



TECHNICAL INFORMATION SHEET 49

RISK ASSESSMENT CONSIDERATIONS FOR ACTIVITIES INVOLVING COMPRESSED GAS CYLINDERS WITHIN THE WORKPLACE

The handling, storage and use of gas cylinders is potentially hazardous and requires suitable and sufficient risk assessment. Risk assessments should be recorded in an appropriate format, for example, those published by the *Health and Safety Executive* (HSE), useful advice is available on the HSE [website](#).

To assist with the risk assessment process, this document provides information on the hazards associated with gas cylinders. This information should be read in conjunction with BCGA publications referenced in this document, which are free to download – www.bcga.co.uk. This document summarises the potential hazards associated with gases and cylinders, and signposts to useful safety information. It does not constitute a comprehensive assessment of all workplace hazards as required under the *Management of Health and Safety at Work Regulations* ^[SI 1999, No. 3242]. Additional specific risk assessments may be required, for example, for manual handling, slips, trips, falls, etc.

Cryogenic liquid vessels, including dewars, are outside of the scope of this document. For advice on these items refer to BCGA [CP 30](#), *The safe use of liquid nitrogen dewars*, and BCGA [CP 36](#), *Cryogenic liquid storage at users' premises*.

The basic principles of conducting a risk assessment require:

- identifying the potential hazards in the workplace (this document covers gas cylinders);
- identifying who might be harmed and how;
- evaluating the risks and deciding on appropriate control measures, taking into account control measures already in place;
- recording the risk assessment;
- reviewing and updating the risk assessment.

Additionally, the risk assessment should take into account other potential risks, for example, damage to property, harm to the environment, quality management, etc.

Only persons who are competent under the *Management of Health and Safety at Work Regulations* ^[SI 1999, No. 3242] shall carry out the risk assessment. Relevant persons shall be engaged in the risk assessment, who have sufficient knowledge of the gases, the gas cylinders, associated activities and the specific workplace(s). Sources of information include:

- published literature, such as BCGA [GN 23](#), *Gas safety. Information, instruction and training*, supplier's information, safety data sheets, the HSE website, etc.
- appropriate training, from a recognised training provider <https://bcga.co.uk/members/>;
- support from a competent person.

HAZARDS

The hazards to take into account include:

- cylinders, refer to Section 1;
- gases, refer to Section 2;
- pressure release, refer to Section 3;
- external influences, refer to Section 4;



- related considerations, refer to Section 5;
- additional considerations for transportation, refer to Section 6.

1. Cylinders

The hazards associated with cylinders include:

- weight. Cylinders range from small lecture bottles, which weigh approximately 1 kg, to large cylinders which are over 100 kg. There are also combinations of cylinders in a bundle, which may weigh greater than 1000 kg.

A specific risk assessment is required for manual handling. Bundles are usually moved by fork lift truck;

- instability. Gas cylinders typically have a large height to diameter ratio, this makes them susceptible to toppling, creating manual handling and storage challenges. Gas cylinders shall not be left freestanding at any point in time.

NOTE: Lifting of gas cylinders should be avoided. If cylinders are dropped from height the valve could shear off on impact, resulting in gas being released (creating a hazard from its properties and pressure).

2. Gases

Safety information is displayed on the cylinder label and is detailed in the relevant safety data sheet. This information shall be used when carrying out the risk assessment.

Some gases have an expiry life. These gases should only be used when they are in-date.

Dependant on the properties of the gases, a release may create a hazardous atmosphere, for example, an asphyxiant, flammable, oxidant, toxic or corrosive atmosphere. Sources of gas release are detailed in BCGA [GN 11](#), *The management of risk when using gases in enclosed workplaces*.

The risk is dependent on the gas properties, the rate of gas release, the size of the workspace and the ventilation level.

NOTES:

- (i) The introduction of gas into a workspace may result in that space becoming a 'confined space', as defined in *The Confined Spaces Regulations* ^[SI 1997 No. 1713].
- (ii) Released gases may create a hazard where accumulation could occur, for example, either in underground services, such as drains, sewers, conduits, etc., or above ground, in roofs, voids, etc.

3. Pressure release

Cylinders contain gases stored under pressure and may have significant stored energy. Any pressure above atmospheric released from a cylinder has the potential to cause injury to personnel, or damage to plant or property. The higher the pressure, the greater the hazard.

The risk assessment shall include the risk(s) of the gas being released under pressure, for example, through normal use, following an accident, through mishandling, uncontrolled leakage, etc.

Examples where releases (controlled and uncontrolled) can occur include:

- disconnecting;
- operation of safety devices, such as pressure relief valves, bursting discs, etc.;
- purging and venting;
- insecure connections;
- poor maintenance;
- poor cylinder handling;
- equipment failure;
- the use of incompatible equipment.

4. External influences

External influences which affect a gas cylinder include:

- variations in temperature, particularly outside of the range of -20 °C to +55 °C (which is the standard design range for gas cylinders in the UK), may affect the safe operation of gas equipment and components and may affect the gas flow.
 - High temperature:
 - will increase the internal cylinder pressure, increasing the risk of gas leakage;
 - may reduce the mechanical strength of the cylinder, which can lead to cylinder failure;
 - for liquefied gases, may activate pressure safety devices, resulting in a release of gas.

