

COMPRESSED GAS CYLINDERS



Workers to be able to:

- Identify main hazards associated with gas cylinders
- Identify the main gases used in a construction site
- Identify the safe conditions to store gas cylinders safely
- Identify what to inspect before using a gas cylinders
- Manage damaged cylinders

- High Pressure, spills and jet
- Fire and flames, explosion
- Gas and Vapour (toxic, flammable, asphyxia)
- Chemical agents, hazardous substances contact, inhalation and swallow
- Cut, abrasion, puncture, hot surface during handling, slip/trip and posture
- Material falls











Commonly Used Industrial Gases

- Commonly used industrial gases and their characteristics are given in the next slides. Color of their containing cylinders varies from Geographical areas to another.
- Reference for their color-coding shall be made to the Local Authorities of the Country where the Project is being carried out.

Typical Compressed gas cylinders and Color Code Example – **Not in EU** | 5

| GAS | CHARACTERISTICS | CYLINDER COLOR |
|-----------|--|----------------------------------|
| Oxygen | No smell, non-toxic. Will not burn but supports and accelerates combustion. Materials not normally considered combustible may be ignited in oxygen rich atmospheres | Blue with black Letters |
| Nitrogen | No smell, does not burn. Inert except at high temperatures. Non toxic but does not support life so will cause asphyxiation in high concentrations | Black with yellow letters |
| Argon | No smell. Heavier than air. Does not burn. Non toxic but does not support life so will cause asphyxiation in high concentrations | Black with yellow letters |
| Acetylene | Distinctive garlic-like smell. Fire and explosion hazards are similar to those of propane. Cylinders of acetylene must be kept cool because chemical reaction in the cylinder can cause the cylinder to explode if allowed to get hot | White with red letters |
| Propane | Distinctive fish-like smell. Highly flammable and highly explosive when mixed with air. | Red with white letters |
| Butane | Highly flammable and highly explosive when mixed with air. Heavier than air | Red with white letters |

GAS CYLINDER COLOUR CODE – *(Typical in EU only!)*

| Cylinder shoulder colours | | |
|---|--------------|---|
| By hazard property | | |
| Flammable | Red |  |
| Toxic/corrosive | Yellow |  |
| Inert | Bright green |  |
| Oxidising | Pale blue |  |
| Note: More than one hazard property may be shown on the cylinder shoulder e.g. red and yellow | | |
| By specific gas | | |
| Argon | Dark green |  |
| Carbon dioxide | Dusty grey |  |
| Helium | Brown |  |
| Nitrogen | Black |  |
| Nitrous oxide | Dark blue |  |
| Oxygen | White |  |

Oxygen (O₂)

Oxygen has no smell and while it does not burn, it supports and accelerates combustion.

Care must be taken to avoid the risk of clothing or other flammable materials such as oil being ignited:

they will burn quickly/easier in Oxygen or where the atmosphere has been enriched with Oxygen

Precautions against Oxygen Enrichment

- Oxygen not be used to ventilate any space
- Oxygen not be used to power pneumatic machinery or portable tools
- Prevent the accidental leakage of Oxygen from lines, pipes and cylinders, manifolds and other equipment

ATTENTION !!!!

- In a **confined space** even a small amount of Acetylene, Oxygen or propane may create a dangerous condition which will cause explosion or fire from a spark or naked light.

Acetylene (C₃H₃)

