, indirect or consequential loss or damage resulting from any such irregularity or inaccuracy for information, or use of the guidance provided by the association.

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LIQUID GAS UK, Camden House, Warwick Road, Kenilworth, CV8 1TH

Website: www.LiquidGasUK.org Email: mail@LiquidGasUK.org

Revised: January 2014

Safe Use of Propane and Butane Cylinders and Cartridges

This Consumer Guidance Sheet gives general guidance for all users in domestic, small commercial and industrial applications who use LPG (Liquefied Petroleum Gas) cylinders and cartridges as a fuel supply to gas fired appliances. This guidance applies to vapor use only. The Health and Safety Executive was consulted in the production of this publication and endorses the advice set out in this guidance.

In this document cylinders are portable pressure containers up to 150 L capacity and cartridges are small containers of less than 1.4 L capacity [see 4].

The reference to Propane and Butane also covers mixtures of these two gases.

The guidance is limited to appliances only operating with pre-set pressures and does not cover Bitumen Boilers, and is limited to the storage and use of up to four cylinders or cartridges. Where a greater number of cylinders are required we recommend that consideration is given to a bulk storage tank.

For further information on the use and storage of cylinders refer to:

Liquid Gas UK Code of Practice 7; Storage of Full and Empty LPG Cylinders and Cartridges

Liquid Gas UK Code of Practice 24 series; The Use of Cylinders Part 1-6 depending upon your application.

The guidance is also intended to support and inform the risk assessment required under Health and Safety law at places of work [see 8]

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Consumer Guidance Sheet 28

January 2014

Camden House, Warwick Road, Kenilworth, Warwickshire CV8 1TH mail@liquidgasuk.org



Liquid Gas UK

www.liquidgasuk.org

Page one of the Guidance Sheet 28 (Safe use of LPG cylinders and cartridges) issued by Liquid Gas UK



Example of consumer instructions on an LPG cylinder – courtesy ELGAS Australia



Example of consumer instructions on an LPG cylinder – courtesy ELGAS Australia

Appendix Five

CARBON MONOXIDE

Carbon Monoxide poisoning is deadly. Carbon Monoxide is produced by the incomplete burning of fossil fuels. There are several ways that this can occur, including poorly fitted or badly maintained LPG appliances, inadequate ventilation, and blocked chimneys or vents.

There are several types of gas appliances that can create Carbon Monoxide, these include:

- Gas cookers
- Free-standing gas heaters
- Gas fires
- Boilers and water heaters

Carbon Monoxide can also be produced as a by-product of burning solid fuels such as coal, charcoal, wood or kerosene:

- A lit fire with a blocked flue or chimney will prevent Carbon Monoxide from escaping and produce it into your home
- Using a gas appliance in a confined space without proper ventilation, or bringing it inside a caravan or tent after use, can result in dangerous levels of Carbon Monoxide being produced

In order to minimise the risks of Carbon Monoxide poisoning:

- Ensure that all gas appliances are properly installed and regularly serviced on an annual basis. This work should be carried out by a registered gas installer
- Ensure that all chimneys and flues are regularly cleaned to prevent blockages, this should also be done annually
- Allow adequate ventilation into the room where the gas appliance is located to ensure there is plenty of oxygen available for complete combustion, Carbon Monoxide is generated where there is inadequate oxygen
- Fit Carbon Monoxide alarms and test them regularly. Alarms should be fitted around three metres from an appliance at door height. This would ideally be in each room where there's a gas appliance fitted

If there is any concern about the possibility of Carbon Monoxide poisoning you should act as quickly as possible and:

- Open all doors and windows
- Move outside into fresh air
- Call the local Gas Emergency Services

Carbon Monoxide has no smell at all, making it very difficult to detect a leak. Further to that, you cannot taste or see the gas either - this is part of the reason it is known as 'The Silent Killer'.

Having a working audible Carbon Monoxide alarms and learning to spot the physical signs and symptoms of Carbon Monoxide poisoning, is essential to minimise the health risks posed by a leak.

If you spot any of the signs below, it doesn't definitely mean that there is a release of Carbon Monoxide, but it's possible:

- Gas flame appears 'floppy' and burns orange or yellow rather than mostly blue
- Pilot light frequently blows out
- There is soot or yellow-brown staining on or around an appliance
- You see or smell smoke or have excessive condensation in the room where you have a gas appliance

After you have inhaled Carbon Monoxide, it enters your bloodstream and begins to mix with the haemoglobin. This creates carboxyhaemoglobin, with a level of 30% of carboxyhaemoglobin indicating severe exposure. This process makes it impossible for your blood to carry oxygen around the body, leading to illness, tissue and cell failure and, from long term exposure, potential paralysis and brain damage.

