# CAMPING GAS

## GUIDANCE ON SAFE USE OF GAS APPLIANCES FOR COOKING, BARBEQUES, HEATERS - OUTDOORS AND INDOORS

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# CONTENTS

# Introduction

The purpose of this factsheet is to provide best practice advice to Scouts when using Liquid Petroleum Gas (LPG).

Advice particularly for gas has been taken from different recognised agencies such as the UKLPG Association and The Camping and Caravanning Club. There is not always only one solution and the key to determining the safest individual camping arrangements, will remain as the risk assessment process.

Many of the UK H&S legislative standards apply to workplaces and the one key standard relevant to camping fuels will be the relevant fire safety standards.

# Plan your use and assess the risks

Planning is the key to all successful and enjoyable Scouting experiences. A risk assessment is a key part of the planning and must not be underestimated.

As well as the obvious considerations about the most suitable style of equipment for the type of activity, also consider the following:

- Where will you be using it?
- The risk of fire and the safe set up of the equipment
- Risk of burns during operation from the set up to when it is packed away
- Controls to reduce the occurrence or exposure to Carbon Monoxide – a toxic gas
- Is the equipment properly maintained and safe to use? Have you tested it?
- Do those using it know how to? Are you confident they are competent?

Take a look at the specific sections on these hazards later on in this factsheet to help you better understand them.

Why not produce a simple **Checklist** to help others understand the steps they need to take for safe use.

# Gas

Which gas should I use, Propane or Butane?

The physical properties of the two gases are similar, and when regulated to the correct pressure, they will perform almost identically. However there are some important differences. Of the two gases, Butane has the most advantages.

Litre for litre, it contains around 12% more energy than Propane and so you can squeeze more running time into the same sized bottle. (Butane is heavier than Propane though, so weight for weight it's a pretty close call.)

Butane also burns cleaner than Propane and although this isn't normally a serious issue in camping it might be a consideration on the maintenance of gas equipment in the long term.

Finally, while it's not strictly a property of the gas, Butane cylinders generally but not always, use clip-on type connections. These are far more convenient than the Propane screw type connections, especially if you swap cylinders around regularly.

Conversely, Propane has only one advantage over Butane - but it's a big one! It is more effective than butane when the temperature is lower so might be better during activities during the colder months.

In order to be usable, the liquid in the bottle must be able to boil into a gas. In the case of Butane, this will happen at any temperature above -2C, whereas with Propane, this figure is much lower, at -42C. In the real world, it's not so clear cut. Whenever some of the liquid boils into gas, the remaining liquid cools. It is therefore possible for the temperature of the liquid to drop to several degrees below ambient. This can easily prevent a Butane canister from producing a useful gas supply, even when the outside temperature is several degrees above 0C.

So choosing the right gas pretty much boils down to whether you need to use it in freezing (or near freezing) conditions. If this is likely, then Propane is a must. If not, then Butane has the edge.

**Similarities**
Both gases burn clearly and have a high calorific value, giving similar flame shapes and heat outputs, and in principle, appliances will burn equally well off either gas.

**Differences**
However, as gas is drawn off from the cylinder and liquid turns back into gas, the liquid cools down causing the rate of change from liquid to gas to slow down. This effect is particularly marked for butane which will not turn from liquid to a gas below -2C, so that on cold days or when the gas is being withdrawn at a high rate, the liquid gets so cold that it delivers very low amounts of gas, or indeed no gas at all.

**Thus butane tends to be used for low pressure domestic appliances indoors, or outdoors in the summer only.**

Propane continues to turn from liquid to gas at much low temperatures than butane and thus gives a high pressure of gas on the coldest of days. Although propane cylinders can be used indoors on a temporary basis, they should not be stored indoors because of the higher pressures in them.

# Equipment

The owner / user of all LPG appliances and equipment is responsible to ensure that all their kit has been specially designed for use with LPG and thus ensure they can give long and reliable service to the user provided they are correctly operated and maintained.

