ORIGINAL

WOC LP & EP Department

WOC HSE Standards Manual

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Section C003 – Compressed Gas Cylinders

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1. PURPOSE

To ensure the correct colour coding, storage, transportation, use and filling of compressed gas cylinders and equipment.

2. APPLICATION

All WAHA sites and locations.

3. POTENTIAL HAZARDS

Fire/explosion

Burn injuries

Eye/face injuries

Asphyxiation

4. PROCEDURES

4.1. Compressed Gas Cylinders and Equipment

4.1.1. Compressed gas contained in cylinders is potentially dangerous and should be treated with care. The following guidelines shall apply to all compressed gases in cylinders and in particular to oxygen, propane and dissolved acetylene.

4.1.2. Compressed gas cylinders in use must be stored in an upright position and secured by the use of carts, racks, chains, straps, etc.

4.1.3. No fittings or equipment containing above 90% copper (except burner tip) shall be used with acetylene, as copper in contact with acetylene may form a dangerously explosive compound, copper acetylide.

4.1.4. To avoid acetone carry-over from acetylene cylinders, the following points must be observed:

4.1.4.1. Discharge pressure shall not exceed 9 psi at the regulator

4.1.4.2. Settling periods as follows shall be strictly observed

4.1.4.2.1. 24 hours after unloading a cylinder from a lorry.

4.1.4.2.2. 24 hours after moving a cylinder around the Plant.

4.1.5. The use of lead washers or any kind of packing in the valve joints shall be forbidden. Packing, particularly lead or copper, tends to get forced into the orifice causing a blockage; its subsequent extraction is attended by grave risk.

4.1.6. Cylinders with faulty valve joints, stuck valve spindles, or valve leakage shall be returned immediately to stores with a note stating the cylinder number, nature of the fault and whether the cylinder is charged. Under no circumstances shall the user of the cylinder attempt any repair.

NOTE: All cylinder valve spindles have right handed threads.

4.1.7. Only standard valve keys shall be used and cylinder valves shall always be opened slowly by gently tapping the key. Cylinder valves shall always be closed when the cylinders are empty or not in use. Keys with long leverage should never be employed to force a valve to close. If the valve leaks when closed it is usually due to grit and this can often be removed by opening the valve slowly and closing it sharply.

4.1.8. All cylinders shall have a valve protection device, either a welded-on cage or a screw on cap. Valve protection devices shall be utilized when cylinders are not in use.

NOTE: The above does not apply to air cylinders for BA sets.

4.1.9. Only standard automatic pressure regulators and pressure gauges shall be fitted to oxygen and acetylene cylinders when in use. Flash back arresters shall be used at both ends of the hose, i.e., immediately after the regulator and immediately before the torch. The adjustable screw on the regulator shall always be released before the

cylinder is opened. The cylinder valve shall be closed before the regulator is removed.

4.1.10. Compressed gas regulators must be used when connecting compressed gas cylinders to equipment.

4.1.10.1. Safety glasses or goggles must be worn when opening the compressed gas cylinder or LPG valve.

4.1.10.2. Employees must not stand in front of the opening of the compressed gas cylinder valve/regulator assembly while opening the cylinder valve.

4.1.10.3. Compressed gas cylinder valve must be opened slowly.

4.1.10.4. Compressed gas regulators and hoses should be de-pressurized when not in use.

4.1.11. Oil, grease, or other combustible substance must not come in contact with compressed gas cylinders and valves containing oxygen, especially valve and regulator threads.

4.1.12. Rubber hoses and other connections should be regularly inspected and damaged hoses replaced. Red hoses shall be used for acetylene and other combustible gases and blue hoses shall be used for other gases.

4.1.13. Leak testing should be carried out using soapy water or proprietary leak testing fluid. Leaking equipment shall never be used. Frozen equipment should be thawed out using hot water. Never use a flame to thaw equipment.

4.1.14. Compressed gas cylinders (especially acetylene) and LPG tanks must not be exposed to sparks and flames from welding or cutting torches.

4.1.15. No cylinder shall be used if there is any doubt as to its contents.

In case of doubt:

- the valve should be taped
- the cylinder should be clearly marked 'DO NOT USE'
- the cylinder should be returned to the supplier

Cylinders, valves, regulators and hoses should be inspected before starting a job and only equipment in serviceable condition shall be used.

4.1.16. Discontinue use of cylinders prior to being completely empty to leave a minimal amount of positive pressure in the cylinder.

4.1.17. Compressed gas cylinders must not contact electrical circuits.

4.2. Storage and Handling

4.2.1. Cylinders must be stored in a dedicated area, with signage and segregation of full and empty cylinders. The following rules shall apply to storage of cylinders:

4.2.1.1. Cylinders shall be stored with due regard to the fire hazard. No flammable materials shall be stored in the building with them or in the immediate vicinity on site.

