HSE JOINING

HEALTH, SAFETY AND ENVIRONMENT TRAINING FOR JOINING

GAS CYLINDERS HANDLING

IO2 – EDUCATIONAL MATERIALS

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Compressed gases

Depending on the particular compressed gas, there is a potential for simultaneous exposure to both mechanical and chemical hazards.
Gases may be:

- Flammable or combustible
- Explosive
- Corrosive
- Poisonous/toxic
- Inert
- Cryogenic
- Pyrophoric (burns on contact with air)
- Combination of hazards

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Main Causes of Accidents

- Inadequate training and supervision;
- Poor installation;
- Poor maintenance;
- Faulty equipment and/or design
  (e.g. badly fitting valves or regulators);
- Poor handling;
- Poor storage;
- Inadequately ventilated working conditions;

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Compressed gases

If the gas is flammable, flash points lower than room temperature compounded by high rates of diffusion present a danger of fire or explosion.

Additional hazards of reactivity and toxicity of the gas, as well as asphyxiation, can be caused by high concentrations of even "harmless" gases such as nitrogen.

The large amount of potential energy, resulting from compression of the gas, makes the cylinder a potential rocket or fragmentation bomb.

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Compressed gases

Careful procedures are necessary for handling the various compressed gases, the cylinders containing the compressed gases, regulators or valves used to control gas flow, and the piping used to confine gases during flow.

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Flashback Arrestors

- Flashback = mixture of fuel gas and oxygen burning within the hose, flame travels and burns its way towards the gas source at great speed, can result in force of explosion in either cylinder;
- Flashback arrestors must be fitted on both oxygen and fuel gas regulators;
- Flashback arrestors should only be used with the gas they are labelled for and the pressure they are designed for;
- Reasons for flashback: incorrect purging of hose/torch prior to use, incorrect gas pressure, incorrect nozzle, damaged torch valves, gas passages blocked within the torch, kinked or trapped hose;

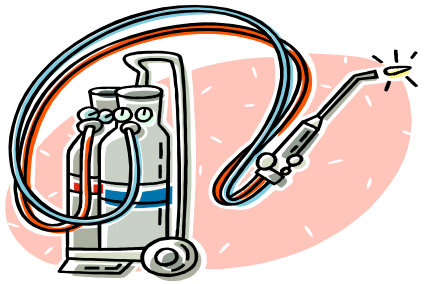

Figure 1 -Oxy-acetylene welding unit with flashback arrestors. Source: https://ubisafe.org/image/torch-vector-welding/1432688.html

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Piping

- Distribution lines and their outlets shall be clearly labeled as to the type of gas contained
- Piping systems should be inspected for leaks on a regular basis
- Special attention should be given to fittings as well as possible cracks that may have developed

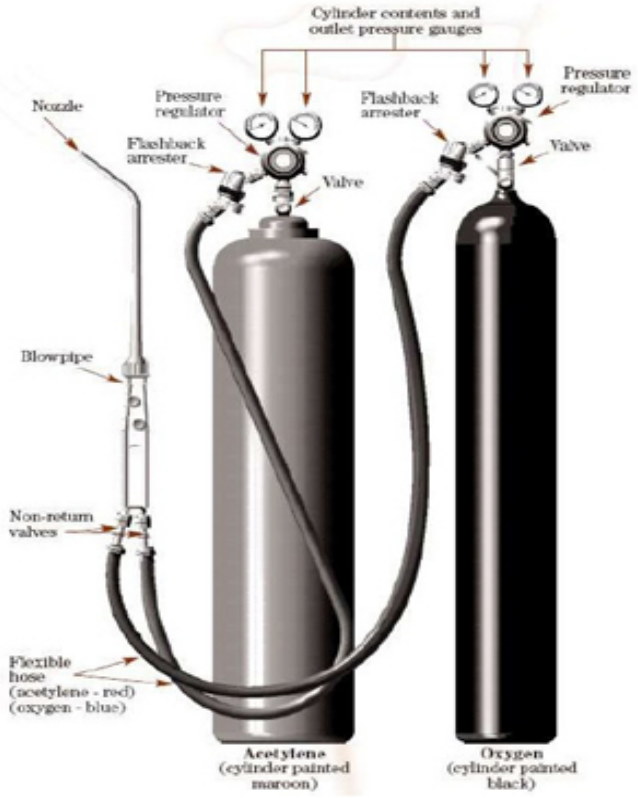

Figure 2 - Oxy-acetylene welding unit with flashback arrestors. Source: https://www.metals4u.co.uk/how-to-oxy-acetylene-weld.asp

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Compressed gases

- All gas lines leading from a compressed gas supply should be clearly labeled to identify the gas.
- The labels should be color coded to distinguish hazardous gases.
- Never rely only on the color of the cylinder for identification.
- Signs should be posted in areas where flammable compressed gases are stored, identifying the substances and appropriate precautions.

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Compressed gases - Handling & Use

- Gas cylinders must be secured at all times;
- Cylinders may be attached to a bench top, to the wall, in holding cages, or have a non-tip base attached.
- Chains or straps shall be used to secure them;

Under no circumstances should any attempt be made to repair a cylinder or valve.

