



**GUIDANCE NOTE 33**

**THE SAFE USE OF GASES  
FOR LEISURE AND CATERING**

**2021**

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**British Compressed Gases Association**

## **GUIDANCE NOTE 33**

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## PREFACE

The British Compressed Gases Association (BCGA) was established in 1971, formed out of the British Acetylene Association, which existed since 1901. BCGA members include gas producers, suppliers of gas handling equipment and users operating in the compressed gas field.

The main objectives of the Association are to further technology, to promote safe practice and to prioritise environmental protection in the supply, use, storage, transportation and handling of industrial, food and medical gases, and we produce a host of publications to this end. BCGA also provides advice and makes representations on behalf of its Members to regulatory bodies, including the UK Government.

Policy is determined by a Council elected from Member Companies, with detailed technical studies being undertaken by a Technical Committee and its specialist Sub-Committees appointed for this purpose.

BCGA makes strenuous efforts to ensure the accuracy and current relevance of its publications, which are intended for use by technically competent persons. However, this does not remove the need for technical and managerial judgement in practical situations. Nor do they confer any immunity or exemption from relevant legal requirements, including by-laws.

For the assistance of users, references are given, either in the text or Appendices, to publications such as British, European and International Standards and Codes of Practice, and current legislation that may be applicable but no representation or warranty can be given that these references are complete or current.

BCGA publications are reviewed, and revised if necessary, at five-yearly intervals, or sooner where the need is recognised. Readers are advised to check the Association's website to ensure that the copy in their possession is the current version.

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\* Throughout this publication the numbers in [ ] brackets refer to references in Section 16. Documents referenced are the edition current at the time of publication, unless otherwise stated.

## TERMINOLOGY AND DEFINITIONS

Competence	Competence is, alongside other factors, the combination of training, skills, experience and knowledge that a person has and their ability to apply them to perform a task safely. The employer is solely responsible for determining when an employee is competent. BCGA provide guidance on competence in Guidance Note 23 <sup>[30]</sup> , <i>Gas safety. Information, instruction and training.</i>
Confined space	<p>Any place, including room, chamber, tank, vat, silo, pit, trench, pipe, sewer, flue, well, or other similar space in which, by virtue of its enclosed nature, there arises a reasonably foreseeable specified risk.</p> <p>It has two defining features:</p> <ol style="list-style-type: none"><li>1. It is a place which is substantially, (though not always entirely) enclosed.</li><li>2. There will be a reasonably foreseeable risk of serious injury from; flammable or toxic atmosphere, oxygen deficient or enriched oxygen atmosphere.</li></ol> <p>(as defined in the <i>Confined Spaces Regulations</i> <sup>[31]</sup>)</p>
Cryogen	A very low temperature gaseous, liquid or solid substance. For the purposes of this document this refers to substances at a temperature below -50 °C.
Food gas	<p>Gases intended to be used as an ingredient, processing aid or as a food additive.</p> <p>Examples are gases used as food additives (packaging gases, propellants), processing aids (nitrogen for freezing) and gases used as ingredients (carbonation, hydrogenation of vegetable oils).</p>
Gas cylinder	A transportable pressure receptacle of a water capacity not exceeding 150 litres.
May	Indicates an option available to the user of this Guidance Note.
Shall	Indicates a mandatory requirement for compliance with this Guidance Note and may also indicate a mandatory requirement within UK law.
Should	Indicates a preferred requirement but is not mandatory for compliance with this Guidance Note.
User	The party who has management control of an activity in which gas (including its container(s) and ancillary equipment) is used, stored, handled or transported. This includes the management control of situations where a third-party receptor (for example, a neighbour, member of the public, etc.) is present or sufficiently close by that the receptor could affect or be affected by the activity.

# GUIDANCE NOTE 33

## THE SAFE USE OF GASES FOR LEISURE AND CATERING

### 1. INTRODUCTION

There are many uses for gases in the leisure and catering industries. Gases, for example, can assist with cooking, transform cocktails, create spectacular effects or be used to assist with recovery after exercise and / or injury. Provided gases, their containers and ancillary equipment are stored, handled and used responsibly and competently, they are a valuable resource and are safe to use.

Users of industrial and food gases, their containers and ancillary equipment, have a duty of care to all those who may be affected by their activities. Users shall ensure that they understand the hazards associated with the specific gases being used and take all necessary safety measures to control all risks.

Gas Suppliers have a responsibility for their products and should have in place product stewardship arrangements. This will assist the User (including down-stream Users) to use products supplied to them in a safe and responsible manner.

All parties should ensure they have adequate insurance to cover their activities and that they use their gases and look after their gas cylinders and associated equipment in a safe and responsible way.

This code of practice is intended for use in conjunction with current guidance and information produced by the *Health and Safety Executive* (HSE) and other related bodies and Trade Associations.

### 2. SCOPE

This document covers the use of industrial and food gases when used for leisure and / or catering purposes. It provides advice on safe and appropriate storage, handling, use, gas quality as well as appropriate ancillary equipment and conditions.

