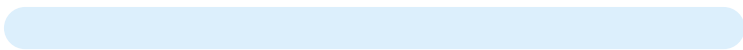


The safe use of gas cylinders





INTRODUCTION

Accidents involving gas cylinders can cause serious injury or even death. This leaflet provides simple practical advice on eliminating or reducing the risks associated with using gas cylinders.

The leaflet is aimed at anyone who manufactures, owns, fills, repairs or uses gas cylinders at work. **The legal term for gas cylinders is transportable pressure receptacles or transportable pressure vessels.** The advice will be useful for those who own or manage small businesses.

Gas cylinders used in adverse or extreme conditions, such as under water, may require special precautions. Although the advice in this leaflet is valid for all uses of gas cylinders, these extra precautions are not covered.

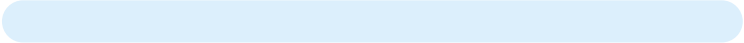
As an employer or self-employed person, you have a duty to provide a safe workplace and safe work equipment. Designers, inspectors, manufacturers, suppliers, users and owners also have duties.

Employers have a further duty to consult any safety or employee representatives on health and safety matters. Where none are appointed, employers should consult the workforce directly.

Uses of gas cylinders

Gas cylinders are a convenient way to transport and store gases under pressure. These gases are used for many different purposes including:

- chemical processes;
- soldering, welding and flame cutting;

- 
- breathing (eg diving, emergency rescue);
 - medical and laboratory uses;
 - dispensing beverages;
 - fuel for vehicles (eg fork-lift trucks);
 - extinguishing fires;
 - heating and cooking;
 - water treatment.

The main hazards are:

- impact from the blast of a gas cylinder explosion or rapid release of compressed gas;
- impact from parts of gas cylinders that fail, or any flying debris;
- contact with the released gas or fluid (such as chlorine);
- fire resulting from the escape of flammable gases or fluids (such as liquefied petroleum gas);
- impact from falling cylinders;
- manual handling injuries.

The main causes of accidents are:

- inadequate training and supervision;
- poor installation;
- poor examination and maintenance;
- faulty equipment and / or design (eg badly fitted valves and regulators);
- poor handling;
- poor storage;
- inadequately ventilated working conditions;
- incorrect filling procedures;
- hidden damage.

HOW TO REDUCE THE RISKS

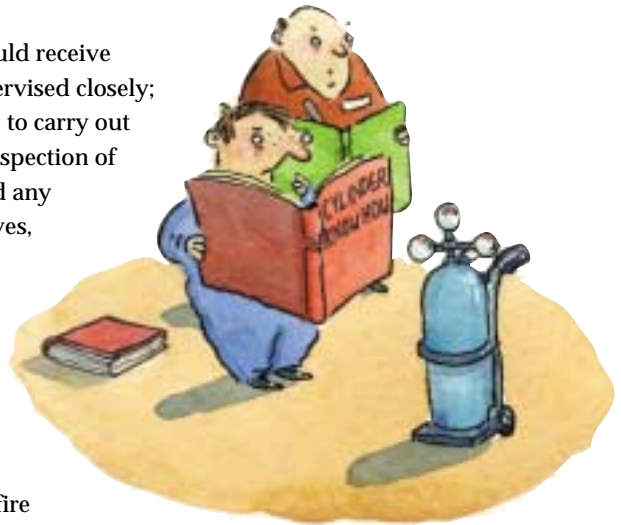
All gas cylinders must be designed and manufactured to an approved specification to withstand everyday use and to prevent danger (see Legislation, page 10). They must be periodically examined at appropriate intervals to ensure that they remain safe in service. To reduce the risks of failure you need to know, and act on, the following precautions.

Training

Anyone who examines, refurbishes, fills or uses a gas cylinder should be suitably trained and have the necessary skills to carry out their job safely. They should understand the risks associated with the gas cylinder and its contents.

In particular:

- new employees should receive training and be supervised closely;
- users should be able to carry out an external visual inspection of the gas cylinder, and any attachments (eg valves, flashback arresters, and regulators), to determine whether they are damaged. Visible indicators may include dents, bulges, evidence of fire damage (scorch marks) and severe grinding marks, etc.



Manufacture and initial examination

The law requires that gas cylinders are:

- manufactured to the design standards and specifications of the relevant legislation (see Table 1 on pages 12/13);
- examined by 'a relevant inspection body' (see Table 1) to verify that the cylinders are manufactured correctly.

