

Technical guide to specifying LPG

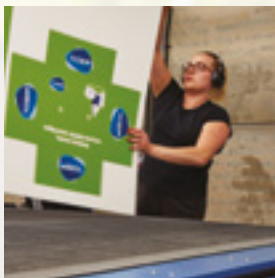
calor.co.uk/specifiers



Our commitment to you

We're here to help. Free, no-obligation surveys, quotes and planning. Our specialist team are on hand to provide you with guidance on all aspects of LPG use, no strings attached. And we also provide a 24/7 emergency call-out service.

We operate a registered Quality Management System in accordance with BS EN ISO 9001. Plus, we're also a member of key trade associations in our field.



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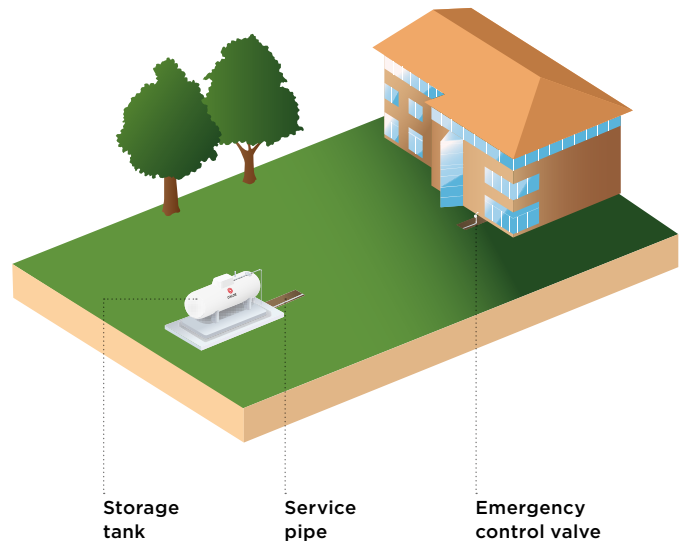
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LPG systems that make perfect sense

We like to keep things simple. That's why our LPG systems usually consist of just a few features:

- One or more storage tanks
- Underground service pipework to the building (plus interior pipe installation)
- Regulators to reduce the LPG gas pressure to appliance working levels
- An emergency control valve outside the building to ensure safety

Our specialists are on hand to advise on the design, size and suitable location of the storage. We'll consider the available space, the off-take of the appliances and the amount of space required. Then create a gas solution that works for you.



The many uses of LPG

Whether it's a commercial or industrial application, you can use our LPG in the same way as natural gas: radiator systems, warm-air heating or industrial unit heaters. It's also suitable for use with condensing boilers.

We employ heat load and loss calculation techniques similar to those used for natural gas. So, there are only minor adjustments needed when we install.

Choose your appliance

LPG is efficient and its vapour has approximately 2.5 times the energy of the same volume of natural gas. That's why it's important that appliances fuelled by LPG are designed and manufactured for purpose. But don't worry, most appliances which work with natural gas are also compatible with LPG.