Whilst there are many applications for which the general requirements of this Guidance Note will apply, there are several applications which are covered in more detail, such as:

- cryo-cookery (liquid nitrogen, carbon dioxide), refer to Appendix 1;
- drinks, where gases are used for cooling, fogging and conditioning (carbon dioxide, liquid air gases), refer to Appendix 2;
- cryo-treatment (liquid air gases), refer to Appendix 3;
- welding, cutting and allied processes (fuel gases, oxygen, argon), refer to Appendix 4;

- theatrical and local atmospheric effects (liquid air gases, carbon dioxide), refer to Appendix 5;
- swimming pools, for effects such as fogging (carbon dioxide, liquid nitrogen), refer to Appendix 6;
- balloon filling (helium based mixtures), refer to Appendix 7.

Excluded from the scope of this Guidance Note are:

- liquefied petroleum gas (LPG) cylinders and cartridges, refer to documents provide by *Liquid Gas UK*;
- compressed air, including charging arrangements for air devices charged by an individual, for example, paintball, diving accessories, etc. refer to documents, for example, provided by the *British Compressed Air Society (BCAS)*;

NOTE: For paintball, and similar applications, other compressed gases could theoretically be used (other than compressed air). This is discouraged as these other gases introduce additional hazards.

- aerosols, refer to documents provided by the *British Aerosol Manufacturers' Association (BAMA)*;
- the supply and use of self-contained breathing apparatus (SCBA) or self-contained underwater breathing apparatus (SCUBA), whether for professional diving or leisure applications;
- the supply of food grade gases (in gaseous form) for beverage dispense, refer to BCGA GN 30 <sup>[32]</sup>, *The safe use of gases in the beverage dispense industry*;
- medical gases and medical gas concentrations where they are administered under medical supervision.

### **3. SIGNIFICANT HAZARDS**

Each gas will have its own particular set of hazards based on its physical and chemical properties.

Before an activity commences a safe working procedure shall be developed by the User based on the equipment manufacturer's instructions for use, the gas product label and safety data sheet, and any gas equipment instructions used, including compliance with relevant legislation and industry documents. The safe working procedure shall specify: the correct product for use, including its pressure, quality, valve connection, the sequence of events, appropriate safety controls, etc.

The person conducting the activity shall be competent to do so and follow the safe working procedure, including all necessary safety checks, refer to Section 12.

For detailed information on managing gases in the workplace refer to BCGA Guidance Note 11 <sup>[27]</sup>, *The management of risk when using gases in enclosed workplaces*.

Examples of the significant gas hazards include:

- asphyxiation, death due to a lack of oxygen;
- toxicity, toxic effects due to the chemical nature of the gas and / or due to oxygen deprivation;
- ingestion of a cryogen, with resulting damage to internal organs;
- extreme cold, causing injuries from being in proximity to cold, for example, frostbite, hypothermia, etc.;
- flammability, with an increased risk of fire;
- equipment failure, for example, from over pressure or due to cold embrittlement;
- pressure hazard. Even low pressures can be hazardous, and some gases are provided at high pressures, for example at 300 bar;
- poor visibility, leading to disorientation, slips, trips and falls.

To minimise hazards from the container(s) and their gases, Users shall ensure:

- a suitable and sufficient risk assessment takes place for use of the relevant items, for example, the proposed activities, nearby activities, use, storage and handling of gases their containers, ancillary equipment and other associated equipment, etc., refer to Section 4;
- adequate and suitably secured storage. Refer to Section 6;
- they provide suitable information, instruction and training, refer to Section 12;
- safe handling of the cylinders, other portable containers, accessories and other equipment. Refer to Section 8;
- safe and compliant transport of cylinders and other portable containers in accordance with legislation and good practice. Refer to Section 9;
- correctly designed and installed pressure (or non-pressure) system(s) to distribute a gas, including a liquefied gas, refer to BCGA CP 4 <sup>[17]</sup>, *Gas supply and distribution systems (excluding acetylene)*. In-service, pressure systems shall be maintained in accordance with BCGA CP 39 <sup>[22]</sup>, *In-service requirements of pressure equipment (gas storage and gas distribution systems)*;
- suitable accessories, equipment and surroundings;

- competence of personnel, including in line with suitable operating procedures.

#### 4. RISK ASSESSMENT

Gases are hazardous. Their storage, handling and use is subject to appropriate risk assessment, as required by *The Management of Health and Safety at Work Regulations* <sup>[5]</sup>. The User shall ensure that a suitable and sufficient risk assessment is carried out, including specific risk assessments, for example, to comply with *The Dangerous Substances and Explosive Atmospheres Regulations* (DSEAR) <sup>[8]</sup>, refer to BCGA GN 13 <sup>[28]</sup>, *DSEAR Risk assessment guidance for compressed gases*. Before any activities are carried out suitable and sufficient controls shall be fully implemented.

Information on risk assessment can be obtained from the HSE, who provide a wide range of guidance on carrying out risk assessments on their website: [www.hse.gov.uk/risk](http://www.hse.gov.uk/risk)

Where there are enclosed spaces, specific guidance on risk assessment is available in BCGA GN 11 <sup>[27]</sup>. This applies, whether or not the affected area is strictly a workplace or any other (for example, non-workplace) leisure-type environment.

