

For further information please reference University of Oxford Policy Statements
S7/00 *Pressure Systems & Gas Cylinders* <https://www.admin.ox.ac.uk/safety/policy-statements/s7-00/>
S5/03 *Safety with Gas Cylinders* <https://www.admin.ox.ac.uk/safety/policy-statements/s5-03/>

ACTIVITY

This procedure covers the use of Gas Cylinders including storage, changing and general use.

Who is likely to be affected?

- Individuals at greatest risk are those involved in the direct handling & changing of cylinders.
- Indirectly & to a lesser extent, all other workers (including employees, researchers, visitors and contractors) within the vicinity of a cylinder may be at risk.

HAZARD & RISK

Hazards associated are:

- Manual handling – Transportation of cylinders.
- Compressed gases involved:
 - Flammable substances e.g. Acetylene, Ethane, Hydrogen
 - Corrosive substances e.g. Boron Trifluoride, Hydrogen chloride
 - Asphyxiants e.g. Nitrogen, Argon (*may pose a threat in an enclosed or poorly ventilated area*).
 - Oxidiser e.g. Oxygen (*may react with flammable material or give rise to spontaneous combustion*).
 - Refrigerated gases e.g. Nitrogen, Carbon Dioxide, Helium (*Thermal & asphyxiant risks*).
 - Toxic e.g. Carbon monoxide, Hydrogen sulphide
 - Varied e.g. Nitric Oxide (Toxic, Corrosive, Oxidiser)

The above list is by no means conclusive and each individual should identify the exact Hazards associated with their gases by referring to the Material Safety Data sheets provided.

The associated risk is therefore controlled by the safe handling of the cylinders and the correct selection, use & maintenance of all equipment involved, including cylinders, regulators & pipework. The working practises outlined below are expected to reduce this risk to an acceptably low level.

TRAINING

Before continuing you should familiarise yourself with the University Safety Policy S5/03: Safety with Gas Cylinders <https://www.admin.ox.ac.uk/safety/policy-statements/s5-03/>

Persons working with compressed gases are advised to attend the University Safety Office Training on *Compressed Gas Safety*
<https://www.admin.ox.ac.uk/safety/safetytraining/safetytraining/course/?crsID=101>

WTCHG Guidance Note: *Guidelines for Safe Handling of Gas Cylinders*

PROCEDURES

Anyone who uses a gas cylinder must 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:

- Before use, always carry out an external visual inspection of a cylinder & any attachments (e.g. 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.
- Do not use any cylinder that is not provided with a legible decal that identifies its contents.
- If the labelling on a cylinder becomes unclear or defaced, mark the cylinder 'contents unknown' and return directly to the supplier.
- Cylinders should be stored in a well-ventilated area away from flames, sparks or any source of heat or ignition. Keep cylinders away from electrical circuits.
- Do not expose cylinders to an open flame or to any temperature above 50 degrees C.
- Oxygen cylinders (empty or full) in storage should be separated from fuel-gas cylinders and combustible materials by at least 6 metres. Where this is not possible, you should consult your Departmental Safety Officer.
- Do not store flammable gas cylinders with oxygen or nitrous oxide cylinders adjacent to oxygen charging facilities.
- Full and empty cylinders of all gases should be stored separately and identified by signs to prevent confusion. Always mark empty cylinders with chalk or other suitable means to state they are empty (eg. write 'MT' on the cylinder neck).
- Cylinders may be stored outdoors but should be protected from the ground to prevent bottom corrosion. Where extreme temperatures prevail, cylinders should be stored so they are protected from the direct rays of the sun.
- Cylinders should not be exposed to continuous dampness, stored near salt or other corrosive chemicals or fumes.
- Keep the number of Cylinders used/stored indoors to an absolute minimum.
- Do not drop cylinders or permit them to strike anything violently.
- Always transport cylinders with a suitable truck, in an upright & secure position so that they will not fall. Where this is not practicable, then suitable arrangements should be made with the Departmental Safety Officer.
- When transporting cylinders or moving cylinders into position, operators should wear suitable safety shoes that comply with EN 345.