It is essential that sensible safety precautions be followed with any appliances using butane and propane gases which are considerably heavier than air and highly flammable; and because of these facts, we list here simple safety measures which should always be adopted when using the appliances.

Failure to observe these could result in a serious accident.

It is very important that whoever is going to use the equipment knows how to operate it and never allow anyone other than a competent person (someone with a good level of experience) to connect or disconnect appliances and regulators.

You might need to be trained in this by a technically competent person.

# Appliances

With new appliances, read the instructions provided, taking particular care to ensure that the gas type is correct and the supply can provide sufficient gas for the appliance and any other appliances drawing on the same supply.

- Ensure that the regulator provides gas at the correct pressure for your application;
- Site the appliance so that it cannot overheat any surfaces and cannot cause an accident;
- Ensure the table you use for cooking burners has a heat resistant cover or surface such as thin metal plate;
- Set up away from mess tent / dining shelter sides as far as reasonably practicable.

For older equipment, ensure that the appliance has an adapter and regulator already attached for the type of gas bottle you are going to use. If the equipment does not have the connector on, do not guess at the type required, get advice from a manufacturer or supplier. Do not change the connector or regulator unless competent to do so.

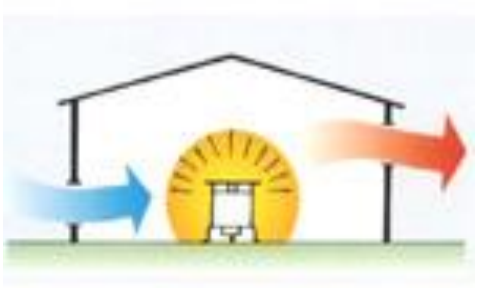
The appliance should burn cleanly without the formation of soot. If it does not, turn it off and ensure any maintenance is carried out by a competent person before re-using.

Most appliances operate at high pressures (i.e. in the range 0.35 to 2 bar) since this gives the hot compact flames required for lights and portable heating equipment.

## Ventilation

Fixed installations:
All LPG equipment consumes oxygen and emits carbon dioxide and carbon monoxide in use so that when using un-flued equipment in an enclosed space it is important that there is **adequate permanent ventilation and adequate free space** surrounding it. These requirements are laid down in various British Standard Codes of Practice.

When using appliances in mess tents, party type tents or marquees, there must be open doors and the ventilation meshes must be open at **all times** the equipment is connected up to the cylinder.



Gases are heavier than air and closed tentage in the case of gas leaks would entrap a layer of gas at low level. **(See section on Carbon Monoxide poisoning).**

# Cylinders

Make sure the cylinder is large enough for your requirements. Cylinders must be sited away from any heat source, in a well-ventilated place and must stand in a stable upright position.

Never put a cylinder in an area below ground level such as ditch, as LPG is heavier than air and any leak will allow gas to pool and become a greater risk from naked flames.

Cylinders should be placed upright and outside the confines of the cooking tent so the cylinder valve is more accessible in the event of a fire. Allow enough hose for this. Bottles should not be kept under a cooking table as, should a fire start, you cannot get to the bottle to turn off the supply without going under the fire itself.

If required, a suitable lightweight weather cover can be used to protect bigger cylinders (e.g.47Kg Propane) against excessive wet weather or the heat of the midday sun if this is deemed a risk factor.


Calor Gas

Campingaz

# Connecting to the gas supply

## Regulators

Regulators change the pressure of the gas so that it arrives at the equipment at a suitable level for it to use.

**Regulators must be marked BS3016 or BS EN12864**

Appliances should only be used in conjunction with a British Standard regulator. It is important to check that the regulator:

- gives the correct pressure for the appliance;
- is suitable for the gas being used (check also that the gas is suitable for the appliance);
- has a large enough maximum flow for the appliance.