Owners and fillers should satisfy themselves that the manufacturing requirements have been carried out by examining either:

- the written certificate which accompanies the gas cylinder; or
- the stamp or mark of the relevant inspection body on the gas cylinder itself (see Table 1).

Periodic examination

If you own or fill gas cylinders, **you** must ensure that they have been examined at the appropriate intervals to make sure that they are safe for continued use.

The law requires that all gas cylinders are:

- examined and tested by the relevant inspection body, in accordance with relevant regulations and at the appropriate intervals (see Table 1); and
- permanently marked by a relevant inspection body to show the date of the last periodic examination.



Repair

The law prohibits modifications (with the exception of neck thread cutting) or major repairs to the body of seamless gas cylinders or cylinders that have contained acetylene. However, the law does allow for modification and major repair (ie hot work), by an approved person only, of other types of cylinders, subject to certain conditions. These include that a relevant inspection body (see Table 1) marks or certifies the cylinder as being fit for use.

Where there is minor damage only, refurbishment work which does not affect the integrity of the cylinder can be undertaken by a person competent to do so.

Filling

Anyone carrying out the filling of gas cylinders should wear suitable personal protective equipment as appropriate. This may include safety shoes, protective overalls, gloves, and ear and eye protection.

Before filling a gas cylinder check that:

- from the markings on the cylinder, it has been properly examined by a relevant inspection body and is still within its due test date;
- it shows no sign of damage, external corrosion, falsification (defacing) of markings or illicit repairs that may affect integrity;

If it is necessary to alter some cylinder markings, eg because of a change in tare weight, it is preferable that this is done by overstamping the old markings with 'XXX', not by grinding them off. Grinding can reduce cylinder wall thickness to unsafe levels and shorten cylinder life.

- it is suitable for the gas/fluid with which it is to be filled;
- from the markings on the cylinder, the safe operating limits are established;
- valves, fittings and regulators (where fitted) are:
 - correctly fitted and not leaking;
 - not damaged and in good working condition;
 - suitable for their intended purpose;
 - not contaminated, eg with incompatible lubricants.

If any of the above conditions are not met, then the cylinder must not be filled.

After filling a gas cylinder check that:

- it is within its safe operating limits;
- it is not overfilled or overpressurised. In the event of inadvertent overfilling, any excess gas must be removed in a safe manner and the cylinder checked for further fitness for service;
- the cylinder's valves, fittings and regulators are not leaking, for example by using special equipment, such as 'sniffers' or manometers. If appropriate, the simple method of using a soapy water solution can be adopted.



Handling and use

- Use gas cylinders in a vertical position, unless specifically designed to be used otherwise.
- Securely restrain cylinders to prevent them falling over.
- Always **double check** that the cylinder/gas is the right one for the intended use.
- Before connecting a gas cylinder to equipment or pipework make sure that the regulator and pipework are suitable for the type of gas and pressure being used.
- When required, wear suitable safety shoes and other personal protective equipment when handling gas cylinders.
- **Do not** use gas cylinders for any other purpose than the transport and storage of gas.
- **Do not** drop, roll or drag gas cylinders.
- Close the cylinder valve and replace dust caps, where provided, when a gas cylinder is not in use.
- Where appropriate, fit cylinders with residual pressure valves (non-return valves) to reduce the risk of back flow of water or other materials into the cylinder during use that might corrode it (eg beer forced into an empty gas cylinder during cylinder change-over).



Lifting

- Use suitable cradles, slings, clamps or other effective means when lifting cylinders with a hoist or crane.
- **Do not** use valves, shrouds and caps for lifting cylinders unless they have been designed and manufactured for this purpose.
- Gas cylinders **should not** be raised or lowered on the forks of lift trucks unless adequate precautions are taken to prevent them from falling.

Transport

- Fit suitable protective valve caps and covers to cylinders, when necessary, before transporting. **Caps and covers help prevent moisture and dirt from gathering in the valve of the cylinder, in addition to providing protection during transport.**
- Securely stow gas cylinders to prevent them from moving or falling. This is normally in the vertical position, unless instructions for transport state otherwise.
- Disconnect regulators and hoses from cylinders whenever practicable.
- **Do not** let gas cylinders project beyond the sides or end of vehicles (eg fork-lift trucks).
- Ensure gas cylinders are clearly marked to show their contents (including their UN number) and the danger signs associated with their contents.
- It may be necessary to take special measures with certain types and quantities of compressed gases and fluids in order to ensure



their safe carriage. If you have any doubts seek further guidance (see Further advice, page 15).

