A specifier's guide to LPG

CALOR

Calor – Committed to Service

All the benefits of mains gas, for all types of commercial buildings, where mains gas is not available. Calor is the UK's leading supplier of LPG and operating one of the UK's largest LPG storage facilities with an impressive customer support infrastructure to match its market position.

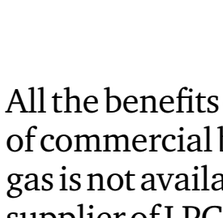
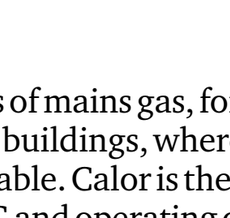
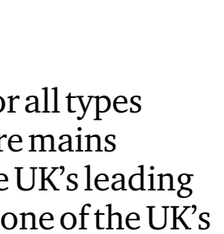
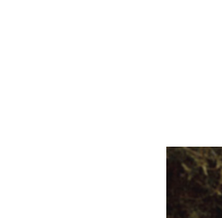
Calor operates the only truly nationwide distribution network in the UK LPG industry. There are 16 strategically positioned bulk distribution depots, together with 11,000 cylinder stockists available for the smaller consumer.

Calor has the largest LPG tanker fleet in the UK, which means gas can be delivered in bulk to any location on the UK mainland. Also available is a computerised automatic top-up bulk delivery system which uses a telemetry system mounted on the tanks to ensure continuity of supply regardless of consumption.

Calor can provide a free, no-obligation survey and quotation service. Free planning and advice is always available. Our technical team can provide expert guidance on all aspects of the use of LPG, without obligation.

Once the decision has been taken to use Calor LPG, a totally committed specialist workforce is placed at the customer's disposal. This includes an all-day, every-day emergency call-out service.

Calor operates a registered Quality Management System in accordance with BS EN ISO 9001. The company is also a member of key trade associations in its areas of activity.


For more information call free phone 0800 121 4561 visit www.calor.co.uk or email specifiers@calor.co.uk

LPG is ideal for a multitude of uses

- Air-conditioning
- All terrain vehicles
- Asphalt/bitumen heating
- Autogas
- Barbecues
- Bird scaring
- Blown air heating
- Boiler systems
- Boiling rings
- Catering
- Central heating
- Convection heating
- Crop chilling
- Crop desiccation and weed control
- Dishwashing
- Drying
- Fire training rigs
- Food processing, smoking and production
- Fork lift trucks
- Fridges and freezers
- Game rearing
- Generators
- Golf cars
- Grain/crop drying
- Greenhouse heating
- Heavy Goods Vehicles
- Hot air ballooning
- Incineration
- Kilns and furnaces
- Lawnmowers
- Lighting
- Metal work
- Paint drying
- Patio heating
- Pig rearing
- Plaque heaters
- Pool heating
- Poultry rearing
- Powerboat fuel
- Process heating
- Radiant heating
- Real flame fires
- Roof torches
- Showers
- Shrink wrapping
- Space heating
- Spot heating
- Tar boiling
- Temporary lighting
- Urns
- Utility vehicles
- Warm air heating
- Water heating
- White lining

Calor LPG Systems and Applications

Calor LPG Systems

A Calor LPG system generally consists of one or more storage tanks; underground service pipework to the building; regulators which reduce the natural pressure of the gas to appliance working pressure; an emergency control valve outside the building and installation pipework inside the building to serve the appliances.

The storage tanks are installed above ground or for certain applications may be buried underground.

For small installations, the tanks may be replaced by cylinders. In this instance, the usual arrangement is to have two sets of cylinders connected to an automatic changeover device which provides a continuous supply.

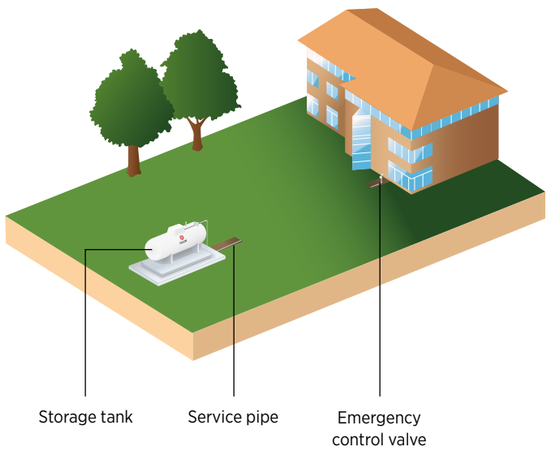
For a metered supply to a multi-occupancy site, central storage tank(s) can serve all users, with each having a meter.