For propane cylinders, and for butane cylinders with screw connectors:

- always, before connecting a regulator to a cylinder, ensure that the mating parts are clean, free from dirt and undamaged, and, in the case of butane regulators, check that the washer is in place on the spigot of the connector and is in good condition;
- the connecting nut of the regulator must be hand force spanner tightened to the cylinder valve. (Note: The thread is left-handed.) Do not over tighten.

For butane cylinders with ‘switch-on’ or ‘clip-on’ connectors: Consult your dealer on the type of adaptor or regulator you require and fit in accordance with the manufacturer’s instructions

**Screwed connections**
Note that all nuts with notches on the hexagon have a left-handed thread.

## Hoses and Clips

British Standard hose only must be used for passing these gases as LPG attacks and corrodes natural rubber. There are no fixed lengths but it is good practice to keep hose lengths as short as possible for your needs and they must be securely attached with suitable hose clips to the ends provided.

- Low pressure certified hose, (which should show the number BS.3212/1 and the year of manufacture) must only be used for regulated pressures up to 50mbar.
- High pressure certified hose (which must show the number BS.3212/2) can be used for all pressure up to 17.5 bar.
- Hose and clips should be regularly inspected and replaced if corroded, rusty, worn or otherwise damaged.


Make sure that the hoses are kept clear of ‘hot spots’ and inspect them from time to time.
Replace any hose that shows signs of wear, cracking, corrosion, rusting or other damage.
Keep hose lengths as short as possible for your particular set up.

Hose or tubing with an internal diameter of 8mm or greater and operated at a **pressure of up to, but not**

**exceeding, 50mbar** may be secured using either crimp clips or swaged fittings or worm drive clips.
Hose or tubing with an internal diameter of less than 8mm and hose operated at **a pressure exceeding 50mbar** should always be secured by crimp clips or swaged fittings. **Worm drive clips should not be used.** Only crimp clips of the correct size.

If Worm drive clips are used to secure the hose or tubing do not over tighten so as to damage the hose.

## Hoses and Tubing

Hose and tubing does not generally have a time limited in-service life (if in any doubt, it is recommended you replace hose after 3 years) but it is essential that LPG hose/tubing and end connections are regularly inspected by a competent person and replaced if showing signs of:

- Physical damage such as - cuts or abrasion, cracking, stretching, flattening, kinking and, where fitted, missing/worn sealing washers, damaged cylinder connections;
- Environmental deterioration such as - stiffening, cracking, de-lamination of outer covering, chemical degradation i.e. softening of outer coating by contact with oil.
- Hose service failure such as - blistering, soft spots, rupture and, for pre-assembled end fittings, corrosion or loosening of swaged fittings attaching hose.

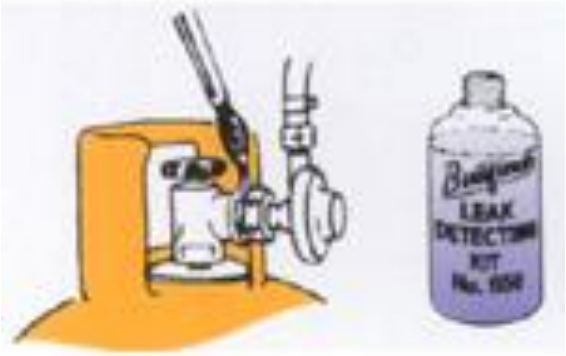
It is good practice to always check hoses at the beginning of the camping season and also immediately before setting up for use and to make a record of formal inspections. Ideally, record the dates that you fit new hoses so you can track time in use, and mark the hose accordingly.

## Leaks

After connecting appliances/regulators, etc., check that there is no leak of gas before using. Propane and butane have a distinctive smell and a leak can usually be detected immediately by this fact.

If a leak is suspected, extinguish all naked lights and close the cylinder valve.

NEVER look for a leak with a naked flame, but trace it by smell and confirm by brushing suitable leak-detecting fluid over the suspected joint. Equipment must not be used until any leak is eliminated.




