

GAS CYLINDER SAFETY

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1. INTRODUCTION

In general using gas cylinders is safe. There is however the potential for a serious accident if the gas cylinder or the attachments are not treated properly. In the near future the pressure in many non-medical gas cylinders supplied by BOC is scheduled to increase. This has already happened for industrial grade O₂ and for some other gases.

2. GRADES OF GASES

BOC have divided the gases that they supply into 3 grades.

Medical A pure grade of gas to be used for medical purposes. These gases are normally stored at 137 bar.

Industrial This grade of gas is normally used in laboratories and workshops. Most gas cylinders at present charged at 175 bar. The pressure is scheduled to increase to 230 bar in the next few years. This has already occurred for oxygen.

Special Gases These cylinders contain mixtures of gases or inert gases. Pressure range between 175 bar and 230 bar.

3. PRESSURES

CONVERSION

| <u>BAR</u> | <u>KPa</u> | <u>PSI</u> |
|------------|------------|------------|
| 1 | 100 | 14.5 |
| 137 | 13700 | 1972 |
| 200 | 20000 | 2900 |
| 230 | 23000 | 3335 |
| 300 | 30000 | 4350 |

1 Bar = 0.987 atm = 401.8 in H₂O = 750 mm Hg.

The maximum pressure in the cylinder should be indicated on a label located on the cylinder shoulder.

4. TYPES OF VALVES & REGULATORS

VALVES

Valve outlet threads are screwed left-hand (anti-clockwise to tighten) for combustible gases. Valve outlet threads for non-combustible gases are screwed right-hand (clockwise to tighten).

When a valve is opened it should never be left against the backstop, but should be turned back half a turn to avoid seizure in an open position.

Oil, grease or jointing compounds must never be used on valves because of risk of fire or explosion. The risk is much greater with cylinders containing oxygen.

REGULATORS

Standards

| | |
|--------------------|-----------|
| BS 5741 (1979) | - 200 bar |
| BS 5741 (modified) | - 230 bar |
| BS 7650 (1993) | - 300 bar |

British Standards BS 5741 and BS 7650 were originally developed for regulators used for welding operations. Other regulators may not conform to a BS standard but must indicate a maximum pressure (e.g. 206 bar). Older types of regulators may not indicate a maximum pressure. These should not be used. The exception are regulators designed for **medical gases**.

Pressure gauges may be manufactured to British Standard BS 6752. The maximum pressure shown on the gauge must be above that of the gas in the cylinder.

The life span of a regulator is about 4 years. In some cases this could be extended by servicing. Regulators should have a date stamp on them. If they have not they may be over 10 years old.

Regulators may be simple where the output pressure varies between zero and the pressure in the cylinder. There are also regulators which reduce pressure to a set figure well below that of the cylinder pressure. The output varies between zero and the reduced pressure.

Oxygen. Only regulators labeled for oxygen gas may be used with oxygen. They contain no oil or grease. Using a regulator labeled for a different gas could result in a fire or explosion. If an oxygen regulator has been used with another gas it must never be used again with an oxygen cylinder unless it has been serviced and declared safe. Never use oil or grease.

5. TRANSPORT

Cylinders should only be transported on purpose designed trolleys of the correct size. Three wheeled trolleys are safer than two wheeled. Trolleys for transporting cylinders should be manufactured to BS 2718.

If a cylinder is known or suspected of leaking its contents it must never be transported in a manned lift car. If the cylinder contains oxygen and is leaking then it must not be transported in a lift.

Testing for leaks can be carried out by brushing on a solution of detergent such as 1% Teepol HB7 or other proprietary leak detector solution and looking for bubbles. Cylinders with leaking valves must be returned to BOC as soon as possible. Leaking regulators need to be replaced.

Anyone transporting gas cylinders (unless cylinder is small), must wear suitable protective footwear such as toetectors. Leather gloves are also strongly recommended when handling cylinders. Eye protection needs to be worn when valves are cleared.

Do not attempt to lift cylinder by its valve or cap.

Anyone transporting cylinders must have manual handling training unless the cylinder is small and light. A manual handling risk assessment needs to be made and significant findings recorded. A full J sized cylinder weighs approximately 69Kg (150lb).

6. STORAGE

Outside Stores Cylinders should normally be stored in a secure well ventilated enclosure. The door or gate must be kept locked when not in use. Used cylinders must be separately stored from ones containing gas. The enclosures must be properly labelled.