The design of storage installations is undertaken by Calor specialists to provide the optimum solution taking into account the available space, the gas off-take of the appliances and the amount of storage required.

Applications

Generally, Calor LPG can be used in the same types of commercial and industrial space and water heating systems as natural gas, including, for example, radiator systems, warm-air heating, strip and plaque radiant heaters and industrial unit heaters. Calor LPG is equally suitable for use with condensing boilers.

Calor LPG System



The techniques employed for heat load and loss calculations are very similar to those for natural gas and there are only minor additional or different requirements for the installation, ventilation and flueing of boilers or other appliances.

Choice of appliance

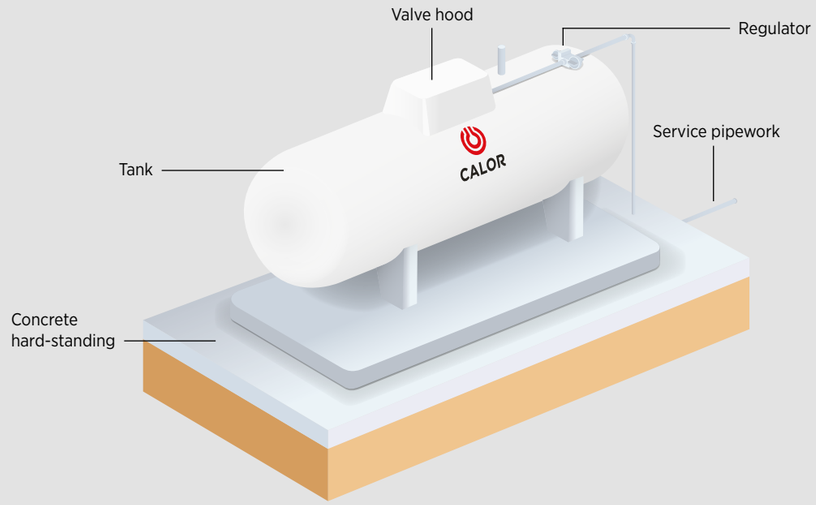
Calor LPG vapour has approximately 2.5 times the energy of the same volume of natural gas. It's therefore important that any appliances fuelled by LPG are designed and manufactured for that purpose. Most appliances which burn natural gas are also available to burn LPG and appliance manufacturers generally produce suitable appliances or have conversion kits.

Installation of appliances

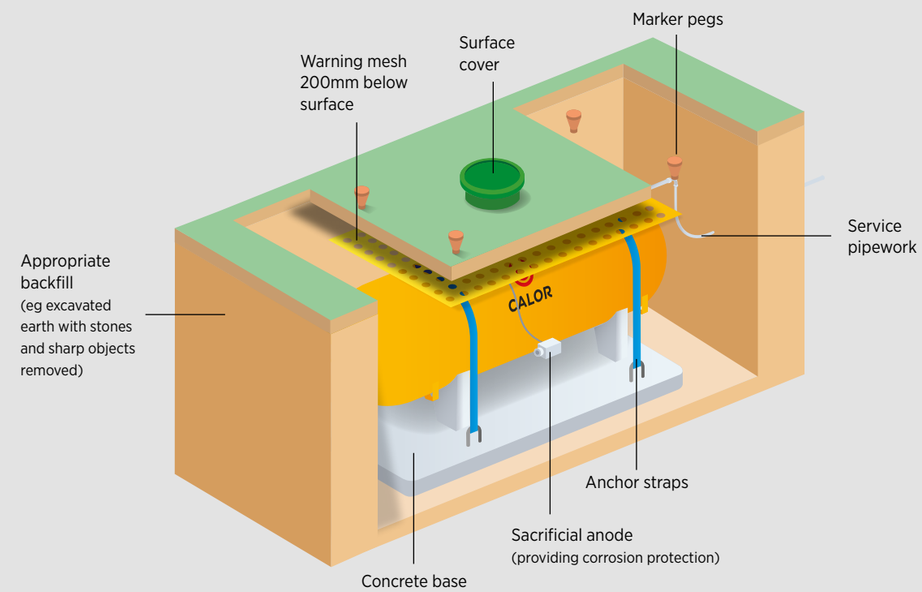
Because LPG is heavier than air, no LPG-burning appliances should be installed in cellars or basements, or otherwise below ground level.