4.2.1.2. Smoking is prohibited in compressed gas cylinder storage and use areas.

4.2.1.3. The cylinders shall be stored in such a manner that they can be readily removed in the event of a fire.

4.2.1.4. Oxygen cylinders and their fittings, including hoses, must be stored separately from combustible/flammable material by at least 20 feet, or by a

noncombustible wall. Oils and greases are spontaneously combustible in the presence of oxygen

4.2.1.5. Compressed gas cylinders must be protected from heat sources in excess of 125°F (51.5°C) and heating equipment must not be installed in store rooms where compressed gas cylinders are kept. Outside storage is acceptable if cylinders are protected from direct sunlight, heat, and standing water/corrosion.

4.2.1.6. If oxygen and acetylene cylinders have to be stored in the same area they shall be kept well apart. Preferably they should be stored in separate areas or a minimum of 6 meters apart

4.2.1.7. Compressed gas cylinders must be secured in an upright position while in storage to prevent over-pressurization.

4.2.2. The following rules shall apply to handling and movement of cylinders:
Cylinders should be moved by handcart, handtruck, or cylinder cart designed for moving compressed gas cylinders, when possible.

4.2.2.1. Cylinders of oxygen, propane and dissolved acetylene shall not be subjected to rough handling or excessive shock. Dragging, sliding, or horizontal rolling or compressed gas cylinders should be avoided. Cylinders weighing greater than 50 pounds (23 kg) should be moved by mechanical means or by utilizing additional persons to assist.

4.2.2.2. Cylinders shall never be dropped from a height or permitted to strike each other. A proper carriage or cage, NOT a sling, should be used for moving cylinders whether empty or full. Cylinders should be lifted using a wire rope sling and not a chain sling to avoid the possibility of sparking

4.2.2.3. Cylinder valve protection caps shall be fitted to all compressed gas cylinders and left in place while in storage.

4.2.2.4. Cylinders shall not be transported with regulators and hoses attached unless a proper trolley is used.

4.2.2.5. Cylinders shall be transported in an upright vertical position.

4.3. Color Coding of Cylinders

Gas cylinders are normally color coded for identification. It is important to be able to identify cylinders readily. The following table shows typical cylinder colors and characteristic for some gases likely to be used.

Identification of cylinders should be verified by the decal or label on the cylinder. Color coding should not be relied upon as the sole identification method as all suppliers do not consistently use the same color coding. Cylinders must not be used if there is any doubt regarding the contents.

4.4 Testing and recertification

There are a variety of tests that may be performed on various cylinders. Some of the most common types of tests are hydrostatic test, burst test, tensile strength, Charpy impact test and pressure cycling.

During the manufacturing process, vital information is usually stamped or permanently marked on the cylinder. This information usually includes the type of cylinder, the working or service pressure, the serial number, date of manufacture, the manufacture's registered code and sometimes the test pressure. Other information may also be stamped depending on the regulation requirements.

High pressure cylinders that are used multiple times--as most are--are hydrostatically or ultrasonically tested and visually examined every few years.

Hydrostatic/ultrasonic testing is required either every five years or every ten years, depending on cylinder and its service.

GAS	CHARACTERISTICS OF CYLINDER	(ISO)
Oxygen	No smell - toxic in high concentrations. Will not burn but supports and accelerates combustion. Materials not normally considered combustible may be ignited by sparks in oxygen rich atmospheres.	White shoulder
Nitrogen	No smell – does not burn. Inert except at high temperatures. Non-toxic but dies not support life so could cause asphyxiation in high concentrations.	Black shoulder
Argon	No smell – heavier than air – does not burn – inert. Will cause asphyxiation in absence of sufficient oxygen to support life.	Dark Green
Acetylene	Distinctive garlic-like smell. Fire and explosion hazards are more severe than those of propane. However it is lighter than air and less likely to collect in ducts and drains.	Reddish Blue/Maroon
Propane	Distinctive fish-like smell. Will ignite and burn instantly from a spark or piece of hot metal. Is heavier that air and will collect in ducts, drains etc.	Normally bright red and bearing the words "propane" and "Highly Flammable"
Hydrogen	No smell – non toxic. Much lighter than air. Will collect at the highest point in any enclosed space unless ventilated there. Extreme fire and explosive hazard.	Normally Bright Red
Air		French Grey

4.5 Handling and Use of Compressed Air

4.5.1 Extreme caution shall be taken when using compressed air. An air hose shall never be aimed at any person. Compressed air can be extremely dangerous when misused. Air under pressure may pass right through clothing and cause severe or fatal injury.

4.5.2 Compressed air shall not be used for blowing dust / chips from hair, clothing or workbench.

[See: Hand Tools (Pneumatic Powered Tools and Equipment)]

5.0 References

- CFR 1910.101
- EN 1089-3: Transportable , Gas Cylinders Part 3 - Colour Coding.
- ISO 32: Gas cylinders for medical use -- Marking for identification of content
- EN 1089-2: Gas cylinders, Marking, Identification methods, Transportable, Gas pressure vessels, Pressure vessels, Labels, Safety measures, Warning devices, Design
- EN 1968:2002 for Periodic inspection and testing of transportable Steel Gas Cylinders