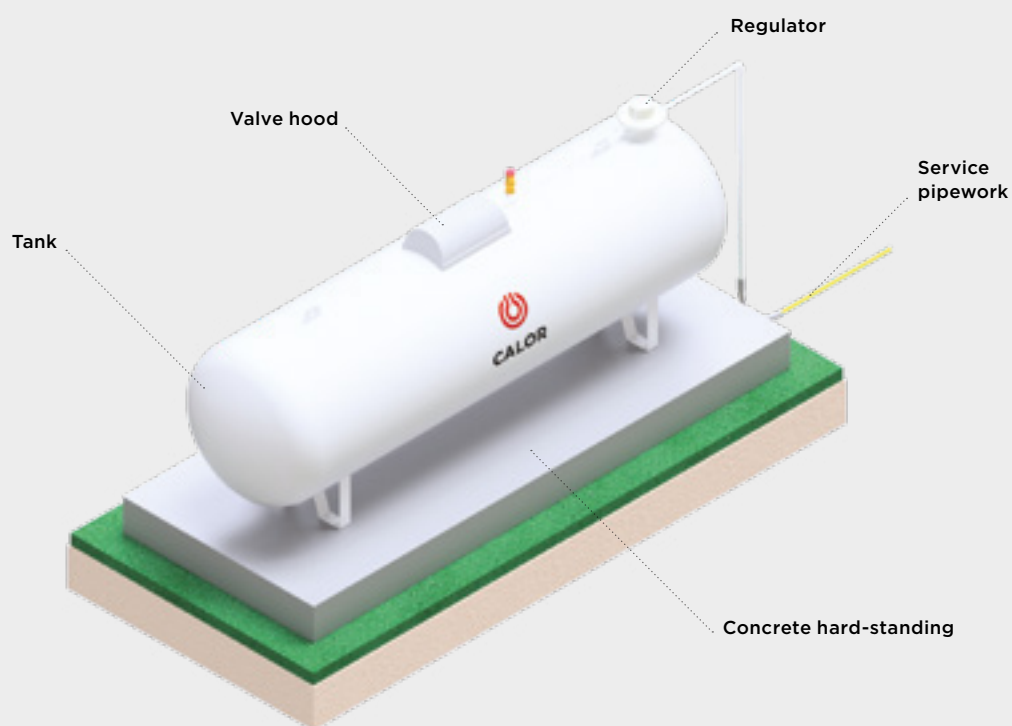
Safety first

Because LPG is heavier than air, we won't install LPG-burning appliances in cellars, basements, or below ground level.

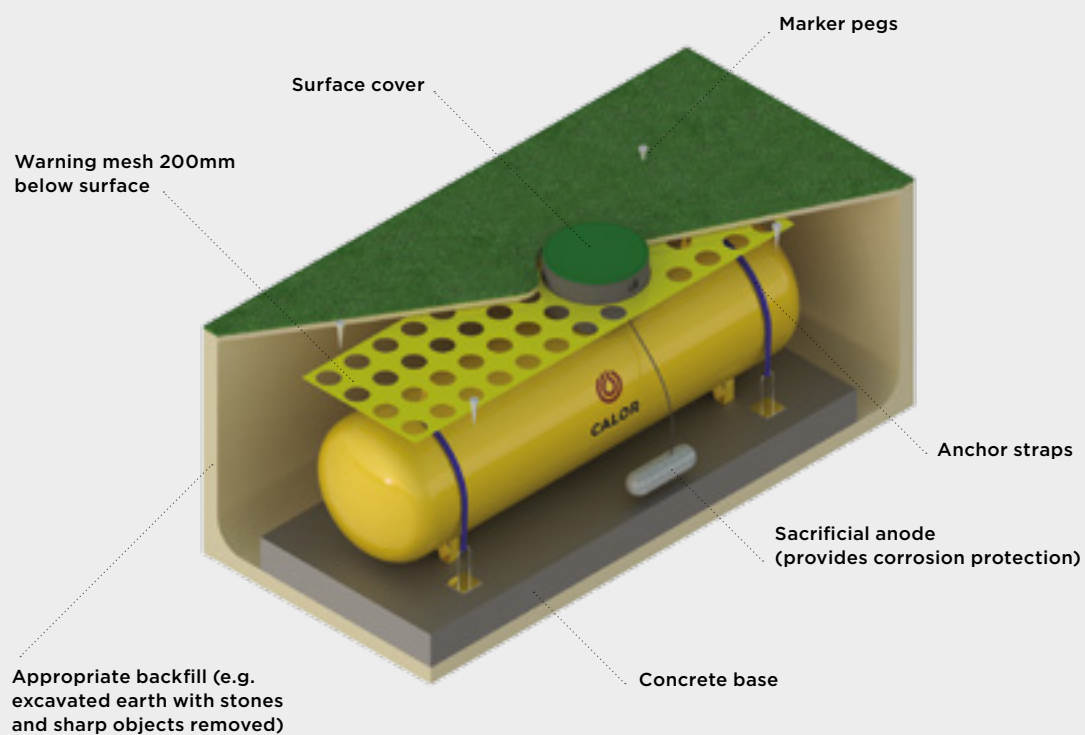
As always, Gas Safe™ registered installers must carry out all the work. In addition, they must also be certified to work on LPG systems, holding all the relevant ACS modules.



Above-ground tank installation



Underground tank installation



Tank sizing

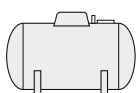
We make sure your tank storage solution meets your demand. When specifying for your project we allow for enough gas for six weeks – at maximum demand. If space allows, we can install more than one tank.