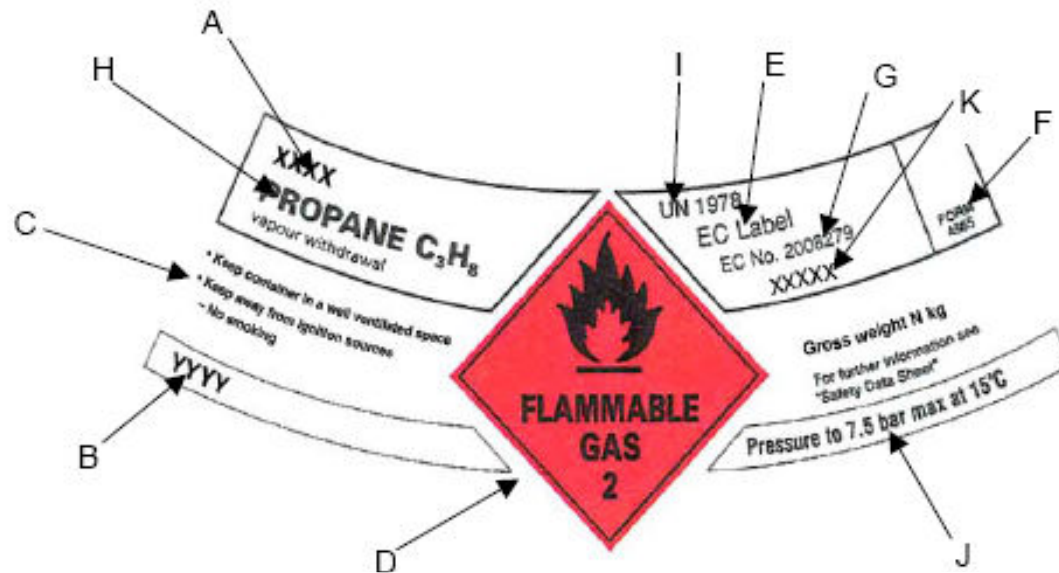
- Acetylene can form explosive compounds in contact with certain metals or alloys, in particular those of copper and silver
- Joint fittings or piping made of copper must not be used. Only Approved material shall be used in Acetylene System
- Acetylene is mixed with acetone inside the cylinder to prevent internal explosion, therefore is essential, particularly for acetylene cylinder, to be always maintained in vertical position

IDENTIFICATION OF GAS CYLINDER

All cylinders shall be identified by color coding, and all color coding shall be maintained in a clear and legible condition.

Notices indicating the color codes shall be mounted in areas where compressed gases are stored and regularly used.

In addition to the color coding, the name of the gas contained within the cylinder shall be clearly stenciled in letters CLEARLY VISIBLE on the cylinder body.



- A Company name
- B Address of the company in the United Kingdom
- C Risk and safety phrases relating to the product
- D Hazard symbols
- E EC label (for pure substances only)
- F Revision number (gas company use to identify label revision)
- G EC number, if applicable
- H Product name
- I UN identification number and proper shipping name (given by product name)
- J Any additional company information
- K Emergency contact telephone number

SITE SUPPLY

Cylinders shall be supplied with protective guards or caps for the valve assemblies. Suppliers shall be instructed to strictly adhere to this requirement.

Cylinders shall not be rolled from vehicles and allowed to free-fall onto rubber tires or similar packaging, but shall be lowered to the ground manually or using appropriate lifting equipment: **BASKET.**



TRANSPORT OF CYLINDERS

- All cylinders when being transported shall have the protective guards or caps in place over the valve assemblies.
- All cylinders shall be transported in a vertical position in appropriate carriers or chained to vertical supports
- When cylinders are to be returned empty to a supplier, they shall be clearly marked empty. The valves shall be closed and the protective caps fitted