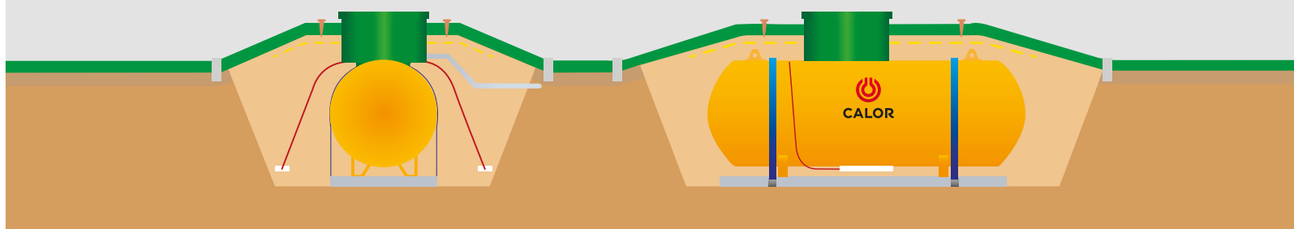
As with all gas systems, work must only be undertaken by Gas Safe™ registered installers, who must also be certified as competent to work on LPG systems by holding the relevant ACS modules.

Above-ground tank installation



Underground tank installation





Tank Sizing

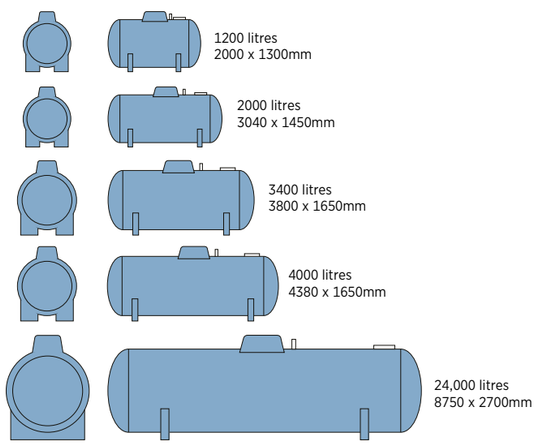
Where the site allows, it is sensible to allow for storage of sufficient gas for six weeks' consumption at maximum demand. More than one tank can be used to provide the necessary storage requirement and give the required maximum off-take rate.

The appropriate size of tank will depend on the following factors:

- Total estimated gas consumption of all of the appliances on the system at peak demand
- Physical constraints imposed by the site
- Access for installation of tank
- Access for deliveries
- Required frequency of delivery

Tank sizes

Height (to top of tank hood) x length (mm)



Note: All dimensions are approximate and tank sizes can vary depending on manufacturer.

Off-take capacity

The tank must be able to vapourise liquefied petroleum gas fast enough to supply the maximum hourly demand for gas of all of the appliances at peak time. As a rule of thumb, Tables 1 and 2 to the right can be used for estimating the tank size required – it should be noted that tanks can be grouped to provide the required off-take rate.

Gas requirement

The figures in Table 1 provide a useful rule of thumb for calculating gas requirement against appliance heat input.

Table 1
Gas requirements against appliance heat input

Heat input (kW/h)	Gas requirement (m3/h)	(kg/h)
10	0.38	0.72
20	0.76	1.44
30	1.13	2.16
40	1.52	2.88
50	1.89	3.60
70	2.65	5.04
100	3.78	7.19

Table 2
Maximum off-take rates for standard tank/cylinder sizes

Tank capacity (litres)	Tank size (LxD, mm)	Maximum off-take rate: (m^3/h)	Equivalent heat input (kW/h)
Above-ground tanks			
1200	2000x1300	5.66	150
2000	3040x1450	7.10	187
3400	3800x1650	10.00	261
4000	4380x1650	10.20	269
8000	5440x1980	17.56	463
24,000	8750x2700	39.65	1046

Tank Siting

Every tank installation varies, so this brochure is intended for general guidance only. Please consult a Calor specialist on the optimum tank size and the most suitable positioning for it.

For sensitive locations such as listed buildings, conservation areas and national parks, and for numerous other applications, an underground tank is the ideal solution. Your Calor specialist can offer you advice as to whether such an option is viable.