The right size of tank for you depends on several factors:

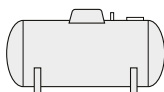
- > Estimated gas consumption of the site
- > Physical constraints
- > Access for installation
- > Access for deliveries
- > Required frequency of delivery

Available tank sizes

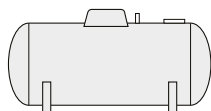
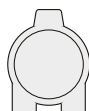
Height (to top of tank hood) x length



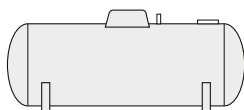
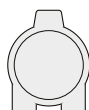
1,200 litres
2,000 x 1,300mm



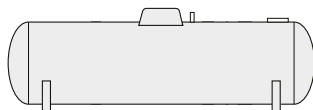
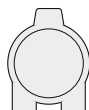
2,000 litres
3,040 x 1,450mm



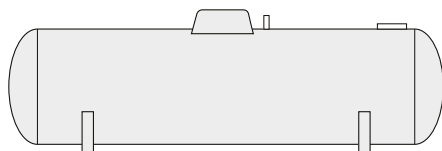
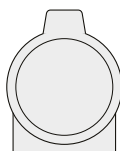
3,400 litres
3,800 x 1,650mm



4,000 litres
4,380 x 1,650mm



8,000 litres
5,440 x 1,980mm



24,000 litres
8,750 x 2,700mm

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

Gas requirement

Tanks need to be able to vaporise LPG fast enough to supply the maximum hourly demand. That means enough gas for all of your appliances at peak time. As a rule, Tables 1 and 2 (to the right) are used for working out what size tank you need. The figures in Table 1 provide a useful way of working out gas requirement against appliance heat input.

Keep in mind that tanks can be grouped to provide the required off-take rate.



Table 1

Gas requirements against appliance heat input

Heat input (kW/h)	Gas requirement	
	(m ³ /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	3.6
70	2.65	5.04
100	3.78	7.19

Table 2

Maximum off-take rates for standard tank sizes*

Tank capacity (Litres)	Tank size (LxH, mm)	Maximum off-take rate (m ³ /h)	Equivalent heat input (kW/h)
Above-ground tanks			
1,200	2,000 x 1,300	4.95	128
2,000	3,040 x 1,450	7.1	187
3,400	3,800 x 1,650	9.09	235
4,000	4,380 x 1,650	10.2	269
8,000	5,440 x 1,980	15.48	400
24,000	8,750 x 2,700	34.44	890

*For underground tanks the off-take will be approximately half that of an equivalently sized above-ground tank.

Tank siting

Every tank installation varies. So, our general advice is for guidance only. But you can consult a Calor specialist on the most suitable size and position for the tank.

Listed buildings, conservation areas, national parks: they're all sensitive spots. That's why an underground tank might be the ideal solution.

As a rule, you'll need to position your tank away from buildings, boundaries and fixed sources of ignition – in accordance with the relevant Liquid Gas UK Codes of Practice. This keeps the tank safe from external factors.

Tanks also require delivery and service by large vehicles. So, you'll need suitable road access. This needs to allow the delivery vehicle to get within 35m of the tank. Drivers stand at the tank during the delivery, but they'll need to be able to see their vehicle throughout the re-filling process.

We have a statutory obligation to provide a safe gas supply. That's why we require good access to the tank site, including a suitable road and gas pipeline route.

You can find more information on tank siting in the Liquid Gas UK Code of Practice 1.



Out of sight, out of mind

Just like above-ground tanks, we'll advise you on the best designs available for underground installation. It's important that the area immediately surrounding the tank is free from structures, traffic and deeply rooted trees. Flooding or a

high-water table can also cause issues, tanks can be semi-mounded to reduce the likelihood of flooding.

The Calor specialist would be able to advise on the number of tanks required and the separation distances for them. However, for general guidance refer to Table 3 below.

Table 3

Separation distances for underground tank installations up to and including 4,000l (2 tonnes capacity)

Minimum safety distances from buildings, boundary, property line or fixed ignition source (Metres)			
To tank surface	To turret		Distance between tanks
	Without a gas dispersion wall	With a gas dispersion wall	
1	3	1.5	1

Above-ground installation

Our specialists will advise you on the design of above-ground tank installation. If the general public has access to the area, a purpose-built compound may be required. But don't worry. We'll provide you with details of the compound's requirements.

