

LPG-fuelled motor vehicles



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 readily 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 though, as with used vehicles, this is often done by a specialist

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.

Take care during reassembly of LPG tanks and fuel lines. Check 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 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 or, if safe to do so, move the vehicle to a safe place in the open air. Evacuate the building and do not 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 is reasonably practicable. There is also a duty to prepare procedures for accidents, incidents and emergencies, and to keep employees informed.

DSEAR also requires the classification and zoning of areas where there is the potential for an explosive atmosphere. New workplaces with inspection pits, ovens or flammable liquid stores must be zoned immediately. Existing workplaces have until July 2006 to comply.

Also, from July 2003, new equipment intended for use in hazardous areas must comply with the Equipment and Protective Systems Intended for Use in Potentially

Explosive Atmospheres Regulations 1996 (EPS) and be CE marked.

The Confined Spaces Regulations 1997 place restrictions on entry into places where there is a risk of serious injury from fire or explosion.

Further reading

Fire and explosion: How safe is your workplace? INDG370 HSE Books 2002 (single copy free or priced packs of 5 ISBN 0 7176 2589 3)

Safe use of petrol in garages INDG331 HSE Books (single copies free or priced packs of 10 ISBN 0 7176 1836 6)

See Liquefied Petrol Gas Association (LPGA) website: www.lpga.co.uk for details of publications.

Further information

HSE Books, PO Box 1999, Sudbury, Suffolk CO10 2WA
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HSE Infoline 08701 545500, e-mail: hseinformationservices@natbrit.com. HSE Information Services, Caerphilly Business Park, Caerphilly CF83 3GG.

This leaflet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

Single free copies of this leaflet are available from HSE Books and can be downloaded from HSE's website. Priced packs of 10, ISBN 0 7176 2755 1, are available from HSE Books.

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specialist converter. For most vehicles, therefore, a standard conversion does not exist and the type and positioning of LPG components may differ.

There is no legal requirement for external markings on LPG vehicles. The most obvious signs are the additional filling point (possibly on the rear wing or in the bumper assembly), the fuel tank (usually located in the luggage space and sometimes replacing the spare wheel) and the dashboard-mounted fuel changeover switch.

Anyone working on LPG vehicles must know where the system components are located and be aware that some contain liquid LPG whereas others contain its vapour under low 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.

Do not 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 identified.

Only people trained in the safety aspects of LPG and LPG systems should be allowed to carry out work on LPG vehicles. 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.

General precautions to consider

- **provide safe locations** for parking and working on LPG vehicles, eg away from openings in the ground like drains and pits, and sources of ignition;
- **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;
- **do not take vehicles with leaking LPG systems inside** a workshop or other building, as dangerous concentrations of vapour could accumulate;
- **train staff** on what to do in an emergency.

For any work that may have the potential to affect the LPG

system, consider isolating, physically protecting, emptying and gas-freeing or completely removing the system. In these circumstances the following precautions may be appropriate for you:

- **wear suitable personal protective equipment (PPE)** to prevent cold burns, eye damage and the discharge of static electricity;
- **empty LPG fuel lines** from the tank to the engine by isolating the fuel tank and running the engine until it stops (NB: This procedure will not remove LPG from the line between the filling point and tank.);
- **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;
- **release LPG slowly** into the atmosphere where appropriate and give it time to disperse.

Additional precautions to consider

Vehicle inspection pits etc

Do not 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.

Inspection pits used for vehicle servicing, repair and maintenance work are now classified as Zone 2, ie places where there is the possibility of an explosive atmosphere, but only as a result of abnormal operations (see 'Legal requirements'). This means that:

- **existing fixed lighting** of the type which is recessed into the pit wall, usually fitted at least 1 m from the pit floor, can continue to be used provided it is sealed behind toughened plastic or glass and protected against physical damage and if the risk assessment shows it is safe to do so;
- **fixed lighting** or other electrical equipment installed after July 2003 in a newly constructed or modified inspection pit must meet the requirements of the EPS Regulations to comply with DSEAR (see 'Legal requirements');
- **portable tools**, including handlamps, used in pits should be either air-powered or explosion-protected and can continue to be used provided the risk assessment shows it is safe to do so. New equipment now normally needs to comply with EPS.

'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 minimum clearance of 1 m 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 this clearance cannot be achieved.

Always consult the vehicle manufacturer and/or converter 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 high temperatures. Some guidance allows tanks to remain on vehicles provided the temperature does not exceed 40°C. In such cases, the oven control equipment and system of work must ensure the recommended temperature cannot be exceeded.

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 safe to do so, close the tank isolation valve. If the leak cannot be stopped, alert the emergency services but do not 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/scrapping businesses should:

- identify LPG vehicles before accepting them from their owners;
- 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 that LPG tanks are removed before scrapping.

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 which have not been emptied and gas-freed in clearly marked and secure areas, preferably above ground in the open air, away from drains and pits, and clear of combustible materials and sources of ignition.