As a general rule, tanks must be sited in a position that is away from buildings, boundaries and fixed sources of ignition. This is so the tank is kept safe from external factors. Tanks should be sited in accordance with the UKLPG.

The tank(s) need to be delivered and serviced by delivery tankers via a suitable roadway; the roadway must allow the tanker to get within 25m of the tank. The driver stands at the tank during the delivery and must be able to see his tanker throughout the re-filling process.

To ensure that we are able to fulfil our statutory obligation to provide a safe gas supply, Calor requires safe access to the land on which the tanks are sited, including the access road and gas pipeline route.

Further information on tank siting is available in UKLPG Code of Practice 1.

Above-ground tanks

A Calor specialist will advise on the design of the above-ground tank installation. Tanks which are installed above ground may require a purpose-built compound if the general public has access to the area. The Calor specialist can provide details of the compound's requirements.

For all installations, a water supply will be needed for fire brigade use and a 19mm hose-reel where the storage capacity exceeds 2,000 litres.

Where there is any risk of damage to the installation by road vehicles, suitable crash protection must also be provided.

Underground tanks

Similarly to the above-ground tanks, a Calor specialist will advise on the optimum design of an underground tank installation. For under-ground tanks, it is important that the area immediately surrounding the tanks is kept clear of structures, traffic and deeply rooted trees, and that the ground is not susceptible to flooding or a high-water table.

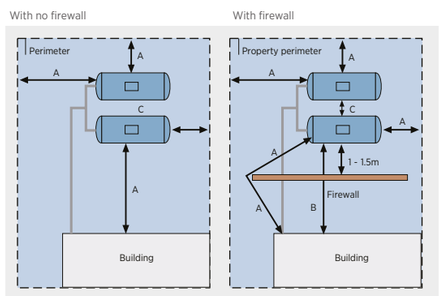


Table 3
Separation distances for multi-tank installations

Propane capacity (litres)	Minimum safety distances from buildings, boundary, property line or fixed ignition source (m):		Maximum number of tanks in group	Distance between tanks (m)	Height of firewall* (m)
	No firewall A	No firewall B			
1200	3	1.5	5	1	1.4
2000	3	1.5	3	1	1.5
3400	7.5	4	6	1	2
4000	7.5	4	6	1	2
8000	7.5	4	3	1	height of vessel
24,000	15	7.5	6	1.5	height of vessel

*the height of the vessel if greater

Installation, servicing and repair from Calor

Calor's extensive in-house customer engineering team delivers expert knowledge and renowned customer care. Our technicians are fully aware, and work to, the very latest legislation and abide by all relevant codes of practice. Whatever your installation requires, you can rest assured that your work will be carried out to the highest technical and legislative standards.

Gas Pipeline Services

- Under ground gas supplies (Installation, repair & testing)
- Trenchless technology & civil engineering
- Gas compounds

The Calor Commitment

- Our customer engineering team guarantees a professional and flexible service, working with you to meet your requirements and provide a timetable to suit you
- We fully cost work before starting and provide you with a fixed quotation
- All customer engineering team technicians carry ID cards for security purposes and we ensure they are fully qualified for the work undertaken
- For complex installations, we offer unrivalled technical design capabilities and full project management
- All work is covered by our warranty*

*Subject to Terms and Conditions.

"Calor's process from start to finish has been seamless and we are delighted with the end product."

– SIMON PEENE, PROPERTY & SAFETY MANAGER, WELCOME BREAK.

Supply Pipework

The supply pipework should be designed by a Calor specialist to ensure it provides an adequate supply of gas and that it conforms to the relevant standards.

The vapour pressure in the storage tank must be reduced to the working pressure of the appliance/(s). This is achieved by installing pressure regulators that maintain the optimum supply pressure. They contain safety devices that are activated in abnormal conditions.

Pipework

Typically, polyethylene (PE) pipe is used underground with copper or galvanised steel pipework being used above ground.

The underground PE service pipework between the tank and the building should be installed in a trench. The pipework should be run in the most direct route between the tank and the entry point to the building. The pipework at the building will terminate with an emergency control valve.

PE pipework should not be installed above ground or inside any building. Additionally, pipework must not be run under the footings of a building.