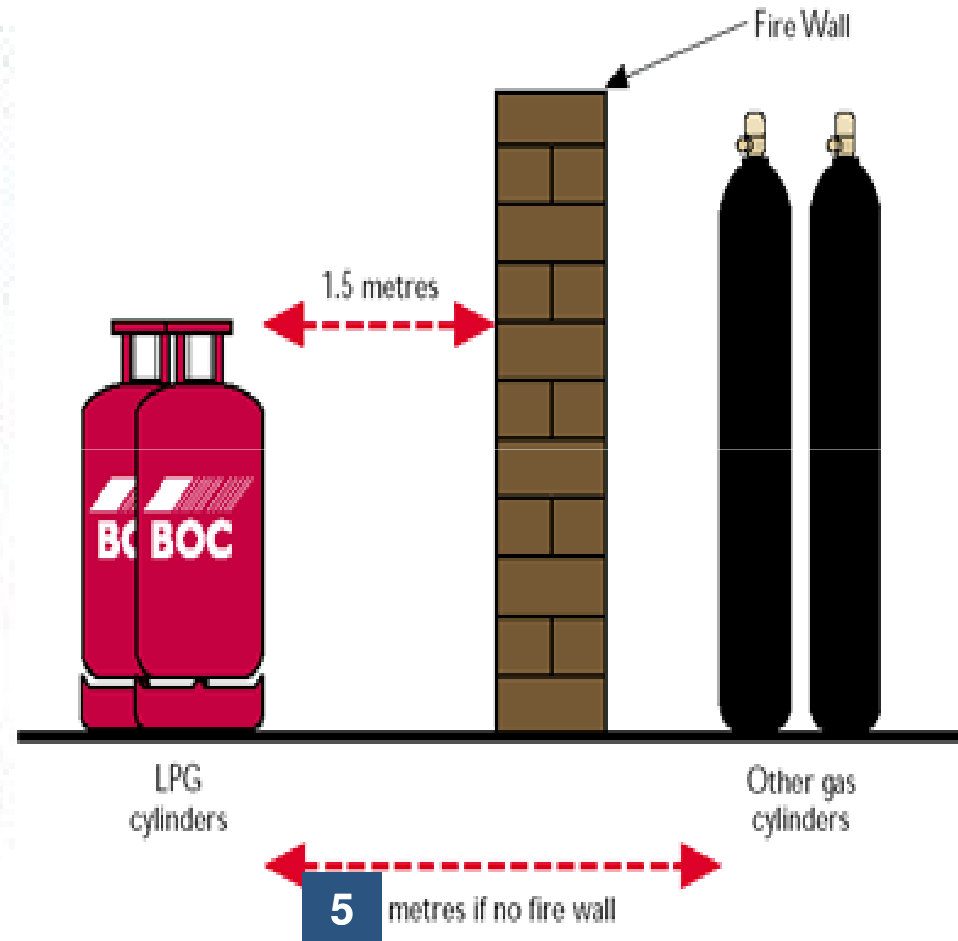
UNSAFE TRANSPORT OF CYLINDERS



STORAGE OF CYLINDERS

- Compressed Gas Cylinders storage areas shall be clearly identified, with the names in different languages of the gases stored within, prominently displayed
- Cylinders containing combustible gas shall be stored separately from oxygen and wherever possible, not closer than 6 meters. If 6 meters are not possible, a fire-resisting wall shall separate them.

COMPRESSED GAS CYLINDERS



- Protective caps or guards shall be retained in place on all full and empty cylinders within the store
- No smoking, naked lights or sources of ignition shall be allowed within or in the vicinity of cylinder stores (not less than 20 meters)
- No Smoking/No Naked Flame signs shall be displayed nearby in several languages
- Portable Fire extinguishers shall be located outside the store entrance, so that the travel distance to any fire extinguisher is 15 meters or less

- Cylinders stored in the open must be protected in cold weather from accumulation of ice and snow, and in hot weather from the direct rays of the sun. Tarpaulins or any other cover must not be used in direct contact with the cylinders
- Cylinders must be protected from rusting and corrosive conditions
- Hoses shall be stored in dedicated location when not in use. Hoses and valves shall be kept free from oil and grease and they shall be protected against damages

COMPRESSED GAS CYLINDERS

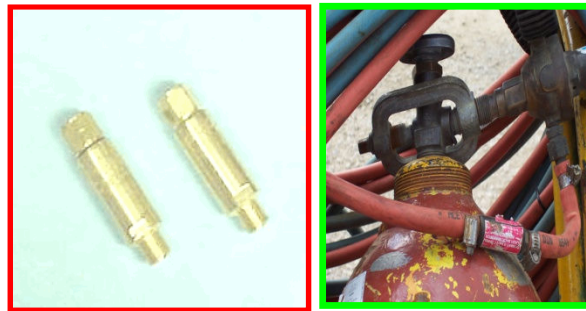


- Lighting for storage areas containing acetylene or other combustible gas cylinders shall be an approved explosion proof type
- Electric switches must be explosion proof or placed at a safe distance outside the storeroom



GENERAL REQUIREMENT

- Activities where compressed gases (including air) are to be transported, stored or used shall be recognized to have potential hazards in the risk assessment and appropriate controls shall be identified and implemented.
- When not in continuous use, all gas cylinders, torches, and manifolds shall be **turned off** and purged
- Oxy-acetylene equipment shall used only with a double approved an approved **flash back arrestors** located in line at the regulator to prevent a flash back to the cylinder.



