



FIRE SAFETY:

ACETYLENE

CONSIDERATIONS

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INTRODUCTION

Acetylene is a popular gas for welding and cutting metal, whether used in a professional or personal capacity. It has many benefits and is very safe when used and stored correctly.

However, if acetylene is exposed to significant heat, it can start to decompose. This can continue for up to 24 hours after the heat source has been removed, and could cause the cylinder to explode and has resulted in many deaths in the past.

When this happens, anyone in the vicinity could be in the path of a ball of fire, flying metal, glass, debris and structural damage that could extend over 200 metres.

This is why national guidance for the Fire Service recommends that firefighters put an initial 200-metre cordon in place when an acetylene cylinder is involved in fire. As a result it may be necessary for homes and businesses to be evacuated and roads and railways closed. Firefighters will work to cool the cylinder and monitor its temperature until they consider it to be safe from the risk of explosion. The time this takes should be around 2hrs but could extend to 24hrs dependant on the individual circumstances.

Dependent on their location and quantities involved the presence of Acetylene could prevent firefighters from actively fighting a fire in the premises. A defensive position may be adopted to cool cylinders and prevent further fire spread whilst personnel remain outside of the risk area.

Properties of Acetylene

- i. Acetylene is a colourless gas and has a garlic odour due to presence of impurities of phosphorous and hydrogen sulphide. However, pure acetylene has a pleasant odour.
- ii. It is insoluble in water but highly soluble in acetone and alcohol. Acetylene is transported under high pressure in acetone soaked porous material packed in steel cylinders.
- iii. Its boiling point is -84°C .
- iv. It is lighter than air and somewhat poisonous in nature.
- v. It burns with a luminous flame and forms an explosive mixture with air.

The Law

The Dangerous Substances and Explosive Atmospheres Regulations 2002 require businesses to assess the risks of work activities with dangerous substances and eliminate, substitute or reduce the risks as far as reasonably practicable.

The Regulatory Reform (Fire Safety) Order 2005 requires the responsible person (typically the business owner) to carry out a Fire Risk Assessment. This should take account of the impact of a fire involving a cylinder on surrounding premises and people.

Alternatives to using Acetylene



Virtually all welding and cutting work using acetylene can be carried out using different products which present less of a risk to firefighters and the wider community if they are involved in fire.

Welding

Tungsten Inert Gas (TIG) Welding: a welding arc, formed by an electric current passing between a pointed tungsten electrode and the work piece, melts a weld pool. The electrode and the weld pool are protected by the inert gas shield.

TIG is best for fine, high quality welding especially in thinner materials and specialist metals. As the electrode is not consumed, the input of heat and the formation of the weld pool are separate from the addition of filler metal (as for oxy-acetylene welding).

Metal Inert and Metal Active Gas (MIG & MAG) Welding: (also known as CO₂ and semi-automatic) describes those processes where a continuous wire electrode is used. A gas shield gives weld pool protection. Welding wire: a wide variety of solid and tubular (containing metal and or flux) wires are available to match the composition & properties of the metal being joined. There are also MIG brazing wires available.

Manual Metallic Arc (MMA) Welding: with this process an arc is struck between a flux coated metal rod (electrode) and the work piece. The flux melts forming a gas and a slag, which protect the weld pool. The slag must be chipped off at the completion of each weld run. Only short lengths of weld are made before a new electrode needs to be used. Weld penetration is low and the quality of the weld deposit is highly dependent on the skill of the welder.

Heating

An alternative to using Acetylene for heating metals is to consider the use of oxy-propane. In many cases this is a viable alternative however it does not have the same high flame temperature as Acetylene so is not always a direct replacement.

Cutting

Mechanical cutting: many metals can be effectively cut using saws (band and jig), angle grinders, slitting wheels or guillotines. They can give good performance and productivity.

Plasma cutting is carried out by a high velocity jet of ionised gas (plasma) that is formed by electricity flowing from the cutting torch to the work piece. The plasma melts work piece material, and the gas jet blows the molten metal away to make the cut. Any conductive metal can be cut using compressed gas, typically air (note oxy-acetylene cannot cut stainless steel or aluminium). Easy to master, the process is much faster than oxy-fuel cutting (for less than 25mm metal).

We suggest you do your own risk assessment and liaise with your gas supplier to establish which product best suits your requirements.



If, after doing this, you decide that you need to use acetylene you should:

- Carry out a Fire Risk Assessment, as required by the Regulatory Reform (Fire Safety) Order, 2005;
- Incorporate into the Fire Risk Assessment the requirements of DSEAR 2002 in regard to Acetylene;
- Store acetylene cylinders in accordance with the guidelines published by the Health and Safety Executive;
- Let your local fire service know that you are using or storing acetylene as this will help them to maintain an accurate risk profile for your county. They will then be armed with the information they need to keep firefighters and the community safe if called to a fire at your address.





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