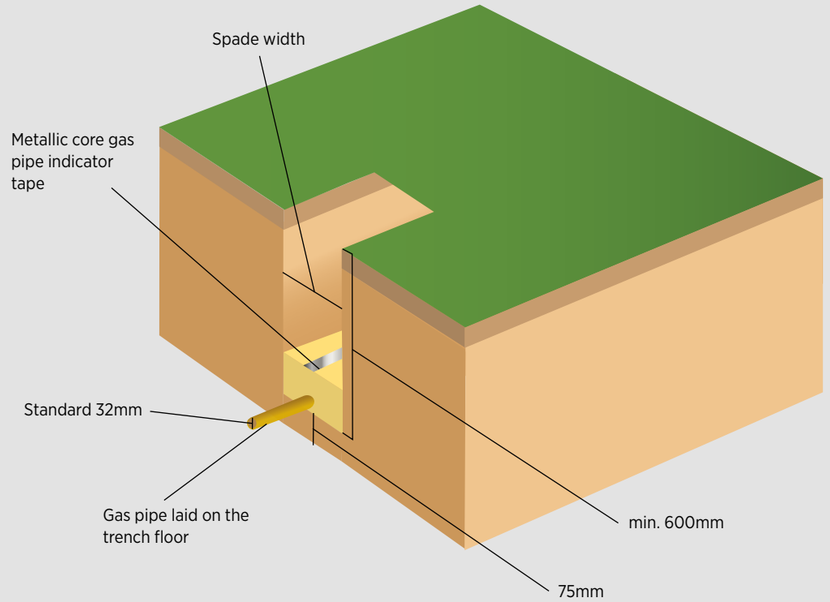
Trench

The trench should provide a minimum of 600mm of cover, a typical diagram of a trench is provided opposite (see figure above). A full specification of the trench requirements and advice on routing can be provided by Calor's specialist.

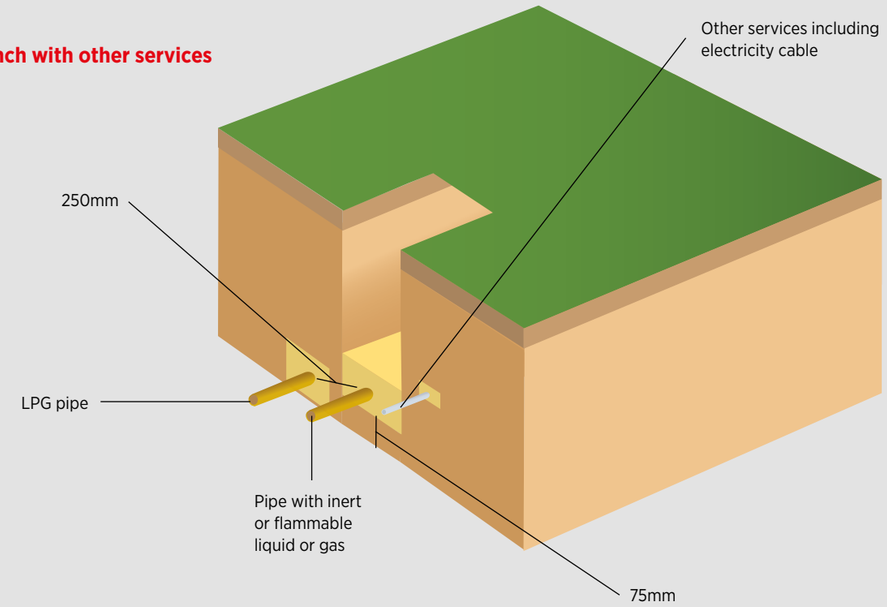
UKLPG Code of Practice 22 provides further information on the design of pipework systems for LPG installations. This is available directly from UKLPG, www.uklpg.org. Anyone working on pipework must be registered with Gas Safe and hold the appropriate ACS qualifications.

Typical pipework installation

Where risk of damage is negligible



In trench with other services



Information in this publication is intended for general guidance only. For more detailed information please contact Calor on 0800 216 659.

Costs and regulations

As with any fuel or energy source, LPG should be considered in the context of capital cost, running cost and maintenance cost.

Capital cost

In terms of capital cost, an LPG installation will be cheaper than laying a natural gas pipeline, and the installation costs are cheaper than oil. Capital costs will be incurred in the construction of the plinth to support the tank, trenching for pipework, excavation for underground tanks, any costs associated with the tank compound and the construction of impact protection around the tanks. The storage tanks are rented from Calor, who retain ownership and are responsible for their maintenance.

