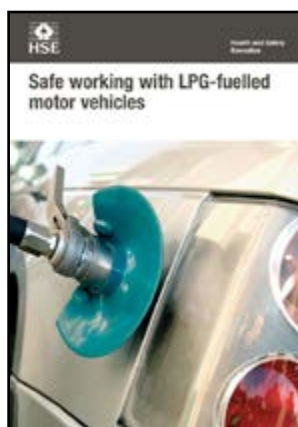


Safe working with LPG-fuelled motor vehicles



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Introduction

This leaflet tells you about the main health and safety risks associated with work on vehicles fuelled by liquefied petroleum gas (LPG) and the precautions that should be taken. It does **not** cover repair work on the LPG fuel system itself, nor does it cover vehicles fuelled with compressed natural gas (CNG).

Although there are specialist centres for installing and maintaining LPG systems, conventional vehicle servicing and repair work are normally carried out at motor vehicle repair (MVR) garages.

Vehicle recovery operators and breaking/recycling businesses will also have to deal with LPG vehicles.

This guidance is aimed at employers, self-employed people, supervisors and others likely to carry out any work which may affect LPG systems.

Properties and hazards of LPG

The term 'LPG' covers a range of mixtures of propane and butane stored as liquids under pressure, but it is propane that is mostly used to fuel vehicles.

LPG and petrol have many similar properties and the good practices appropriate for work on petrol vehicles apply equally to LPG vehicles.

The main difference is that LPG vaporises more rapidly than petrol, so, as LPG is stored in the fuel tank and associated fuel lines at elevated pressure (up to 10 bar g), any leakage will immediately vaporise and disperse. LPG vapour is highly flammable and mixtures in air of between 2% and 10% will easily ignite and explode.

The rapid expansion resulting from the conversion of liquid propane into a vapour causes severe cooling of the gas. Anyone exposed to a vapour cloud or in contact with metal surfaces may receive cold burns.

Vehicle conversion

Most LPG vehicles can operate on both LPG and petrol. Conversion to LPG usually involves fitting an additional fuel tank, fuel lines and associated components.

New vehicles can be converted by the original manufacturer, but as with used vehicles, this must be done by somebody with the necessary skills and knowledge to carry out the work safely, such as a UKLPG Approved Autogas Installer (see 'Find out more' at the end of the leaflet). There is no such thing as a 'standard conversion', which is why competence when carrying out this work is so important.

Competence requirements for working on LPG-fuelled vehicles

Only personnel trained and competent in the use of LPG as a road vehicle fuel should be allowed to work on the vehicle engine or fuel system. No one should remove any part of the system, nor should they empty or gas-free it, unless they have received appropriate training and are competent to do the work.

Only people trained in the safety aspects of LPG and LPG systems should be allowed to carry out any work on LPG vehicles where their work is adjacent to, or could otherwise affect, the LPG system on the vehicle itself. General information on competence can be found on the HSE website (www.hse.gov.uk/work-equipment-machinery/training-competence.htm).

Anyone working on LPG vehicles must know where system components are located and be aware that some contain liquid LPG whereas others contain its vapour. In either case, the LPG will be at an elevated pressure

What precautions should be taken?

Always assume that an LPG system contains LPG or its vapour until it has been proved otherwise, especially where a vehicle has been involved in an accident or components are to be removed, eg for scrapping or recycling.

Don't do any work that may affect the LPG system unless a suitable and sufficient assessment of the risks has been carried out and the precautions to minimise the risks have been identified. You can find more information about risk assessment on HSE's website (www.hse.gov.uk/risk).

General precautions to consider

- Provide safe locations for parking and working on LPG vehicles. As with petrol-fuelled vehicles, they should be parked away from sources of heat, open flames or other sources of ignition. They should also be parked away from openings in the ground like drains and pits.
- Clearly identify each LPG vehicle, eg with suitably positioned signs, as a reminder to people working on the vehicle, and anyone in the vicinity, especially those who may be carrying out 'hot work'.
- Provide plant and equipment that is suitable for its intended use.
- Don't take vehicles with leaking LPG systems inside a workshop or other building, as dangerous concentrations of vapour could accumulate.
- Train all staff on what to do in an emergency.

For any work that may have the potential to affect the LPG system, and where it is possible to do so, the shut-off valve (where provided) on the fuel tank(s) should be closed and the LPG fuel in the service line exhausted. When doing so, take the following precautions.