High temperatures may result from a fire, extreme weather, local sources of heat, direct flame impingement, process, steam, filling rates, etc.

- Low temperature:
 - may cause material embrittlement, increasing the likelihood of rupture;
 - may create handling difficulties;
 - may cause separation of (some) gas mixtures.

Low temperatures may result from extreme weather, excess gas draw-off rates, or can occur near cryogenic or refrigerated substances, etc.

- substances nearby which may be hazardous to a cylinder, for example, water or aqueous environments (corrosive effects), corrosives, etc.;
- impact damage, for example, from vehicle movement, machinery, mishandling (dropping), etc.;
- activities of neighbours, visitors, contractors, unauthorised persons, the general public, etc.;
- topography (for example, slopes) and surface conditions (for example, soft or uneven ground). These may increase the risk of cylinder toppling and mishandling, they may create or contribute to other hazards for example restricted visibility, local ventilation restriction, etc.;
- contact with electricity (including arcs), for example, live electrical cables and equipment, lightning, radio frequencies, electric welding, cutting and allied processes, etc.

5. Related considerations

The activity risk assessment shall also take into account:

- the fumes potentially produced by the gas use activity, for example, welding;
- any released gas. For example, inert gas welding, process wastage, operation of relief devices, purging or venting. Any gas release shall be in a safe area;
- oxygen depletion, which may be due to either combustion or displacement;
- site layout and topography. This may affect available ventilation, dispersion, etc.;
- other substances nearby, for example, chemicals, oils, greases, etc.;
- unrelated activities taking place locally. Examples include, the operation of furnaces, ovens, hot work, construction, etc.;
- the correct equipment, tools and set-up, for example, the use of flashback arrestors or other safety devices;
- suitability of equipment, including pressure incompatibility. Equipment which is incorrectly rated, tested or inadequately maintained is a hazard;
- the choice of gas(es) for the activity;
- incompatibility of gases, materials and other substances. Certain material combinations can create a variety of hazards, for example, oxygen and hydrocarbons, acetylene and copper, etc.;
- the gas draw-off rates from a cylinder or bundle. Excessive draw-off may lead to freezing and subsequent blocking of the gas flow. For dissolved gases excessive draw-off may result in the carry-over of the liquid, for example, the acetone from an acetylene cylinder;
- the quantity of gas(es) and cylinders on site. Excessive inventory and poor management of stores increase the degree of hazard;
- human reliability. This includes supervision and competence;

- local weather and ambient conditions, etc. May increase the risk of mishandling, increase the longer term risk of corrosion, etc.;
- emergency operating procedures and the Emergency Plan. Including details that may be required by the Fire and Rescue Service in the event of an incident, for example, the location and inventory of gases on site or being transported.

6. Additional considerations for transport

There are additional considerations to take into account for transport. These include:

- the suitability of the vehicle for transporting cylinders, especially in terms of ventilation, load compatibility, etc.;
- the condition of the cylinders for transportation, for example, removal of application equipment, the valve position (closed), no leaks apparent, etc.;
- the competence of the vehicle crew;
- the loading and unloading activities, including ensuring vehicle stability during driving;
- the securing of cylinders (and other objects which may impact on the cylinders) to prevent movement. This includes strapping and unstrapping activities. Consider the forces during the journey, for example, braking, cornering, acceleration, etc., as well as the potential of being involved in a traffic accident;
- the position of any relief devices. Any potential gas release shall be, as far as is possible, directed to a safe area and not impinge on nearby equipment or parts of the vehicle;
- the security of the load (to prevent theft);
- minimising the length of time a cylinder is on a vehicle;
- any additional safety requirements, for example, a fire extinguisher, the potential and consequences of a road traffic incident, etc.

CONTROLS AND FURTHER INFORMATION

Having considered the hazards that may be present, appropriate controls shall be implemented to reduce any risk to an acceptable level. Control guidance and further information is available for:

- specialty gases, refer to BCGA [CP 18](#), *The safe storage, handling and use of specialty gases*;
- examination, inspection and maintenance of pressure equipment, refer to BCGA [CP 39](#), *In-service requirements of pressure equipment (Gas storage and gas distribution systems)*;
- cylinder storage, refer to BCGA [CP 44](#), *The storage of gas cylinders*;
- manual handling, refer to BCGA [GN 3](#), *Gas cylinders. Manual handling operations*;
- ventilation assessment and gas hazards, refer to BCGA [GN 11](#), *The management of risk when using gases in enclosed workplaces*. Hazards to persons increase where ventilation is limited, for example, in an enclosed or confined space. In a confined space, specific requirements apply through *The Confined Spaces Regulations* ^[SI 1997 No.1713], etc.;
- competence of personnel, BCGA [GN 23](#), *Gas safety. Information, instruction and training*.
- transportation, refer to BCGA [GN 27](#), *Guidance for the carriage of gas cylinders on vehicles*;
- separation distances, refer to BCGA [GN 41](#), *Separation distances in the gases industry*;
- fire, [Leaflet 6](#), *Cylinders in fires*, and BCGA [GN 13](#), *DSEAR risk assessment guidance for compressed gases*.

For more information:

UK Legislation

Health and Safety Executive (HSE)

British Compressed Gases Association (BCGA)

www.legislation.gov.uk

www.hse.gov.uk

www.bcga.co.uk

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