INSPECTION

- Use red hose for acetylene and other combustible gases, and be careful to see that they are never interchanged with other colors.
- Inspect rubber hoses to see that they are free from cuts, cracks, burns, and worn places, and arrange them so as they cannot be cut by contact with sharp edges or corners, falling metal, sparks, or blowpipe flame.

- Use hoses of equal length and do not coil any surplus hose around regulators or cylinders. Oxy-acetylene hoses shall be taped together to keep them tidy.
- Clamp hoses shall not be sharp and it shall be suitable for the hoses
- Check always the presence of the fire arrest devices on Flammable Gas Cylinder



Cylinders must not be:

- Subjected to undue strain by blows or mechanical damage
- Allowed to drop or come into violent contact with each other
- Transported with the regulators and hose attached, **unless a proper trolley or carrier is used. When transporting by a trolley the cylinder valve must be shut before the cylinder is moved from place to place.**



HANDLING AND USAGE OF CYLINDERS

Oil, Grease and Other Contaminants:

- Oil or grease ignites violently in the presence of high pressure Oxygen and an explosion may result.
- Cylinders and fittings must be kept away from all sources of contamination such as oil barrels, overhead shafting, cranes, or drive belts

Care of Cylinders in Use

- Compressed gas cylinders shall be kept either in trolleys, designed and manufactured as “Gas cylinder trolley”, or secured to a part of a structure such that they cannot be accidentally knocked over. Cylinders shall be retained in an upright position

Care of Cylinders in Use

- **Cylinders and valves must be kept clean.** Grit, dirt, oil and dirty water must not be allowed to enter the cylinder valve sockets, otherwise it will be impossible to prevent equipment from leaking at the joints



- Personnel must **not lubricate** any valve or fitting, and must not use any white or red lead or any other jointing compound;
- Cylinders must be kept away from **sparks**, flames or slag from welding or cutting operations
- Cylinder **valves must be shut** when work has to be stopped for more than a few minutes, or when the cylinder is empty

- Connections to piping, regulators and equipment shall always be kept tight to prevent leakage
- Threads on regulator connections or other auxiliary equipment shall be the same as those on the cylinder valve outlet. Connections that do not fit shall on no account be forced together
- Cylinders must not be used or stored where there is any danger of impact by operating equipment, or danger of ground shift such as near the sides of trenches or excavations
- Do not use cylinders near the intake of an air Compressor

**CYLINDERS SHALL NEVER BE PLACED/USED
INSIDE A CONFINED SPACE**, without a specific
risk assessment and procedure established



USE OF GAS CYLINDER

- To test the valve, before connecting to regulator, opens it slowly and close immediately. This action will be done in safe area with no possible ignition sources
- When opening a valve or a regulator always stay in safe position on one side. Increase always slowly the pressure by the regulator and do not exceed the pressure limits
- Torches shall be inspected for leaky valves, nozzles and/or tips before use
- Only spark igniters shall be light welding torches. Matches and lighters not to be used.

Damaged Cylinders

- Damaged cylinders should, where possible, be isolated from undamaged cylinders. They should be clearly marked 'Damaged - Do Not Touch'
- If an acetylene or propane cylinder is heated accidentally or by a backfire from the use of faulty equipment, it must be dealt with promptly as follows:
 - Shut the valve
 - Detach the regulator and other fittings
 - Take the cylinder into the open air and well away from any sources of ignition at once
 - Immerse in, or apply, water copiously to cool



COMPRESSED GAS CYLINDERS

HOT WORK SAFE PRACTICES ALWAYS WHILE WORKING WITH GAS CYLINDERS



**Screens set to protect other workers from
grinding sparks**