- Wear suitable personal protective equipment (PPE) to prevent cold burns, eye damage and the discharge of static electricity.
- Only carry out work which involves breaking into, or removing components from, the LPG system in a safe place and in the open air; before doing so, disconnect the vehicle battery, and display warning signs, eg 'No smoking' around the area.
- Empty LPG fuel lines from the tank to the engine by isolating the fuel tank and running the engine until it stops (this procedure will not remove LPG from the line between the filling point and tank). If this is not possible, and provided the

fuel tank is isolated, disconnect fuel lines in the open air, where LPG should disperse.

- Release LPG slowly into the atmosphere where appropriate and give it time to disperse.

If the LPG system is likely to be affected but cannot be isolated or emptied, you should consider alternative means of physically protecting it. The system should only be removed by UKLPG Approved Installers.

Additional precautions to consider

Vehicle inspection pits etc

The hazards of working with LPG vehicles over or near to inspection pits are identical to those involving petrol vehicles and the same precautions should apply. Therefore:

- don't carry out any work which could affect the LPG system over or close to a vehicle inspection pit or drain where dangerous concentrations of vapour could accumulate;
- electrical systems, including fixed lighting, in the pit must be of a category consistent with the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) zone classification;
- portable and battery-powered tools, including hand lamps, used in pits should be either air-powered or explosion-protected, and in all cases the risk assessment should demonstrate that they are safe to use.

'Hot work' (as well as the above precautions)

Where heat is applied to a vehicle, eg during welding, burning, infra-red heating or other 'hot work':

- maintain a separation between the area to be heated and the LPG fuel tank or fuel lines;
- provide a heat-resistant shield or empty or gas-free the affected parts of the LPG system where possible, especially where work is being carried out close to the tank or fuel lines.

Always consult the vehicle manufacturer and/or conversion installer before placing an LPG vehicle in a paint drying/curing oven. If local heating is not possible, consider emptying LPG lines and removing the fuel tank before subjecting the vehicle to higher temperatures.

LPG vehicles should not be put through a low-bake repainting oven or similar heating process unless the temperature is limited to 40 °C or less.

Vehicle recovery (as well as the above precautions)

LPG vehicles which have been involved in an accident must be:

- assessed for damage to the LPG system before roadside recovery or repair. If there is a leak, and only if it is safe to do so, close the tank isolation valve. If the leak cannot be stopped, alert the emergency services but don't move the vehicle;
- repaired at the roadside only by suitably trained personnel using appropriate equipment.

End of vehicle life (as well as the above precautions)

Vehicle recycling/scraping businesses should:

- identify LPG vehicles before accepting them;
- only accept LPG vehicles if there are procedures for the safe removal and disposal of the LPG system;
- park vehicles awaiting breaking in a safe place;
- ensure LPG tanks are removed before scrapping.

The Department for Business Innovation and Skills has more guidance on end of vehicle life (see 'Find out more' at the end of the leaflet).

LPG tank emptying, removal and reassembly

LPG tank emptying for replacement, repair, revalidation, recycling, or before a vehicle is scrapped, must only be carried out in a safe place and by suitably trained and competent people using appropriate equipment.

Store LPG tanks that have not been emptied and gas-freed in clearly marked and secure areas. These should preferably be above ground, in the open air, away from drains and pits, and clear of combustible materials and sources of ignition.

Keep LPG tanks in their mounting orientations, chocked to prevent rotation, and with relief valves unobstructed.

During reassembly of LPG tanks and fuel lines, ensure that:

- components are located and fitted correctly, especially the orientation of the tank in relation to its level measurement device and relief valve, as a mistake could result in the tank overfilling;
- rubber gaiters are fitted correctly. These protect the fuel lines located inside vehicles, eg in the boot or load-carrying area, and ensure that leakages are directed to the outside;
- the reassembled LPG system is leak-free.

Emergency procedures

Train all staff in the emergency arrangements for events such as an uncontrolled release from an LPG system, a fire in the vicinity of an LPG vehicle, or people suffering from cold burns.

Where an LPG leak is detected on a vehicle inside a building, close the tank isolation valve and, if it is safe to do so, move the vehicle to a safe place in the open air. Evacuate the building and don't allow anyone back until it has been declared safe. If a leak is uncontrollable or catches fire, call the emergency services.

Legal requirements

Where flammable substances are present, the Dangerous Substances and Explosive Atmospheres Regulations (DSEAR) require employers and self-employed people to carry out an assessment of the risks and eliminate or control them, so far as reasonably practicable.

There is also a duty to prepare procedures for accidents, incidents and emergencies, and to keep employees informed.

What does 'so far as reasonably practicable' mean?

This means balancing the level of risk against the measures needed to control the real risk in terms of money, time or trouble. However, you do not need to take action if it would be grossly disproportionate to the level of risk.