All installations require a water supply for fire brigade use. As well as a 19mm hose-reel and 2 x 9kg dry powder fire extinguishers where the storage capacity exceeds 2,000 litres.

If there's a risk of damage to the installation by road vehicles, you'll also need to provide suitable crash protection.

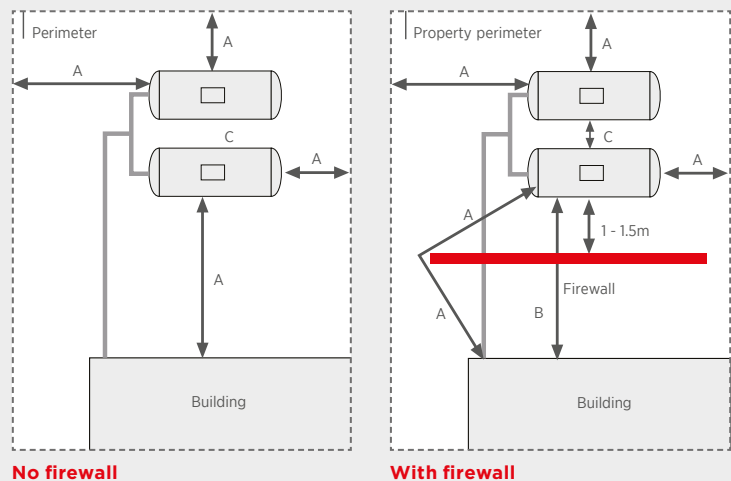


Table 4

Separation distances for above-ground multi-tank installations

Propane capacity (Litres)	Minimum safety distances from buildings, boundary, property line or fixed ignition source (Metres)		Maximum number of tanks in group	Distance between tanks (Metres)	Height of firewall* (Metres)
	No firewall A	With firewall B			
1,200	3	1.5	5	1	1.4
2,000	3	1.5	3	1	1.5
3,400	7.5	4	6	1	2
4,000	7.5	4	6	1	2
8,000	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



“ 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





Installation Servicing Repair The whole package

Expert knowledge and renowned customer care. That's what our in-house engineering team delivers. Whatever your installation requires, our technicians work to the latest legislation and stick to all relevant codes of practice.

Gas pipeline services

**Underground gas supplies
(installation, repair and testing)**

**Trenchless technology
and civil engineering**

Gas compounds

Our commitment to you

- Professional and flexible service. That's our customer engineering team guarantee
- We'll work with you to meet your requirements and provide a suitable timetable
- We'll fully cost work before we start, providing you with a fixed quote.
So, there'll be no unpleasant surprises
- All our engineering technicians carry ID cards for security purposes and we ensure they're fully qualified for the work undertaken
- For complex installations, we offer unrivalled technical design capabilities and full project management



Supply pipework

Our specialists will take care of the design to guarantee an adequate supply of gas which meets all relevant standards.

Your safety is our number one priority. Tank vapour pressures need to be reduced to the working pressure of appliances. We'll install regulators to maintain the optimum supply pressure. These contain safety devices that activate automatically when needed.

Pipework

We use standard polyethylene (PE) pipe underground. Above-ground pipework is either copper or galvanised steel. Ideally, we install underground PE service pipework between the tank and the building in a trench. And we think the most direct route between the tank and the entry point to the building is always the best option. On reaching the exterior walls, pipework terminates with an emergency control valve. We won't install PE pipe above ground or inside any building. And we never run pipework under the footings of a building.

