

Norwich Union Risk Services

*Ref No 2015 (v1)*

*December 2006*

## Acetylene

### Introduction

Acetylene has been used as the fuel gas in oxy-fuel sets for cutting, burning and welding for many years. Its hazards are well known and in the majority of cases its use does not present any undue hazard.

However, acetylene is inherently dangerous, more so than other fuel gases such as propane. Acetylene requires careful handling and use in order to control the risks. The presence of acetylene cylinders at a fire scene poses a serious risk of injury to those nearby including attending fire service personnel.

The Fire & Rescue Service (FRS) will follow a strict protocol when acetylene cylinders are involved in a fire, or are suspected of being affected by heat. This includes the establishing of an extensive cordon, possible evacuation and application of water to the affected cylinder for 24 hours or until they are satisfied there are no hot spots. Such actions are obviously highly disruptive to your business but may also affect neighbouring businesses, and may lead to the closure of nearby road/rail links.

### Acetylene

Acetylene is a hydrocarbon gas, formula  $C_2H_2$  that is slightly lighter than air. Acetylene is described as having a garlic like odour. The nature of the chemical bond means that it is a very reactive substance. It forms explosive mixtures with air and reacts with copper, silver and mercury to form explosive compounds. (Do NOT use copper piping, or alloys containing more than 70% copper with acetylene). Acetylene was traditionally supplied in maroon cylinders; the new European standards require an oxide red shoulder but do not define the body colour. However an acetylene cylinder is different to all other gas cylinders. The acetylene is dissolved in a solvent which is absorbed on a porous mass.

### Uses of Acetylene

Acetylene is most commonly used as the fuel gas in oxy-fuel sets for cutting, burning and welding.

Whilst acetylene is popular it is possible to use substitutes. If naked flames are required then propane can replace acetylene. For welding operations, electrical processes such as MIG and TIG welding may be possible alternatives. For cutting operations mechanical means may be possible e.g. cutting disks, mechanical saws and nibblers.

### Hazards associated with the use of Acetylene

Acetylene may cause asphyxiation but the greatest risks are those of fire and explosion.

**Flashback:** This commonly results from the formation of a flammable mixture in the hoses at the time the blowpipe/torch is lit. The flame can travel back along the hoses and reach the cylinder. If the flame reaches the cylinder it can trigger decomposition.

**Decomposition:** This is triggered by heat and commonly occurs following flashback, when a flame impinges on the cylinder or when a cylinder is involved in a fire. Acetylene decomposes into its constituent parts – carbon and hydrogen - with the evolution of heat and an increase in pressure. The risk of decomposition is increased if the porous mass has been damaged e.g. by repeated flashbacks or through mechanical shock e.g. if the cylinder has been repeatedly dropped. Once decomposition is taking place any release of pressure within the cylinder e.g. through a leak or opening of the valve will increase the rate of decomposition.

Decomposition can cause the cylinder to become unstable and even explode. When decomposition is taking place it is dangerous to move the cylinder and it must be cooled for a lengthy period before it is safe to be touched or moved.

## Acetylene and Fire

The risk of decomposition when an acetylene cylinder is involved in a fire means that FRS follow a strict protocol. A hazard zone of 200m will be set up around the fire site and it may be necessary to evacuate any persons within that area. The cylinder will be cooled and its condition assessed at regular intervals by means of what is known as the "wetting test". Dependent upon the outcome of the wetting test the hazard zone could be reduced but only as determined appropriate by the FRS. However, cooling of the cylinder will continue for at least 24 hours.

This protocol is essential for the safety of fire-fighters as well as other persons in the immediate vicinity. The disruption to business, both yours and that of your neighbours, from the setting up of a hazard and exclusion zone will be considerable.

## Flashback Procedure

Establish clear procedures for dealing with a flashback and ensure that all employees understand them. If a flashback occurs:

- Immediately close cylinder valves
- If this is not possible evacuate the area
- If the cylinder is warm to the touch or is vibrating evacuate the area immediately and call the emergency services
- Do not attempt to move any cylinder that is warm or vibrating.

## Key Action Steps

- Consider whether alternative procedures or fuel gases can be used
- Ensure acetylene cylinders are stored and handled correctly e.g. are not dropped or rolled along the floor and are kept vertical at all times
- Fit flashback arrestors to all cylinders
- Where long lengths of hose are used fit flashback arrestors at both blowpipe/torch and regulator
- Fit non-return valves (also called check valves) on the blowpipe/torch
- Inspect non-return valves regularly and replace them when damaged
- Ensure that acetylene is only taken from the cylinders at the recommended pressure (less than 0.62bar)
- Ensure all employees who use acetylene are trained in its safe use and understand the necessary emergency procedures

- Maintain good records of purchase and use of acetylene
- Ensure that the minimum quantity of acetylene is kept on site and that unwanted/redundant cylinders are returned to the supplier without delay
- Notify cylinder supplier immediately if a faulty cylinder is suspected
- If acetylene cylinders are required you should consider the consequences of a 24 hour evacuation and the effect this may have on your business

Note:

Consider whether the local FRS should be notified of the presence of Acetylene cylinders on your premises. This would be of value in ensuring the correct response in the event of a fire and could reduce the risks to fire-fighters and other persons.

## Reference Documents

MSDS from supplier

The safe use of oxy-fuel gas equipment  
Code of Practice CP7  
British Compressed Gases Association

Managing gas cylinders involved in fire  
Guidance Note GN15  
British Compressed Gases Association

The safe use of compressed gases in  
welding, flame cutting and allied processes  
HSG 139 HSE Books

Take Care with Acetylene  
INDG 327 HSE Books,

Safety in gas welding, cutting and similar  
processes  
INDG 297 HSE Books

Hot Work on small tanks and drums  
INDG 314 HSE Books

HSE Books telephone 01787 881165.

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Norwich Union Risk Services operates a Risk Helpline during normal business hours for the cost of a local telephone call. The telephone number is:  
**0845 366 66 66**  
[www.nu-riskservices.co.uk](http://www.nu-riskservices.co.uk)