- The transport of gas cylinders is subject to carriage requirements. For example, that:
 - the vehicle is suitable for the purpose;
 - the vehicle is suitably marked to show that it is carrying dangerous goods;
 - the driver is suitably trained; and
 - the driver carries the appropriate documentation about the nature of the gases being carried.

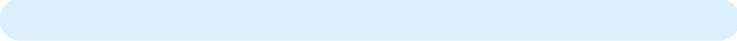
Storage

- Store gas cylinders in a dry, safe place on a flat surface in the open air. If this is not reasonably practicable, store in an adequately ventilated building or part of a building specifically reserved for this purpose.
- Gas cylinders containing flammable gas should not be stored in part of a building used for other purposes.
- Protect gas cylinders from external heat sources that may adversely affect their mechanical integrity.
- Gas cylinders should be stored away from sources of ignition and other flammable materials.
- Avoid storing gas cylinders so that they stand or lie in water.
- Ensure the valve is kept shut on empty cylinders to prevent contaminants getting in.
- Store gas cylinders securely when they are not in use. They should be properly restrained, unless designed to be freestanding.
- Gas cylinders must be clearly marked to show what they contain and the hazards associated with their contents.
- Store cylinders where they are not vulnerable to hazards caused by impact, eg from vehicles such as fork-lift trucks.

LEGISLATION

The five main sets of Regulations covering gas cylinders are:

- The Transportable Pressure Vessels Regulations 2001 (SI 2001/1426) (**TPV Regulations**) came fully into force on 1 July 2001. They allow for the free movement and use of transportable pressure vessels (ie gas cylinders which are designed, manufactured and examined to the requirements of the TPV Regulations) across the European Union (EU) and Great Britain (GB).
- The Carriage of Dangerous Goods (Classification, Packaging and Labelling) and Use of Transportable Pressure Receptacles Regulations 1996 (SI 1996/2092), as amended (**CDGCPL2 Regulations**) cover the design, manufacture and examination of gas cylinders which are only for the domestic market in GB.
- The Gas Cylinders (Pattern Approval) Regulations 1987 (SI 1987/116) (**Pattern Approval Regulations**) for EEC-type cylinders cover the design and manufacture of EEC-type cylinders (under European Directives 84/525/EEC, 84/526/EEC and 84/527/EEC) for both the domestic and EU markets.
- The Pressure Vessels (Verification) Regulations 1998 (SI 1988/896) (**Verification Regulations**) cover the initial examination and verification of EEC-type cylinders (under European Directives 84/525/EEC, 84/526/EEC and 84/527/EEC) for both the domestic and the EU markets.
- The Pressure Equipment Regulations 1999 (SI 1999/2001) (**PE Regulations**) cover within their scope the design, manufacture and initial integrity of cylinders used in breathing appliances and portable fire extinguishers, together with valves and other accessories used with these gas cylinders which have a direct safety function. For periodic examination these cylinders are governed by the requirements of the CDGCPL2 Regulations.



The TPV Regulations do not apply to the gas cylinders used in breathing appliances (including diving cylinders) or portable fire extinguishers. Manufacturers, suppliers, users and owners of diving cylinders are required to comply with the requirements of either the CDGCPL2 Regulations, the Pattern Approval Regulations or the PE Regulations.

The first four sets of Regulations allow owners of cylinders manufactured before 1 July 2003 a number of choices.

For new cylinders, either:

- continue to comply with the requirements of the CDGCPL2 Regulations if the cylinders are for use only in GB; or
- continue to comply with the Pattern Approval and Verification Regulations if they are EEC-type cylinders; or
- comply with the requirements of the TPV Regulations, if the cylinders are for use throughout the EU and GB.

For existing cylinders, either:

- continue to comply with the requirements of the CDGCPL2 Regulations if the cylinders are for use only in GB; or
- have the cylinders reassessed in accordance with the TPV Regulations if they are to be used throughout the EU. However, in the case of EEC-type cylinders, reassessment under the TPV Regulations is not needed. These cylinders may be given a pi-mark (π -mark) at their first periodic inspection after the TPV Regulations come into force.