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- In addition Safety Glasses that comply with BS EN 166.1.B.3.5.9, should be worn whenever a cylinder is to be opened e.g. changing a regulator. Where the risk is greater (e.g. Liquefied gases) then additional protective equipment may be necessary (e.g. Cryogenic gloves).
- Always ensure gas cylinders are stored upright in a secure manner to prevent them from toppling over.
- Caps used for valve protection should be kept on the cylinders at all times except when the cylinder is actually being used. Cylinders must not be transported without safety caps. A cylinder's cap should be screwed all the way down on the cylinder's neck ring and should fit securely. Do not lift cylinders by the cap. The cap is for valve protection only.
- Do not use cylinders for rolling, supports, or any purpose other than the transportation and supply of gas.
- Open cylinder valves SLOWLY. Do not use a wrench to open/close a hand wheel type cylinder valve. If it cannot be operated by hand, the valve should be repaired.
- Do not attempt to repair cylinder valves or their relief devices while a cylinder contains gas pressure.
- Before attaching cylinders to a connection, be sure that the threads on the cylinder and the connection mate are of a type intended for the gas service.
- Do not permit oil or grease to come in contact with cylinders or their valves.
- Always use the proper regulator for the gas in the cylinder.
- Always check the regulator before attaching it to a cylinder. If the connections do not fit together readily, the wrong regulator is being used.
- Ensure that the regulator is checked on an annual basis by a competent person, who may be a contractor. Ensure there are records of these inspections. Also, in line with Industry practice, regulators should be renewed five yearly or in the case of toxic gases two yearly.
- Always "crack" the cylinder valve (open it slightly and close it immediately) before attaching a gas regulator to a cylinder - EXCEPT a hydrogen or fuel gas cylinder.
- Thus, do NOT crack hydrogen and fuel-gas cylinder valves - merely wipe out the outlet connections with a clean, dry, lint-free cloth.
- Wipe the outlet with a clean, dry, lint-free cloth once the cylinder valve has been cracked. The threads and mating surfaces of the regulator and hose connections should be cleaned before the regulator is attached.
- Always use a cylinder wrench or another tightly fitting wrench to tighten the regulator nut and hose connections.
- Attach the regulator securely before opening the valve wide.

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- Stand to the side of the regulator when opening the cylinder valve.
- Check for signs of leaks by using soapy water.
- Tag leaking cylinders or cylinders with stuck valves and move to a safe, secure outdoor location.
- Always ensure pipe-work leading from the cylinder/regulator is appropriate to the gas involved.
- All brass fittings should be used with copper or brass tubing AND steel or stainless steel fittings with steel or stainless steel tubing. Never mix different types of fittings unless you have consulted the Departmental Safety Officer.

Emergency Procedures.

Fire threatening the Cylinders or Ignited Flammable Gas Leak:

- If possible & only if it is absolutely safe to do so, then isolate the gas supply.
- Ensure everyone who is at threat from an exploding cylinder is evacuated to a safe distance. This may involve activation of the Fire Alarm, followed by relocation of the assembled masses to a safe distance.
- Contact Emergency Services and inform them of the whereabouts & contents of cylinders under threat.
- Never extinguish a Flammable Gas leak unless the supply has been isolated, as this could result in an explosion.

Gas Leaks:

- Identify the gas & the severity of the leak and assess the effect of this on the immediate & surrounding areas.
- If the leak poses an immediate threat to individuals (see risk summary above), then the area should be evacuated and either the Supplier or Emergency Services (depending on the immediate risk) should be contacted for help & support.
- However if it is possible & only if it is absolutely safe to do so then isolate the gas supply. As a minimum Safety Glasses must be worn & Oxygen monitor may be necessary.
- If the leak is from the valve outlet connection, then it may be rectified by isolating the gas, removing the connecting regulator, cleaning the outlet again and re-sitting the device. Excessive force must not be applied!
- Where a leak cannot be stopped, but the leaking cylinder can be isolated from any immediate threat, then it should be left in a secure manner, the area cordoned off and the supplier contacted for further advice.
- All damaged & leaking cylinders must be clearly marked before returning back to the supplier.

Personal Exposure:

- Carry out emergency procedures applicable to the substance released.