DSEAR also requires the classification and zoning of areas where there is the potential for an explosive atmosphere. Workplaces with inspection pits, ovens or flammable liquid stores must be zoned appropriately.

Equipment intended for use in hazardous areas must comply with the requirements of the DSEAR Regulations and be CE marked.

Safe working with LPG-fuelled vehicles: The dos and don'ts

Dos:

- Do** assess the risk and precautions to be taken before starting work involving an LPG-fuelled vehicle.
- Do** ensure that only people trained in the safety aspects of LPG and LPG systems should be allowed to carry out any work on LPG vehicles.
- Do** provide safe places for parking and working on vehicles, eg away from drains, pits and other openings in the ground, and all sources of ignition.
- Do** clearly identify vehicles, eg with suitably positioned signs, as a reminder to people working on them, especially those who may be carrying out 'hot work'.
- Do** ensure that tools and equipment are appropriate for the hazardous area in which they are to be used.
- Do** wear personal protective equipment (PPE) to prevent cold burns, eye damage and the discharge of static electricity whenever there is a risk of a release of LPG.
- Do** ensure that the vehicle battery is disconnected when any part or all of the LPG system is to be removed. Always check reassembled systems for leaks.
- Do** store LPG fuel tanks that have not been emptied and gas-freed in a safe place, preferably in the open air.
- Do** check with the vehicle manufacturer or system installer whether the LPG tank should be removed or emptied before drying/curing the paint in a spraybake oven. Where a maximum temperature is specified (no greater than 40 °C), ensure that the oven controls are set so it cannot be exceeded.
- Do** carry out a roadside check for leaks and other damage to the LPG system on vehicles involved in accidents. Call the emergency services if the leak is uncontrollable or there is a fire.
- Do** train all staff in the emergency arrangements in the event of a fire or uncontrolled release of LPG, including the first-aid actions for dealing with cold burns.

Don'ts:

- Don't** allow any work on an LPG vehicle, which could affect the fuel system, before you have identified the risks and precautions to be taken.
- Don't** work on an LPG vehicle, unless you are trained in the hazards of LPG and LPG fuel systems.
- Don't** assume that the fuel system is free from LPG unless it has been proved to be so, especially following an accident or if components are to be removed.
- Don't** do any work which could affect the LPG system without first shutting off the valve on the tank(s) and exhausting any LPG fuel in the service line.
- Don't** carry out welding, burning or other hot work on an LPG vehicle within 1 metre of its tank or fuel lines without a heat-resistant shield, or before the parts have been emptied or gas-freed.
- Don't** take a vehicle with a leaking LPG system into a workshop or other building.
- Don't** attempt roadside repairs unless you are trained and approved equipment is available.
- Don't** try to move a vehicle from the roadside if there are any leaks of LPG which cannot be stopped safely, eg by isolating the LPG tank.
- Don't** accept an LPG vehicle for scrapping or recycling unless you have procedures for the safe removal and disposal of the LPG system.
- Don't** crush a vehicle until the LPG tank has been removed by a competent person.

Find out more

Dangerous substances and explosive atmospheres. Dangerous Substances and Explosive Atmospheres Regulations 2002. Approved Code of Practice and guidance L138 HSE Books 2003 ISBN 978 0 7176 2203 0 www.hse.gov.uk/pubns/books/l138.htm

Controlling fire and explosion risks in your workplace. A brief guide to the Dangerous Substances and Explosive Atmospheres Regulations Leaflet INDG370(rev1) HSE Books 2012 www.hse.gov.uk/pubns/indg370.htm

Safe use of petrol in garages Leaflet INDG331(rev1) HSE Books 2012 www.hse.gov.uk/pubns/indg331.htm

See the UKLPG website (www.uklpg.org) for details of industry-related trade publications.

For information about LPG-fuelled vehicles and details of the UKLPG Approved Autogas Installer scheme, see: www.drivelpg.co.uk

Further information on fire and explosion risks can be found on HSE's website: www.hse.gov.uk/fireandexplosion

For information

For information about health and safety, or to report inconsistencies or inaccuracies in this guidance, visit www.hse.gov.uk/. You can view HSE guidance online and order priced publications from the website. HSE priced publications are also available from bookshops.

This guidance is issued by the Health and Safety Executive. Following the guidance is not compulsory, unless specifically stated, and you are free to take other action. But if you do follow the guidance you will normally be doing enough to comply with the law. Health and safety inspectors seek to secure compliance with the law and may refer to this guidance.

This leaflet is available at: www.hse.gov.uk/pubns/indg387.htm.

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