Running cost

Actual running costs, compared to other non-mains gas fuels, will depend on the building, site layout and the chosen heating system. It is recommended that Calor is consulted at an early stage to discuss the specific installation.

Maintenance cost

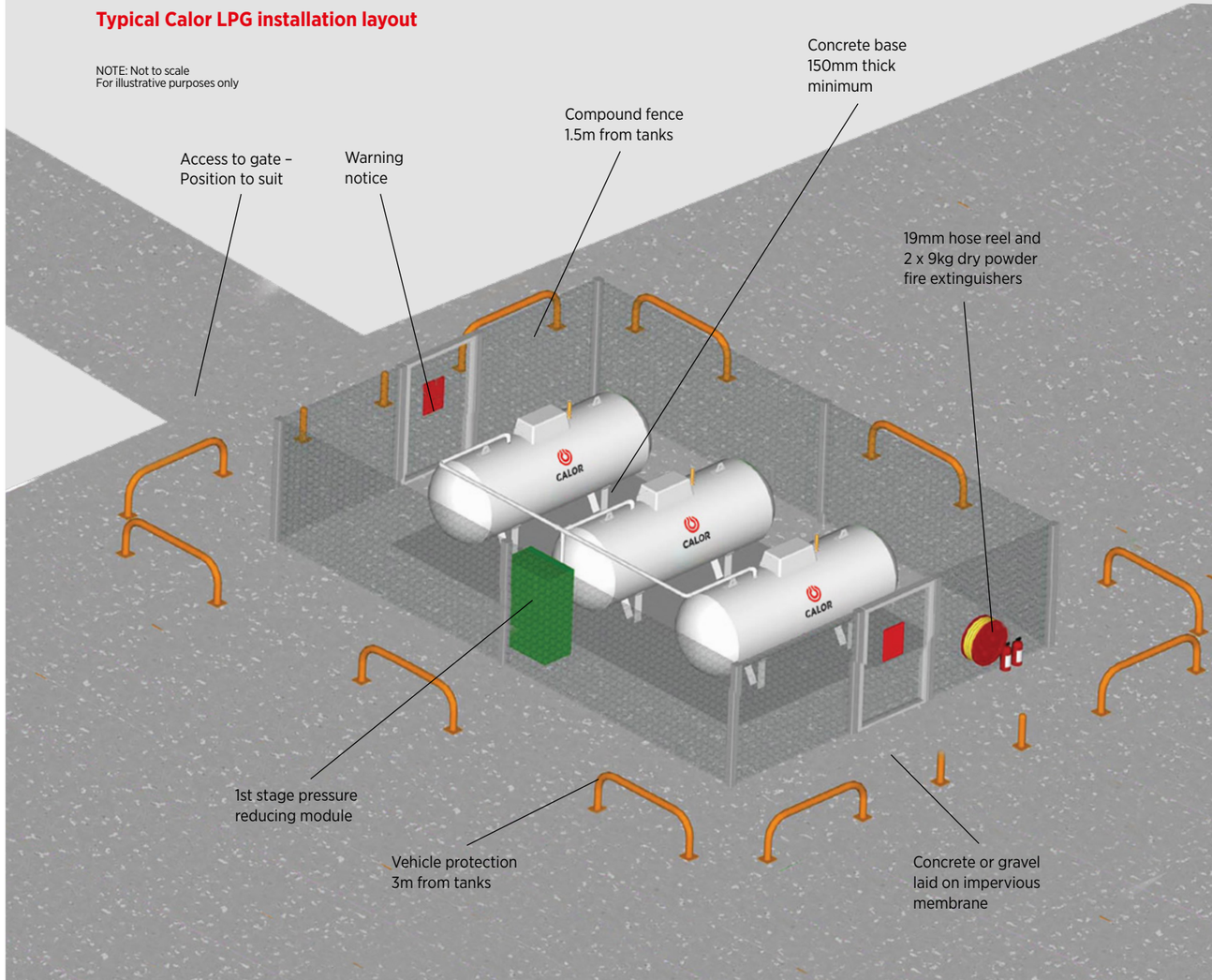
LPG is a cleaner burning, low sulphur fuel and direct maintenance costs will be comparable to those incurred by a natural gas system, which are generally low.

There will be additional costs associated with the physical maintenance of the tank compound and associated roadway and fencing.