There are several symptoms caused by Carbon Monoxide poisoning including:

- Headache
- Dizziness
- Breathlessness
- Nausea or feeling sick
- Collapse
- Loss of consciousness

If you are experiencing any of these symptoms and they cannot be explained by any other reason, such as another illness you are already aware of, or you immediately feel better when leaving the property, there's a chance you have been or are being exposed to Carbon Monoxide.

Some people often describe the early symptoms of exposure as being flu-like. If you have experienced these early symptoms or know you've been exposed to low levels of Carbon Monoxide, you should seek medical advice from your doctor.

The effects of Carbon Monoxide exposure get worse over time, meaning early detection is vital. Over an extended period of Carbon Monoxide exposure, some of the following symptoms may occur:

- Vision and memory loss
- Confusion and difficulty thinking
- Changes in mood
- Chest pain, heart stress and possibly death

Some of these symptoms will only come from inhaling high levels of Carbon Monoxide but can have potentially fatal results. It is also important to remember that these symptoms could also happen in the first instance, so immediate medical help should be sought if you begin to experience these symptoms.

Appendix Six

SAFETY ADVICE FROM A MANUFACTURER

Apart from supporting the LPG industry by providing consumer safety information, manufacturers of LPG equipment also communicate detailed information about their products to LPG marketers/distributors.

The following warning instructions are extracts of examples of what is sent out with every box of LPG valves that are manufactured by the Cavagna Group. The full instructions include general safety advice which are mainly standards, and there is technical information which will vary depending on the product family. They are available in several languages and are always under review in order to keep them updated according to changes of use, and other developments.

The full warning instructions are not designed for the consumer and so have not been included here. However it illustrates the efforts that manufactures go to in order to communicate the detailed warning instructions that are issued to other stakeholders in the LPG distribution channel.

Manual closing Valve

Read these instructions carefully before any fitting

Warning Instructions in accordance with **TPED 2010/35/EU**
ADR (In particular: Pt. 1.8.7.3 e 1.8.7.4)

APPROVAL 

This Product is covered by the manufacturer's warranty terms and conditions which are available on the website www.cavagnagroup.com in the section 'General Warranty Condition'

	 Danger • Gas leaks may cause fires or fatal explosions • Only skilled personnel is allowed to work on gas installations • Inspect the gas installation at regular intervals • Replace the adapters and the Valves as suggested • The non-fulfilment of these instructions may cause serious risks for your health
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Cavagna Group, as Manufacturer, reserves the right to modify the present sheet of instructions without prior notice.

IMPORTANT INFORMATION FOR THE END USER:	• Gas leaks can provoke fires and explosions. • If you smell gas: - Do not use the telephone or electrical devices. - Do not switch on electrical domestic equipment. - Immediately contact your supplier from a neighbour's telephone. - If you cannot contact your supplier, telephone the Fire Department.
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References

WLPGA – Guidelines for Good Safety Practices in the LPG Industry

WLPGA – Guidelines for Good Business Practices in the LPG Industry

WLPGA – Report on the Testing and Requalification of LPG Cylinders

ISO 22991 - Gas cylinders -Transportable Refillable Welded Steel Cylinders for Liquefied Petroleum Gas (LPG) – Design and Construction

ISO 10691 - Gas Cylinders – Refillable welded steel cylinders for liquefied petroleum gas (LPG) -- Procedure for checking before, during and after filling.

EN 1439 - LPG equipment and accessories - Procedure for checking LPG cylinders before, during and after filling

ISO 10464 - Gas Cylinders – Refillable welded steel cylinders for liquefied petroleum gas (LPG) --Periodic Inspection and Testing

BS 5355: 1976 - Specification for filling ratios and developed pressures for liquefiable and permanent gases

EN 1442 - LPG equipment and accessories - Transportable refillable welded steel cylinders for liquefied petroleum gas (LPG) -- Design and construction, European Committee for Standardisation

EN 1440 - LPG equipment and accessories - Transportable refillable welded steel cylinder for LPG -- Periodic requalification, European Committee for Standardisation

Liquid Gas UK – Various Guidance Sheets

ELGAS Australia (www.elgas.com.au)

CAVAGNA Italy (www.cavagnagroup.com)

PERC USA (www.propane.com)

DCC Ireland (www.dcc.ie)

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