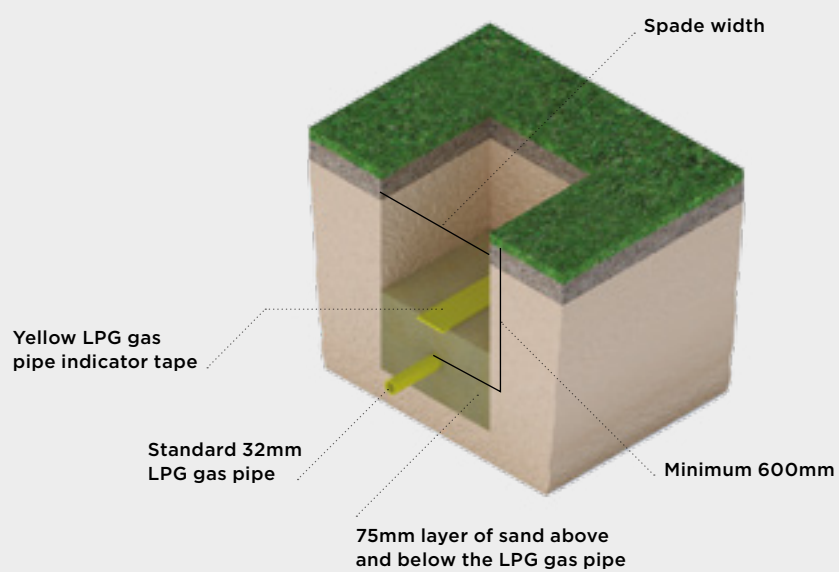
Trenching

The trench needs to provide a minimum of 600mm of cover. You can see a typical trench diagram on the opposite page. Our specialists will also provide you with a full specification of the trench requirements. And we'll offer advice on routing too.

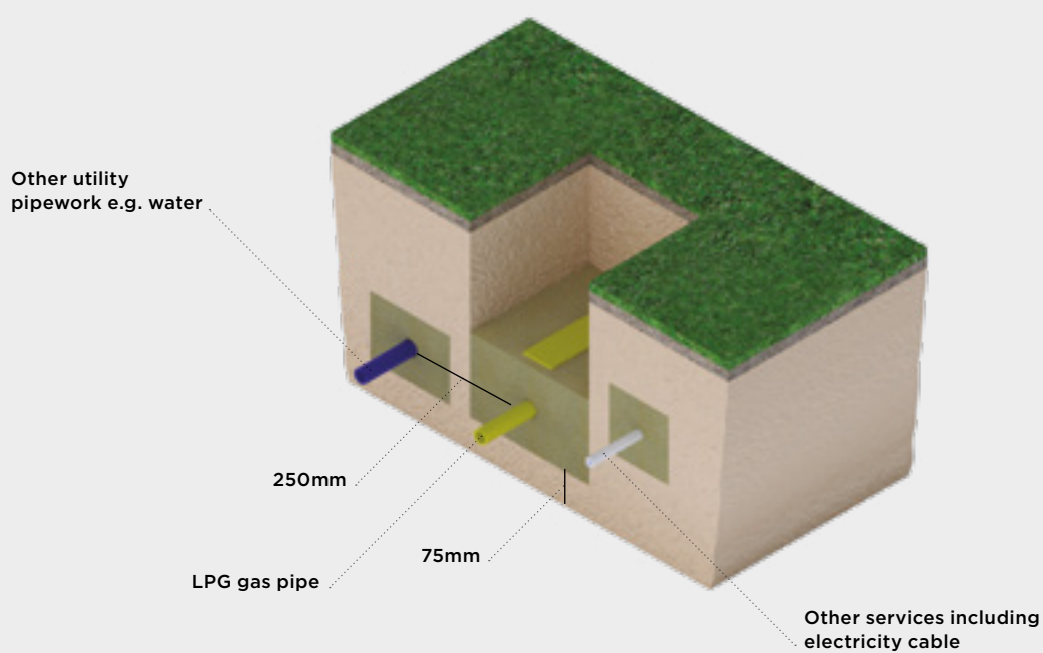
For more information, see the Liquid Gas UK Code of Practice 22 on the design of pipework systems for LPG installations. You can get this directly from Liquid Gas (Former UKLPG), www.liquidgasuk.org

Anyone working on pipework must be registered with Gas Safe™ and hold the appropriate ACS qualifications.