Planning considerations

In certain situations, the local planning authority may require a formal planning application for the installation of LPG storage tanks. There are no special requirements for preparing the application, but the drawing should show the position of the tank in relation to the boundary of the property and any adjacent buildings. Separation distances should be clearly itemised.

Typical Calor LPG installation layout



Everyone benefits with LPG

No fuel theft

- Oil theft is often more expensive than the cost of replacing the oil:
  – Replacement Tank
  – Downtime for your business
  – Potential oil spillage

Pollution free

- The UK Environment Agency says that an oil spill costs a business up to £30,000 in fines, clean-up charges and production losses
- The damage to the environment of a leak or spillage can be extensive; oil can pollute streams, rivers and is toxic to plants and animals
- In contrast, LPG in its pre-burnt state is carbon neutral and cannot pollute soil, air or water

Cleaner burning, cleaner air

- EU legislation is driving tighter limits on the levels of noxious emissions that any energy-generating appliance can emit. This is already placing pressure on oil-burning appliances.
- LPG and liquid natural gas are the cleanest burning fossil fuels for CO_2, sulphur oxides, nitrous oxides and particulates
- The best advice to protect against future clean air legislation is to choose an appliance that burns the cleanest fuel

Tank maintenance and insurance

- Calor is responsible for the tank's on-going maintenance and safety inspections leaving you free to run your business
- Unlike oil there is no need to insure the tank as it remains the property of Calor

Low risk fuel

- LPG is a low risk heating fuel option for your business compared to oil
- With oil heating you are subject to potential theft and damaging spillages
- OFTEC recommends you take out insurance to cover all of these elements
- Fuel pollution is not a threat to LPG users, so the spectre of large insurance premiums and/or crippling clean-up costs is simply not an issue

Save on CO_2

- LPG has the lowest carbon emissions out of all the fossil fuels available to those off the mains gas grid
- It emits 20 per cent less CO_2 per kWh than heating oil
- When you multiply this impact over the 15-plus year lifespan of a commercial boiler this is a huge saving
- The government will continue to focus on reducing the UK's carbon footprint, no doubt resulting in penalties for those businesses that do not comply

Fixed and stable pricing

- When you change your boiler you are making a decision about your future energy supply and costings for at least the next 15 years
- LPG compares very favourably with oil and its future pricing versus other fuels appear strong due to prospective long-term supply and demand scenarios.
- The world supply of LPG is predicted to exceed demand
- Calor's enormous UK storage facilities enable us to buy forwards and fix prices for customers who can commit to predictable levels of consumption

Health & Safety and Technical Information

Health & Safety

LPG is a non-poisonous flammable gas which is heavier than air. Although precautions must be taken to prevent escaped gas from entering underground chambers or pipe and duct systems, the hazards it presents in use are little different from those associated with natural gas.

All work must be undertaken by Gas Safe™ registered installers, who must also be certified as competent to work on LPG systems by holding the relevant ACS module(s).

The following points should be noted:

- As with any fuel-burning system, it is important that adequate air is provided for combustion and that there is also adequate ventilation. Please note: Ventilation requirements are different to natural gas
- Like any gas installation, an LPG system should be regularly inspected and serviced to ensure its continued safe operation
- Storage tanks should be protected from excessive ambient temperatures and a source of water for fire fighting and suitable fire extinguishers should be provided at the storage compound
- Safe separation distances between any storage tanks and buildings etc. must be maintained
- There must be safe access to allow the storage tank to be installed or removed
- Storage tanks should not be sited immediately under overhead electric power cables

Legislation

The 'Gas Safety (Installation and Use) Regulations 1998' cover the siting and installation of all gas-burning equipment on premises.

There are requirements for the identification and marking of sites where LPG is stored listed in the 'Dangerous Substances (Notification and Marking of Sites) Regulations 1990'.

Codes of Practice

Calor has produced a series of safety data sheets covering the use and handling of LPG; see 'References', on following page. Copies of these sheets are available on request.

UKLPG has produced a series of codes of practice dealing with external works and the tank installation. These are available directly from www.uklpg.org

Technical Information Standards

Calor LPG is either 'commercial propane' or 'commercial butane' as defined in BS 4250:1997 'Specification for commercial butane and propane'. Calor supplies commercial propane to its bulk customers.

Composition

Calor's commercial propane consists of mainly propane (C_3H_8), with small amounts of butane propene and pentane. In its natural state, LPG is colourless and odourless; a stenching agent is added during manufacture for safety reasons.