## Turning off

After using a portable appliance it is IMPORTANT:

- that the cylinder valve is closed first thus allowing the gas in the system to burn off;
- that any valve fitted to the appliance is then closed to ensure that when the appliance is again used the turning on of the cylinder valve does not allow gas to escape from the appliance before being lit.


## Problems

If you are in any doubt about the operation of the appliance please consult your dealer directly.
You can get technical and safety advice and there is a comprehensive set of industry recognised Codes of Practice available.

## Transporting gas bottles for camp

The transporting of gas is often forgotten on the risk assessment we undertake for a camp. Gas bottles should be transported and stored upright and secured in position whenever you travel, rather than lying down. With gas or another liquid fuel, containers should always be of an approved type.

It is good practice not to mix people with gas bottles on your transport. If possible carry the gas in a gas tight bulk head. If not, ensure good ventilation in the vehicle.
Carry suitable firefighting equipment to tackle a fire. A flammable gas sign should be displayed on the vehicle.

# Fire

If a fire develops, try to turn off the cylinder valve, remove the cylinder from the fire and extinguish the fire with a dry compound extinguisher – Powder or CO2. (Do not use a water jet on a fire of liquid LPG).

If this is too dangerous call the fire brigade and move all people from the area (at least 100m away if possible)


# Gas cartridges

Most single burner gas stoves burn at around 150g/h (grams per hour). This is the rate at which the stove consumes fuel. This information will be found on either the packaging or the information booklet inside. By doing a simple calculation you will be able to make a rough estimate of how long the cartridge will last.

One litre of water should take around 3-6 minutes to boil. This is longer in colder temperatures, but shorter at altitude as all gas cartridges work better as altitude increases and air pressure is lower. Heat output declines as cartridge empties and pressure drops.

These cartridges are thrown away when empty and come in two main types –with an integral valve and piercable - although there are numerous sizes and shapes of cartridge on the market.


## Pierceable Cartridges

Pierceable cartridges are fitted to the appliance once and cannot be removed without losing the gas inside.

**THE SCOUT ASSOCIATION DO NOT RECOMMEND YOU USE THESE CARTRIDGES.**

## Integral Valve Cartridges

Generally better and safer. They can be removed from the appliance because the valve reseals the cartridge, keeping the gas inside.

The most common of these have screw fittings that comply with EN417 type 2. This standard describes the fitting, so different sizes of cartridges are available for appliances of this type.

## Aerosol Cartridges

Aerosol camping stoves are cheap and popular with all sorts of campers.

We strongly advise you to take extra caution when using these types of stoves and always follow the manufacturer's guidelines.
Some important tips to follow when using this type of stove:

- Explain to adults and young people about the potential hazards and how to deal with them.
- Ensure the collar of the canister is properly aligned and seated before using the locking lever.
- Discard the stove if it cannot be properly aligned and locked without effort.
- Have a bucket of water on hand to cool-down the stove and extinguish flames.
- Turn the stove off safely if you hear irregular hissing.
- Vacate the area in the event of a leak.
- Don't use this type of stove for cooking for long periods.
- Don't use a pan larger than the ring size as the displaced flame may heat up the cylinder at the risk of explosion.
- Never leave a working stove unattended.
- Never attempt to turn off an over-flaming stove without protection to hands, arms and eyes.
- Don't use this type of stove (indeed any gas stove) in a confined area where gas cannot escape freely.

The Scout Association has been made aware of several reports of the aerosols in these stoves exploding. In at least one case, the incident involved initial problems with the locking lever and gas control dial. Later the gas canister exploded. At this stage we cannot be certain of the exact cause but have learned that this type of equipment has been banned in certain parts of Australia. The apparent reason is overheating resulting in explosion.

# Lightweight camping

Many campers will use gas appliances that do not undergo regular safety checks, like barbecues, stoves, lamps and heaters, so you need to be sensible about using them.

