

Procedures and Methods Sheet: 005

Safe Use of High Pressure Gases

Hazards Posed by High Pressure Gases.

Gas at high pressure will rapidly expand if released and may present a hazard.

Inert gases such as nitrogen, helium, argon may cause hypoxia or asphyxiation due to oxygen displacement.

Release of oxygen will cause oxygen enrichment, which may cause breathing problems and will also support combustion in fire situation.

Other gases may be toxic and / or corrosive and/or highly flammable - the user should be aware of the chemical properties of any gas that they are using.

Compressed gas cylinders are extremely dangerous in fire situations as heat increases the pressure in the cylinder which may either cause catastrophic failure of the valve, or fracture the cylinder.

Gas will escape extremely rapidly into the surrounding area, causing hazards such as mentioned above.

Escaping gas may also have enough energy to initiate and propagate propulsion of the cylinder so that it flies through the air with great force - cylinders under these conditions may have enough energy to pass through the walls and floors of a building.

Catastrophic cylinder failure as a result of explosion may involve metal fragments moving at high velocity.

Safe Handling, Transportation and Use of Cylinders and Safe use of Regulators.

Moving cylinders also poses manual handling as the cylinders are heavy and have the potential to topple over.

The following rules **must** be followed when storing, transporting and using pressurised gas cylinders.

Where appropriate these points should be applied to other pieces of high pressure apparatus such as microwave digesters or bomb calorimeters.

Transport

Gas cylinders must always be transported in one of the trolleys provided for this purpose.

The cylinder **must** be turned off at the cylinder head valve and have the regulator removed whilst in transit.

Cylinders must be transported in the goods lift and **must not be accompanied**.

Wear appropriate footwear when transporting gas cylinders. Do not wear open toed sandals when handling or transporting gas cylinders.

Storage

Cylinders must be properly secured with a chain or clamp or mounted in a suitable stand even when not in use.

The number of gas cylinders in laboratories must be kept to a minimum and they should be returned to the stores when empty or unlikely to be used in the near future. The rental charge for a cylinder kept unused in the building for a few months can be more than the cost of the gas contained in the cylinder.

Regulators

Regulators should be inspected frequently for signs of corrosion or mechanical damage.

Ensure that the regulator is suitable for the type of gas, is in-date and is marked as manufactured to BS EN 2053 standard..

Regulators are valid for 5 years (inert gases) and 2 years (corrosive and toxic gases) from the date of manufacture. The expiry date should be shown on the regulator.

Oils or lubricants should not be used when fitting regulators.

PTFE tape, oils and greases tape should **never** be used with oxygen as this presents an explosion hazard.

The regulator connection and all connections in the gas supply line should be checked for leaks after fitting with an approved substance (washing up liquid is not suitable).

Force should not be applied in an attempt to correct a poor seal as this may cause further damage.

Other malfunctions such as wavering pressure readings, jammed spindles etc. represent a damaged regulator. Damaged regulators must be sent back to the manufacturer for repair, not fixed "in house".

Use

When not in use the cylinder valve must be closed.

Gas cylinders in use must always be fitted with a key.

When using or storing flammable gases ensure that there are no sources of ignition (electrical equipment in use, naked flames, risk of static discharge etc.) within 3 metres of the cylinder.

It is best practice not to use or store flammable gases in the vicinity of a cylinder containing oxygen or other oxidising gas.

In a system where a reactive gas is used, protection against suck-back, in the form of an empty reservoir, must be located between the regulator and the reaction vessel.

If the gas is insoluble then a blow-off device is necessary. The correct arrangement is cylinder - suck-back trap - blow-off device.

Flash back arresters must be used when using flammable gas.

Proposed new locations of acetylene cylinders and any applications using acetylene must be discussed with the School Safety Advisor prior to receipt of the cylinder/commencement of the application.

Copper pipes or vessels must never be used or allowed to come into contact with acetylene.

A generic Risk Assessment for use of pressurised gas is available at <http://www.ssnet.chemistry.manchester.ac.uk/health-and-safety/generic-risk-assessment/>

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Date

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