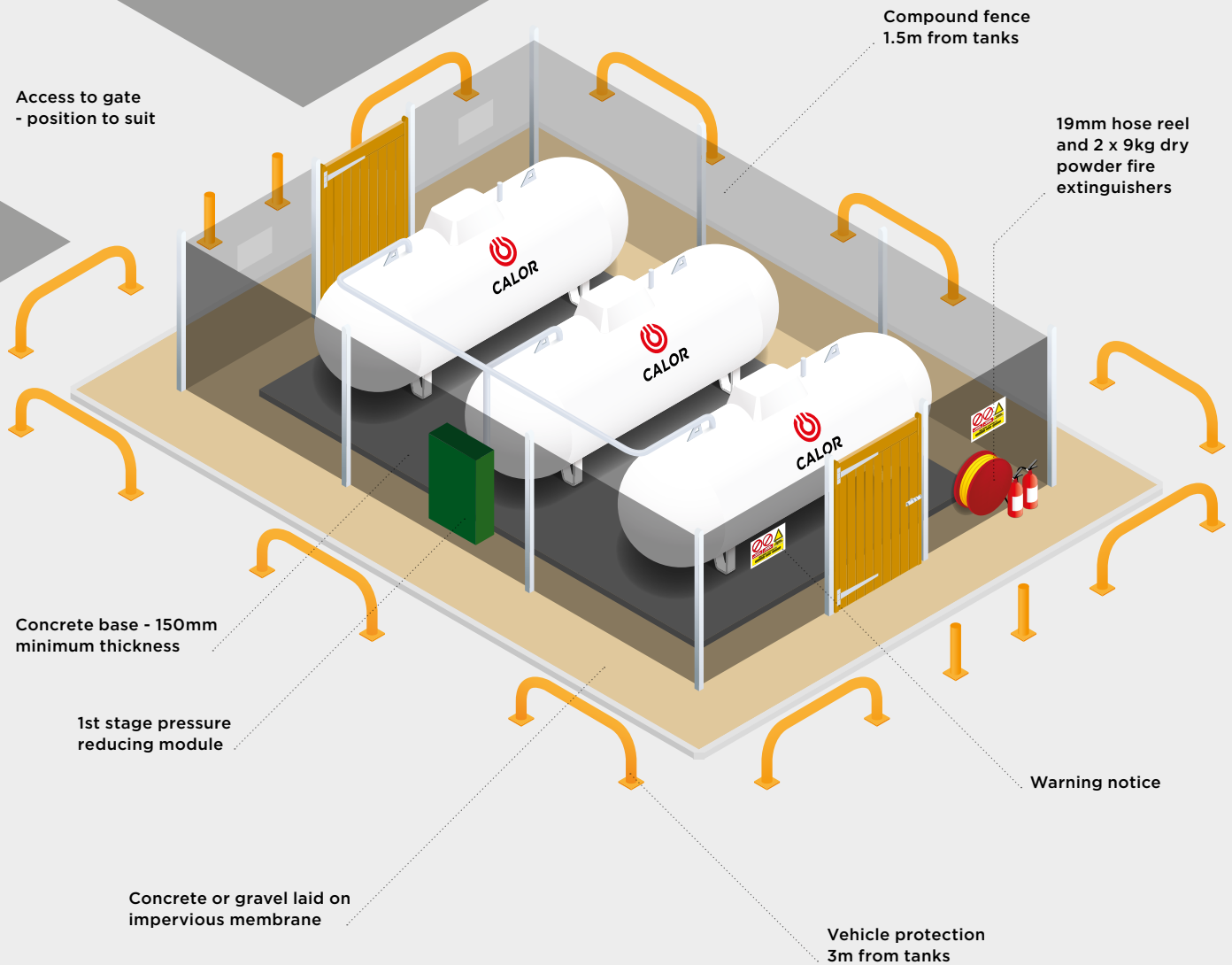
Typical pipework installation



In trench with other services



Typical Calor LPG installation layout



An LPG installation will be cheaper than laying a natural gas pipeline

LPG that doesn't cost the earth

All fuel or energy sources come with costs. LPG is no different. Investment, running and maintenance will all have to be considered. But it may cost less than you think.

Little investment. Big difference

Of course, there is some expense involved in installation: the plinth to support the tank, trenching for pipework, excavation for underground tanks. These things cost money. But, an LPG installation will be cheaper than laying a natural gas pipeline. And the installation costs are cheaper than oil.

There are also the associated costs of the tank compound and the construction of impact protection. These vary depending on your situation. But there's more good news. You rent the tanks from us. And because we retain ownership, we're responsible for their maintenance.

No surprises

As with other non-mains gas fuels, running costs depend on the building, site layout and the chosen heating system. Consult our specialists as early in the process as possible to discuss your specific installation needs. That way, there are no unexpected surprises down the line.

Low cost upkeep

Direct maintenance costs are comparable to those incurred by a natural gas system. There are some additional costs associated with the physical maintenance of the tank compound, roadway and fencing.

Planning considerations

Planning laws affect everybody. Sometimes the local authority requires a formal application for the installation of LPG storage tanks. There are no special requirements for 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 also be clearly indicated.