Additional advice and guidance is listed at the end of this leaflet.

Table 1

Summary of the law							
Regulations and scope of application	Relevant inspection bodies			Manufacturing and design standards	Cylinder markings		
	Initial examination and verification	Reassessment	Periodic examination		Initial examination and verification	Reassessment	Periodic examination
TPV Regulations (EU and GB)	Notified or approved body appointed by the Health and Safety Executive (HSE)	Notified or approved body appointed by the Health and Safety Executive (HSE)	Notified or approved body ¹ appointed by the Health and Safety Executive (HSE)	Schedule 2 of TPV Regulations or standard approved by HSE ²	Domestic market: ID number of notified or approved body ³ EU market: a π-mark and ID number of a notified body	EU and domestic market: a -mark and ID number of notified or approved body under certain conditions ⁴	EU and domestic market: the date of the examination and ID number of notified or approved body
CDGCPL2 Regulations (GB)	HSE approved person ⁵	-	Competent person ⁶	Standard approved by HSE	Verification mark	-	Date of the examination

Pattern Approval and Verification Regulations (EU and GB)	Inspection body⁷	-	Competent person⁶	Pattern approval issued under EU Directives, 84/525/EEC, 84/526/EEC and 84/527/EEC	Pattern approval and EEC verification mark symbols 'E' and 'e' and the mark of the inspection body	-	Date of the examination
PE Regulations (EU and GB)	Notified body or user inspectorates⁸ appointed by the Secretary of State for Trade and Industry	-	Competent person⁶	Essential safety requirements of PE Regulations or harmonised standards	CE mark and ID number of notified body or user inspectorate	-	Date of the examination

Notes

- 1 Examination and testing to be carried out in accordance with Chapter 6.2 of the European agreement concerning the international carriage of dangerous goods by road (ADR 2001) and at the intervals specified in the relevant packing instruction (P200 or P203 in 4.1.4.1 of ADR 2001).
- 2 HSE will charge an applicant or body a fee for the approval of a new standard which meets the relevant requirements of [chapter 6.2] of ADR 2001.
- 3 Until 30 June 2003, manufacturers of new TPVs which are for use only in the domestic market in GB may have their TPVs initially examined and verified by either a notified or approved body under the TPV Regulations or by a HSE approved person under the CDGCPL2 Regulations.
- 4 Owners of existing gas cylinders manufactured before 1 July 2003 in accordance with the CDGCPL2 Regulations but which meet the requirements of the TPV Regulations may have their cylinders reassessed by a notified or approved body and be π -marked to allow the free movement of such gas cylinders throughout the EU. Periodic examination of these cylinders would then be carried out by a notified or approved body.
- 5 New cylinders manufactured in accordance with the CDGCPL2 Regulations must be initially examined by a HSE approved person.
- 6 Periodic examination of cylinders manufactured in accordance with the CDGCPL2, Pattern Approval, Verification and PE Regulations must be carried out by a competent person. A competent person is an individual person or body who has the necessary skills, knowledge of the law, experience and expertise to carry out a thorough examination and test of a gas cylinder to determine whether it is safe for continued use.
- 7 EEC-type cylinders are required to have an initial examination and verification by an inspection body appointed by the HSE under the Verification Regulations. The inspection body will carry out an examination, affix EEC verification marks to the cylinders and issue EEC verification certificates.
- 8 Gas cylinders designed and manufactured under the PE Regulations are required to have their initial examination and verification carried out by a notified body appointed by the Secretary of State for Trade and Industry.

Lists of HSE notified and approved bodies and standards approved by HSE are available on the HSE website at www.hse.gov.uk/signpost/index.htm under the entry for transportable pressure equipment.

FURTHER ADVICE

Contact the following:

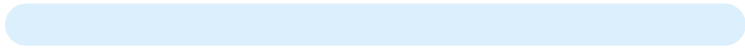
- Your local HSE office - the number can be obtained from directory enquiries or the phone book under 'Health and Safety Executive' or from HSE's website.
- Information on HSE approved standards can be obtained from HSE Technology Division 5, Magdalen House, Stanley Precinct, Bootle, Merseyside L20 3QZ, Tel: 0151 951 4514 or from HSE's website at www.hse.gov.uk/signpost/index.htm.
- For premises covered by the local authority eg offices, shops and public houses, contact the Local Authority Unit enquiry point: Tel: 020 7717 6442, Fax: 020 7717 6418.
- The United Kingdom Accreditation Service (UKAS) can advise on competent persons and notified and approved bodies. UKAS can be contacted at 21-47 High Street, Feltham, Middlesex TW13 4UN, Tel: 020 8917 8435, Fax: 020 8917 8499, or from their website at www.ukas.com.

