



## Safety Services Guidance



### The control of acetylene cylinders and their risks in fires

Key word(s): Acetylene, fire, accidental release

Target audience: Users, Laboratory managers, Principal Investigators, Safety Advisors

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## Properties of acetylene cylinders and acetylene

1. Acetylene cylinders differ from other compressed gas cylinders, in that they do not contain compressed or liquefied acetylene. The acetylene is dissolved in acetone (usually) which is absorbed onto a porous inert matrix inside the cylinder. The porous material is designed to slow or inhibit any decomposition into its constituent elements by subdividing the volume into tiny spaces, and preventing the formation of pockets of acetylene gas. Violent decomposition can be initiated by local heating or from mechanical shocks from rough handling. Acetylene cylinders must always be stored upright, to prevent voids forming in the porous material.

Note: A size G acetylene cylinder contains approximately 20 litres of acetone, in which approximately 7500 litres of acetylene is dissolved in a 15 bar cylinder. At atmospheric pressure, a nominally empty cylinder will still contain 500 litres of dissolved acetylene. Thus, this guidance applies equally to “empty” cylinders.

2. The range between upper and lower explosive limits for acetylene in air is one of the widest for any flammable gas (2.5% lower explosive limit, to 80% upper explosive limit). Any mixture with air within this range will explode. When mixed with oxygen (for example when used in oxyacetylene cutting equipment), the upper limit increases to 93%. Although it is slightly lighter than air, for practical purposes it should be assumed that any leak will result in an explosive mixture. All sources of ignition must be removed promptly, if practicable to do so before evacuation.
3. Newer acetylene cylinders are not fitted with pressure relief valves, following substantiated reports that these actually led to the development of fires and offered no significant safety benefit. Older cylinders may still have them, but these are being progressively removed from circulation.
4. Decomposition of gas in a cylinder can be initiated by a flashback from welding or cutting equipment, or by exposure to intense heat (normally involving direct impingement of flames on a cylinder) or severe mechanical shock (such as a drop from height). In most situations, if decomposition begins and the cylinder is not subject to further movement or impact, the inert filler will eventually extinguish the flame, although this may take many hours. Thus, cylinders must never be removed from the scene of a fire, until there is confirmation that no hot spots exist on the surface.

## General care of acetylene cylinders

5. Ensure the following are carried out:

- Always handle carefully – avoid shocks, jarring or rolling
- Always store and move upright
- Always use with the correct regulator
- Always use a flashback arrestor when using with a source of ignition (e.g. in cutting equipment)
- If a fire occurs because of a leak associated with the cylinder regulator, close the cylinder valve if possible. If this is not possible, and you are competent to do so, use a CO<sub>2</sub> (or dry powder) extinguisher aimed in the same direction as the flame and behind it (not aimed at the flame). Once out, close the regulator, and inform your school safety advisor. **DO NOT TAKE RISKS.** The cylinder and regulator should be immediately taken out of action. **DO NOT MOVE IT.** Contact the supplier for further instructions about its removal from the laboratory or workshop. The supplier will need to implement their own arrangements to ensure safety during removal.
- If the fire cannot be quickly extinguished, **DO NOT** make further attempts. Sound the alarm, evacuate the building and call the Fire Brigade, making sure they are informed of the presence and location of the cylinder.

#### **Accidental release of acetylene – no fire**

##### 6. Do the following

- Close cylinder valve, and if necessary tighten gland nut.
- If leak continues, evacuate building by activating the fire alarm.
- Ensure maximum ventilation within lab or room (if safe to do so).
- Eliminate ignition sources (if safe to do so).
- Prevent re-entry to area, post warning notices (including no smoking if appropriate).
- Notify cylinder supplier of faulty cylinder, and follow their instructions about its removal.

#### **Accidental release of acetylene from cylinder – leak ignited**

##### 7. Do the following

- Sound fire alarm immediately (use nearest call point break glass).
- Evacuate the building.
- If you are trained and competent to do so, and you are present at the time of ignition and are aware of the sequence of events leading to the leak and ignition, close the cylinder valve if possible. If this is not possible, and in the very earliest stages of the fire only, and you are competent to do so, use a

CO2 (or dry powder) extinguisher aimed in the same direction as the flame and behind it (not aimed at the flame). Once out, close the regulator, and evacuate. DO NOT TAKE RISKS. The cylinder and regulator should be immediately taken out of action and the supplier(s) contacted to arrange removal – University staff/students MUST NOT MOVE THEM. The supplier will need to carry out their own risk assessment before implementing procedures for safe transport.

- If the fire cannot be quickly extinguished, DO NOT make further attempts. Evacuate and inform the attending Fire Brigade of the location and condition of the cylinder.
- Any cylinder and regulator which has been subject to this type of event must be returned to the supplier once they are declared safe.

### **Fire in an area where acetylene is used or stored**

#### 8. Do the following

- If not already sounding, immediately activate the evacuation alarm (use the nearest call point break glass).
- If the fire is small and you are competent to do so, use the appropriate fire extinguisher on the fire – always leave yourself a safe exit from the area.
- telephone 9-999 on an internal phone well away from the fire, and confirm the existence of the fire and the presence of acetylene cylinder(s). Also Inform Security on 30(6) 9966 of the nature of the fire. Do not use a mobile phone if flammable gases could be present.
- On arrival of the Fire Brigade, ensure that the officer in charge is informed of the location of the fire and the presence of acetylene cylinders.
- If safe to do so, consider moving the acetylene cylinder away from the fire – CAUTION – DO NOT ATTEMPT THIS if the fire is not being controlled, or if there is any evidence that the cylinder has been heated up by the fire.
- If practicable, douse the cylinder in a spray of water until the Fire Brigade take control of the site.

**NB:** these types of incidents should always be reported to the University Safety Office using the University Accident Report Form or Incident/Near miss Report Form (as appropriate).

### **Oxyacetylene cutting and welding equipment**

9. This Guidance is not intended to cover this topic in detail. The British Compressed Gas Association (BSGA) Code of Practice CP7 should be followed.

## Training Requirements

10. All persons using acetylene cylinders (including laboratory use) must be able to demonstrate competence. This will normally involve attending a suitable training course or equivalent which includes basic legal requirements, properties of the gas and cylinders, safety precautions, use of appropriate personal protective equipment, etc, and receive appropriate levels of general supervision.
11. All persons using oxy-acetylene cutting and welding equipment must attend a suitable course designed specifically for the use of such equipment, or be working under the close supervision of a competent person. In this context, "close supervision" means in constant attendance, and under constant observation.
12. For details of available courses contact the STDU

## Bibliography

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\*available from OHSIS via the A-Z of electronic databases on the [University of Manchester Library web pages](#)

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