Identification

When supplied in cylinders, propane cylinders can be identified by their red colour; butane cylinders are blue.

Weight

In liquid form, 1957 litres of propane weighs 1 tonne.

Density

Propane is roughly one-and-a-half times heavier than air and has a density of 1.85kg/m^3. As a liquid, it is approximately half as dense as water with a density is 512kg/m^3.

The expansion ratio of propane liquid to propane gas is 1:274.

Burning properties

Ignition temperature, 460-580°C.
Maximum flame temperature, 1980°C.
Flammability range, 2-11% gas in air.

Volume of air-to-burn unit volume of gas, 23; the comparable figure for natural gas is 9.6:1 and this means that adequate ventilation is extremely important for combustion efficiency.

The combustion of LPG produces carbon dioxide (CO_2) and water vapour. If the combustion air supply is restricted, carbon monoxide will be produced.

Calorific value

At 95MJ/m3, the calorific value of propane is roughly three times that of commercial natural gas.

1 litre of liquid propane produces 7.1kWh.

Chemical reactions

LPG is aggressive to certain non-metallic materials such as natural rubber, some plastics and some non LPG joint sealants. Hoses, connections and joint sealants must be certified as suitable for use with LPG.

Toxicity

LPG is non-toxic but, at very high concentrations in air, can act as an anaesthetising agent.

Like any gas, it will act as an asphyxiate, at high concentrations, by decreasing available oxygen.

References

Standards

BS 4250:1995 Specification for commercial butane and propane.

BS 5482-1:2005 Code of practice for domestic butane - and propane - gas - burning installations. Installations at permanent dwellings, residential park homes and commercial premises, with installation pipework sizes not exceeding DN 25 for steel and DN 28 for corrugated stainless steel or copper. Part 2:2001 Installations in caravans and non-permanent dwellings.

Building Regulations

Part L - Dwellings
Approved Document L1A: Conservation of fuel and power (New dwellings) (2006 edition). Approved Document L1B: Conservation of fuel and power (Existing dwellings) (2006 edition).

Part L - Buildings other than dwellings
Approved Document L2A: Conservation of fuel and power (New buildings other than dwellings) (2006 edition). Approved Document L2B: Conservation of fuel and power (Existing buildings other than dwellings) (2006 edition).

Technical standards for compliance with the 'Building Standards (Scotland) Regulations 1990' (as amended).

Part J: conservation of fuel and power.

Acts of Parliament and Regulations

Climate Change Levy (Electricity and Gas) Regulations 2001.

Climate Change Levy (General Amendment) Regulations 2002.

Climate Change Levy (General) Regulations 2001.

Dangerous Substances (Notification and Marking of Sites) Regulations 1990.

Electricity and Gas (Energy Efficiency Obligations) Order 2001.

Electricity and Gas Order 2001.

Gas Act 1986.

Gas Safety (Installation and Use) Regulations 1998.

Highly Flammable Liquids and Liquefied Petroleum Gases Regulations 1972.

Pressure Systems and Transportable Gas Containers Regulations 1989.

Health & Safety

Guidance notes chemical safety: Storage and use of LPG at metered estates. CSCS11. London, Health & Safety Executive, 1987.

The storage of flammable liquids in containers. HS(G) 51.

London, Health & Safety Executive.

Calor publications (available on www.calor.co.uk).

Safety data sheet: Calor butane.

Safety data sheet: Calor propane.

Using Calor Gas safely: butane.

Using Calor Gas safely: propane.

UKLPG Codes of Practice

COP 1. Bulk LPG storage at fixed installations. Part 1, Design, installation and operation of vessels located above ground.

COP 1. Bulk LPG storage at fixed installations. Part 2, Small bulk installations for domestic and similar purposes.

COP 1. Bulk LPG storage at fixed installations. Part 4, Buried/mounded LPG storage vessels.

COP 3. Prevention or control of fire involving LPG.

COP 22. LPG piping system design and installation.

Note: Information in this brochure was correct at time of going to press.

CALOR GAS LTD

Athena House
Athena Drive,
Tachbrook Park,
Warwick CV34 6RL
Company Number: 303703

Tel: 0800 121 4561
calor.co.uk

Ref: Jan16

For specialist sales advice
visit calor.co.uk or call 0800 216 659

CALOR