Related Regulations, guidance and further information

This leaflet tells you about the main dangers of gas cylinders and of some of your legal responsibilities. For more detail you should refer to:

The Transportable Pressure Vessels Regulations 2001 SI 2001/1426
The Stationery Office 2001 ISBN 0 11 029347 9

The Carriage of Dangerous Goods (Classification, Packaging and Labelling) and Use of Transportable Pressure Receptacles Regulations 1996 SI 1996/2092 (as amended) The Stationery Office 1996 ISBN 0 11 062923 X



The Gas Cylinders (Pattern Approval) Regulations 1987 SI 1987/116
The Stationery Office 1987 ISBN 0 11 076116 2

The Pressure Vessels (Verification) Regulations 1988 SI 1988/896
The Stationery Office 1988 ISBN 0 11 086896 X

The Pressure Equipment Regulations 1999 SI 1999/2001
The Stationery Office 1999 ISBN 0 11 082790 2

European Agreement concerning the international carriage of
dangerous goods by road (ADR) and protocol of signature done at
Geneva on 30 September 1957

*Guidelines on the appointment of conformity assessment bodies for
transportable pressure vessels in Great Britain. Transportable Pressure
Vessels Regulations 2001* (copies available from HSE at 020 7717 6695
or from HSE's website at www.hse.gov.uk/signpost/index.htm)

The Highly Flammable Liquids and Liquefied Petroleum Gases
Regulations 1972 SI 1972/917 The Stationery Office
ISBN 0 11 880382 4

*Manual Handling: Manual Handling Operations Regulations 1992
Guidance on Regulations* L23 HSE Books 1998 ISBN 0 7176 2415 3

*Safe use of lifting equipment: Lifting Operations and Lifting Equipment
Regulations 1998 Approved Code of Practice and Guidance* L113 HSE
Books 1998 ISBN 0 7176 1628 2

Chemical warehousing: The storage of packaged dangerous substances
HSG71 HSE Books 1998 ISBN 0 7176 1484 0

*The carriage of dangerous goods explained. Part 2. Guidance for road
vehicle operators and others involved in the carriage of dangerous goods by
road* HSG161 HSE Books 1996 ISBN 0 7176 1253 8

The safe use of compressed gases in welding, flame cutting and allied processes HSG139 1997 ISBN 0 7176 0680 5

Cylinder retest stations IGC Doc 79/01/E EIGA.
Available on their website: www.eiga.org

The Storage of Full and Empty LPG Cylinders and Cartridges. LP Gas Association Code of Practice No 7. Available from the LP Gas Association, address given below.

While every effort has been made to ensure the accuracy of the references and websites listed in this publication, their future availability cannot be guaranteed.

Regulations are available from:

The Stationery Office (formerly HMSO), The Publications Centre,
PO Box 276, London SW8 5DT, Tel: 0870 600 5522, Fax: 0870 600 5533

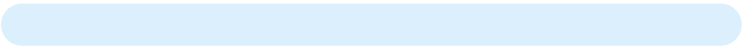
Further guidance may be obtained from:

The British Compressed Gases Association, 14 Tollgate, Eastleigh,
Hampshire SO53 3TG, Tel: 01703 641488

The LP Gas Association, Pavilion 16, Headlands Business Park,
Salisbury Road, Ringwood, Hampshire BH24 3PB, Tel: 01425 461162

For further guidance on diving cylinders contact:
ASSET, 12 Coulston Road, Lancaster, Tel: 01524 381831

IDEST, Scuba Industry Trade Association admin office,
29 Ravenswood Avenue, West Wickham, Kent BR4 0AN,
Tel: 020 8777 6740.



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(HSE priced publications are also available from bookshops.)

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hseinformationservices@natbrit.com or write to HSE Information
Services, Caerphilly Business Park, Caerphilly CF83 3GG. You can
also visit HSE's website: www.hse.gov.uk

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

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