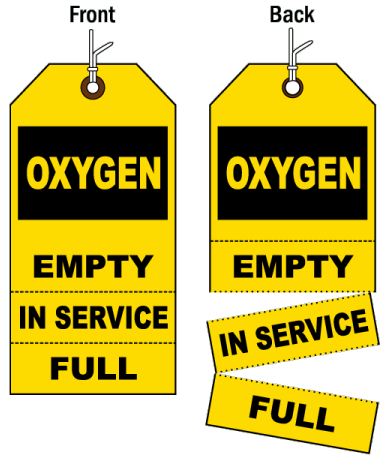

Figure 3 - Labels to caution regarding the storage of cyminders. Source: https://www.safetysign.com/products/5173/3-part-oxygen-cylinder-status-tag

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Compressed gases - Handling & Use

- Cylinders should be placed with the valve accessible all times;
- Main cylinder valve should be closed when no longer necessary to be open;
- Only wrenches or tools provided by the cylinder supplier should be used to open or close a valve;
- Some valves may require washers; this should be checked before the regulator is fitted;

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Compressed gases - Handling & Use

- Cylinder valves should be opened slowly;
- Oxygen cylinder valves should be opened all the way;
- Open up the oxygen cylinder valve stem just a crack;
- Once the needle on the high pressure gauge has stopped, open up the valve all the way;
- When opening the valve on a cylinder containing an irritating or toxic gas, the user should position the cylinder with the valve pointing away from them and warn those working nearby;

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Compressed gases - Handling & Use

Cylinders containing flammable gases such as hydrogen or acetylene must not be stored in close proximity to open flames, areas where electrical sparks are generated, or where other sources of ignition may be present.

Figure 4 -Label for explosive gases. Source: https://www.fivevalleylabels.co.uk/product-page/explosive-gases-i001

Cylinders containing acetylene shall never be stored on their side.

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Compressed gases - Handling & Use

- The proper storage for oxygen cylinders requires that a minimum of 7 meters be maintained between flammable gas cylinders and oxygen cylinders or the storage areas be separated, at a minimum, by a fire wall 1,5 m high, with a fire rating of 0.5 hours;

- Greasy and oily materials shall never be stored around oxygen; nor should oil or grease be applied to fittings;

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Compressed gases - Handling & Use

- Regulators are gas specific and not necessarily interchangeable!
- Always make sure that the regulator and valve fittings are compatible.

Figure 5 - Gas bottle with regulators. Source: http://www.rentfreegas.com.au/shop/nitrogen-kit-includes-cylinder-gas-regulator-pressure-rated-hose/

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Compressed gases - Handling & Use

After the regulator is attached, the cylinder valve should be opened just enough to indicate pressure on the regulator gauge (no more than one full turn) and all the connections checked with a soap solution for leaks.

Never use oil or grease on the regulator of a cylinder valve.

If there are questions regarding the suitability of a regulator for a particular gas, call your vendor for advice.

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Compressed gases - Handling & Use

Following rules are recommended:

- When cylinder is empty, all valves shall be closed, the system bled, and the regulator removed;
- The valve cap shall be replaced, the cylinder clearly marked as "empty," and returned to a storage area for pickup by the supplier;
- Empty and full cylinders should be stored in separate areas;
- Copper piping shall not be used for acetylene;
- Do not use cast iron pipe for chlorine or plastic piping for high pressure systems;
- Piping systems should be regularly inspected for leaks;

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Compressed gases - Handling & Use

- Use safety glasses when handling and using compressed gases, especially when connecting and disconnecting compressed gas regulators and lines;
- All compressed gas cylinders, including lecture-size cylinders, must be returned to the supplier when empty or no longer in use;

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Compressed gases - Transportation

1. To protect the valve during transportation, the cover cap should be screwed on hand tight and remain on until the cylinder is in place and ready for use;
2. Cylinders should never be rolled or dragged;
3. When moving large cylinders, they should be strapped to a properly designed wheeled cart to ensure stability;
4. Only one cylinder should be handled (moved) at a time;

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Handling Gas Cylinders

- Wear PPE: gloves, protective footwear, eye protection;
- Correct way to move cylinders is to: keep upright, secure and with valves uppermost;
- Use suitable clamps or other effective means when lifting;
- On short distances manually moving cylinders can be done only by trained personnel;
- Never roll cylinders along the ground;
- Never transport cylinder with valve and pressure regulator attached or valve open;
- Never attempt to catch a falling cylinder;
- Never lift a cylinder by its cap or valve;

Remember: A cylinder is never empty!

European, National Regulations and Recommendations

- EN ISO 13769: Gas cylinders. Stamp marking
- EN 1439: LPG equipment and accessories. Procedure for checking transportable refillable LPG cylinders before, during and after filling
- EN ISO 24431: Gas cylinders. Seamless, welded and composite cylinders for compressed and liquefied gases (excluding acetylene). Inspection at time of filling
- EN 16728: LPG equipment and accessories. Transportable refillable LPG cylinders other than traditional welded and brazed steel cylinders. Periodic inspection
- EN 1440: LPG equipment and accessories. Transportable refillable traditional welded and brazed steel LPG cylinders. Periodic inspection
- ISO 11513: Gas cylinders. Refillable welded steel cylinders containing materials for subatmospheric gas packaging (excluding acetylene). Design, construction, testing, use and periodic inspection .