- LPG is heavier than air so a gas leak can lead to a puddle of gas in the floor and this, in turn, to a real risk of explosion;
- Ideally always use equipment outside your tent.
- Both butane and propane are odourless but the producers add a strong unpleasant smell to them so leaks will be noticed;

The most dangerous time with gas appliances is probably when you are changing the cartridge or cylinder;

- Make sure you are familiar with the way the cartridge or cylinder fits on the appliance or regulator;
- Ideally, never change the fuel container inside your tent;
- Do it outside and away from naked flames or a hot appliance. If you think the appliance, cylinder or cartridge may be leaking, particularly if liquid gas starts to spray out, then get everyone away from the appliance until the container is empty and the gas has dispersed naturally;
- Dispose of empty gas containers with care and in compliance with local site arrangements for the disposal of waste;
- Never throw them on a fire because any gas residue inside could lead to an explosion.

# Carbon Monoxide

## What is Carbon Monoxide

Carbon monoxide (CO) is a highly poisonous gas which can be produced if an appliance is not working correctly, i.e. full combustion of the gas does not take place. It is a serious danger and can be fatal, but is often less familiar than the obvious hazards such as fire.

Carbon Monoxide is produced by the incomplete combustion of the fossil fuels – gas, oil, coal and wood used in boilers, engines, oil burners, gas fires, water heaters, solid fuel appliances and open fires. Portable barbeques are a common example.

Consider that the use of such equipment could be around tents, caravans, boats, Scout buildings, mountain huts etc. Scouting activity occurs in such a wide variety of venues and locations.

It is difficult to recognise as it has no colour, smell or taste. This means you can inhale it without realising Symptoms of CO poisoning are similar to that of a viral infection. It affects the mental ability causing a person to become incapable without knowing.

Raising awareness of carbon monoxide to adults and young people alike during their various learning experiences is an important control factor.

## Symptoms of Exposure to Carbon Monoxide

- Tightness across the forehead and confusion
- Stomach pain
- Severe headache, weakness, dizziness, nausea, vomiting.
- Coma, intermittent convulsions
- shortness of breath and difficulty breathing

Symptoms of carbon monoxide poisoning can be similar to those of food poisoning and the flu. However, unlike flu, carbon monoxide poisoning does not cause a high temperature (fever).

If the exposure has been severe it may cause death.

For further information about the dangers of carbon monoxide poisoning look online at
http://www.nhs.uk/conditions/Carbon-monoxide-poisoning/Pages/Introduction.aspx
or
www.carbonmonoxidekills.org.uk

## How can I manage the risks?

**DO –** cook or use appliances in a properly ventilated area. If you need a sheltered cooking area, consider a gazebo or a tent porch with sufficient air circulation and ventilation.
**DON'T –** cook in small poorly ventilated spaces or areas where people sleep.

**DO -** regularly check and clean your equipment and arrange for proper maintenance in accordance with the manufacturer's instructions.
**DON'T** – leave known faulty equipment to chance. Get it serviced or dispose of it.

**DO -** consider the use of a Carbon Monoxide alarm to help detect its presence BUT, in the same way as you would position a fire extinguisher, fire blanket or smoke detector in the kitchen…as an extra precaution.
**DON'T –** forget to brief people about what to do if they hear the CO alarm go off. Be cautious and always assume it is a real emergency.

**DO** - stay warm by making sure you layer your clothing, and pick up a warmer sleeping bag.
**DON'T -** use gas stoves/fuel burners/lamps/patio or camping heaters to heat your tent when cold. All gas powered items need plenty of ventilation to prevent producing carbon monoxide.

*When considering where to place a carbon monoxide detector, keep in mind that although carbon monoxide is roughly the same weight as air (carbon monoxide's specific gravity is 0.9657, as stated by the EPA; the National Resource Council lists the specific gravity of air*

*as one), it may be contained in warm air coming from combustion appliances such as home heating equipment. If this is the case, carbon monoxide will rise with the warmer air.*

*http://www.gooutdoors.co.uk/blog/dangers-carbon-monoxide-camping/ gives some really helpful tips.*

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