LPG – fuel for the future

Sustainable future – Calor's commitment to 100% renewable energy by 2040.

Over the next 20 years, our goal is to ensure that the source and supply of our gas products becomes increasingly renewable - this means more bio-based products which have lower carbon emissions. BioLPG plays a big part in our sustainability goals for both Calor and SHV Energy. BioLPG not only reduces CO₂ emissions by up to 80% compared to standard LPG*, it's also identical in use and performance as LPG, and so is an ideal solution for like-minded businesses looking to reduce their own carbon footprint.



Bulk tanks give you peace of mind

- Oil tanks are a target for thieves. And theft is often more expensive than the cost of replacing the oil as it leads to downtime for business. OFTEC recommends you take out insurance to cover for potential theft and spillage
- LPG from a bulk tank is virtually impossible to steal, giving peace of mind to you and your customers



No risk of spillage

- The UK Environment Agency estimates an oil spill could cost you up to £30,000 in fines, clean-up charges and production losses
- The damage to the environment from leaks and spillages can be extensive. Oil can pollute streams, rivers and is toxic to plants and animals
- In contrast, LPG in its pre-burnt state does not pollute soil, air or water



Save on CO₂

- LPG has the lowest carbon emissions out of all the fossil fuels available off the mains grid
- It emits 11.7% per cent less CO₂ per kWh than heating oil*
- Multiply this impact over the 15-plus year lifespan of a commercial boiler and the savings are huge
- The Government looks set to continue its focus on reducing the UK's carbon footprint

*Atlantic Consulting 2017



No maintenance or insurance worries

- > We're responsible for the tank's on-going maintenance and safety inspections leaving you free to run your business
 - > We maintain ownership of the tank, so there's no need for insurance
-



Better 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 CO₂, sulphur oxides, nitrous oxides and particulates
-



Pricing you can count on

- > When you change your boiler, you're deciding about your future energy supply and expenditure for the next 15 years, at least
- > LPG compares favourably with oil and future pricing versus other fuels appears strong
- > The supply of LPG is predicted to exceed demand
- > Our enormous UK storage facilities enable us to buy forwards and fix prices. Great news for customers who commit to predictable levels of consumption



Health & safety matters

What you need to know

LPG is a non-poisonous flammable gas which is heavier than air. So, you'll need to take precautions to prevent escaped gas from entering underground chambers or pipe and duct systems.

As always, all work must be undertaken by Gas Safe™ registered installers. They must also be certified to work on LPG systems by holding the relevant ACS modules.

Keep in mind the following:

- As with any fuel-burning system, you need to make sure adequate air is provided for combustion and that there's also adequate ventilation. Please note: ventilation requirements are different to natural gas
- Like any gas installation, you should arrange regular inspections for your LPG system to ensure continued safe operation
- Storage tanks should be protected from excessive ambient temperatures. You also need to provide
 - a source of water for firefighting and suitable fire extinguishers at the storage compound
- You should maintain safe separation distances between any storage tanks and buildings
- You have to allow safe access for 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' covers the siting and installation of all gas-burning equipment on your 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. Please see the 'References' section. Copies are available on request.

Liquid Gas UK has a series of codes of practice dealing with external works and the tank installation. These are available directly from www.liquidgasuk.org

Technical information standards

Calor LPG is either 'commercial propane' or 'commercial butane' as defined in BS 4250:2014 'Specification for commercial butane and propane'. We supply commercial propane to our bulk customers.

Composition

Our 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 can be identified by their red colour. Butane cylinders are blue.

Weight

In liquid form, 1,957 litres of propane weigh one 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 of 512kg/m^3 . The expansion ratio of propane liquid to propane gas is 1:274.

Burning properties

Ignition temperature is between $460\text{--}580^\circ\text{C}$. Maximum flame temperature is 1980°C . Flammability range is 2-11% gas in air. The volume of air-to-burn unit volume of gas is 23. The comparable figure for natural gas is 9.6:1. 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/m^3 , the calorific value of propane is roughly three times that of commercial natural gas. One 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 4250:2014 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.

BS 6891:2015+A1:2019 Specification for the installation and maintenance of low pressure gas installation pipework of up to 35 mm (R1/4") on premises.

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.

Liquid Gas UK 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, Vapour off-take small bulk propane installations.

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. Design, installation and testing of LPG piping systems.



Find out more

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