Use inside buildings The best internal location is against or near to an external wall. This is particularly true of flammable or explosive gases. Cylinders must always be secured to a wall, suitable furniture or trolley.

Acetylene cylinders must be kept upright. If they have been stored horizontally then they should not be used for 12 hours.

Cylinder stock should be rotated so that older cylinders are used first. Full cylinders should be kept separate from empty ones. Oxygen and flammable gas cylinders should be separated by a wall or 3m.

7. KEEPING THE SYSTEM SAFE

Gas cylinders must always be firmly secured and never left unsupported.

Any hosing or tubes connected to a regulator must be able to stand up to the maximum output pressure. This also applies to clips securing the hose. Any equipment connected to the cylinder must also be able to stand up to the maximum output pressure. The current standard for hosing is BS 1389:1986. Only systems which are essentially open ended may be fitted with low pressure hosing

Flammable gases such as acetylene must be fitted with a suitable flashback arrestor.

Liquefied gas cylinders are designed to be used in a vertical position unless otherwise specified.

Refilling of, or decanting from, a gas cylinder are prohibited unless it is carried out by a suitably qualified person.

Any system connected to a gas cylinder must be risk assessed. Findings of significant risk must be recorded in writing.

8. PROBLEM REGULATORS AND ATTACHMENTS

Regulators must not be used if:

- They are damaged or tampered with.
- Are over 10 years old.
- Specified below the maximum pressure of the cylinder.

- Have no maximum pressure markings.

Regulators should be replaced if:

- They are over 5 years old and not serviced
- The adjusting screw is non captive
- The output connection is damaged
- The regulator is from another gas

The final output from acetylene cylinders should be below 8psi (0.5 bar) or up to 3 turns of the regulator control from the shut position.

Oxygen should never be vented into a potentially flammable atmosphere or where it can adversely react with other chemicals.

9. FURTHER INFORMATION

- BOC Gases Safety Data Sheets on individual gases available from the Safety Adviser.
- Safe Under Pressure, BOC Gases, (4.1997)
- Gas Safe –With medical gases, BOC Gases, (2.1997)
- Gas Safe in the hospital, BOC Gases, (1.1993)

10. FIRE

Should there be a fire in an area where cylinders are stored, only attempt to shut off or move a cylinder if it is absolutely safe to do so. Otherwise shut the door and try and ensure that other staff are well away from the area. If possible inform the emergency authorities. If a cylinder has been in a fire it must not be used without speaking to BOC first. (tel 0800 111 333). This is particularly relevant to acetylene gas.

Dr Leszek Bojanowski
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C\Policies\gas cylinder, 8.12.97 Rev. 8

Rev 29.11.2001

18. No modifications or repairs

17. Gauges

- 1. Gas Name
- 2. Age
- 3. Inspection date

- 4. Max inlet pressure
- 5. Supplier name
- 6. Max outlet pressure
- 7. P.A. Screw captive

- 9. Threads
- 10. Bullnose

8. Filter

11. Nut

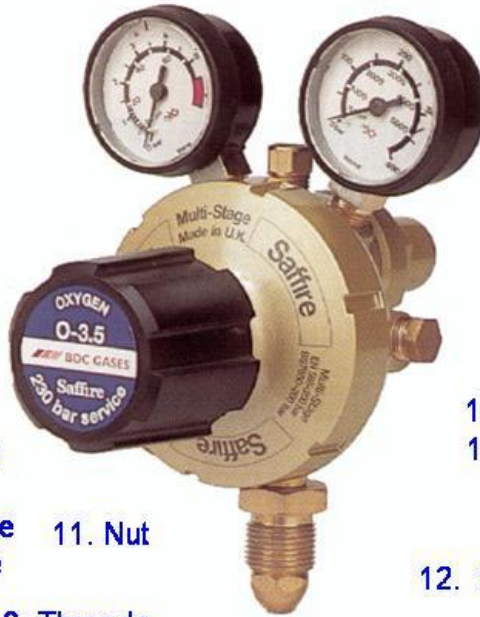
16. Relief valve

15 HP Nut

14 Body

13. Standards

12. 90° to outlet



Parts of a cylinder for safety visual inspection

This is for a visual reference for safety checking and does not form part of the safety notes.