Refer also to HSE Entertainment Information Sheet No 17 <sup>[14]</sup>, *Stunts, fights and other potentially hazardous production activities*.

For all activities involving gases, the risk assessment shall consider:

- the availability, applicability and application of relevant information, for example, safety data sheets. Health effects can occur where people are exposed to gases. The *Control of Substances Hazardous to Health* (COSHH) Regulations <sup>[7]</sup> require that the risk of exposure to any hazardous substance is managed and an appropriate COSHH Assessment is carried out;
- the location of storage areas and areas where gases are in-use. Gases and their containers shall be located in an appropriate place and secured against falling, theft, impact damage, sources of ignition, other hazardous substances and any other foreseeable risks. Refer to Section 6;
- requirements for manual handling, refer to Section 8;
- whether there is adequate ventilation, if there is a requirement for local exhaust ventilation and atmospheric monitoring equipment (such as gas detection), refer to BCGA GN 11 <sup>[27]</sup>;
- the requirement for personal protective equipment, refer to Section 11;
- standard operating procedures (SOP);
- emergency scenarios and emergency operating procedures including the provision of required emergency equipment, for example, first aid provisions. Refer to Section 13;

- personnel competence requirements, including equipment familiarisation, SOP's, Emergency procedures, supervision, etc. Competence assurance methods will vary on a case-by-case basis, but particular attention shall be paid to ensuring necessary information and instruction is reliably communicated to all who require it. Refer to Section 12;

An additional assessment will be required if using gases in the presence of or in close proximity to third parties, for example, customers, spectators, members of the public, vulnerable persons, mixed audiences, etc. Users shall ensure that:

- there is an adequate separation distance between hazards and third parties, and that the separation distance is maintained throughout, along with other relevant controls;
- sufficient numbers of competent personnel are present to ensure that everyone remains safe (for example, to provide supervision, to satisfy emergency requirements, to manage supervise or marshal third parties, etc.);
- all hazards from the gas and process have been fully mitigated if these hazards could affect a third party, for example, a drink containing vaporising cryogen is at a suitable temperature for dispense and human ingestion.

## **5. LONE WORKING**

If lone working can foreseeably take place, Users shall carefully manage this and ensure all aspects of lone working are appropriately risk assessed. Establishing a healthy and safe working environment for lone workers can be different from organising the health and safety of others. Risks associated with gases will have specific implications for lone and remote workers, for example, due to oxygen deficiency hazards, possible leakage, manual handling, etc.

The law requires employers to think about and deal with any health and safety risks before people are set to work.

Considerations to help ensure lone worker risks are managed include:

- assessing areas of risk, manual handling, vulnerability and the medical suitability of the individual(s) to work alone and whether the workplace itself presents a risk to them;
- competence requirements, levels of experience, training and supervision and how best to monitor and support workers;
- emergency requirements and the possible use of alarm systems;
- general communication requirements and systems, such as staying in touch, two-way communication methods, etc.

For further information, refer to HSE INDG 73 <sup>[12]</sup>, *Working alone. Health and safety guidance on the risks of lone working*.

## 6. STORAGE

All gases are classified as dangerous substances, as such they shall be stored in safe and secure stores. Refer to the following Codes of Practice for storage requirements.

For the storage of gas cylinders, refer to BCGA CP 44 <sup>[24]</sup>, *The storage of gas cylinders*.

For the storage of liquefied or cryogenic liquid refer to:

- BCGA CP 26 <sup>[19]</sup>, *Bulk liquid carbon dioxide storage at users' premises*.
- BCGA CP 30 <sup>[20]</sup>, *The safe use of liquid nitrogen dewars*.
- BCGA CP 36 <sup>[21]</sup>, *Cryogenic liquid storage at users' premises*.
- BCGA CP 46 <sup>[25]</sup>, *The storage of cryogenic flammable liquids*.

## 7. TRANSFER BETWEEN CONTAINERS

The filling of pressurised gas cylinders, or the transfer of gas between cylinders, shall only be carried out at specially equipped centres, with qualified staff using appropriate procedures, refer to BCGA CP 43 <sup>[23]</sup>, *The safe filling of gas cylinders*, and BCGA TIS 13 <sup>[34]</sup>, *Gas cylinders. Decanting gases*.

The transfer of cryogens shall only be carried out by competent personnel using appropriate procedures, refer to BCGA CP 30 <sup>[20]</sup>.

## 8. MANUAL HANDLING

Refer to BCGA GN 3 <sup>[26]</sup>, *Safe cylinder handling and the application of the manual handling operations regulations to gas cylinders*, for all aspects of moving gas containers. BCGA GN 3 <sup>[26]</sup> provides guidance on alternatives to manual handling.

BCGA CP 30 <sup>[20]</sup>, provides information on handling cryogenic liquid vessels.

Manual handling shall be avoided where safer options can be reasonably deployed.

Manual handling covers a wide variety of tasks including lifting, lowering, pushing, pulling and carrying. Gas cylinders, containers and ancillary equipment can be awkward objects to handle safely as they vary in weight, size and shape. Employers have a legal obligation under the *Manual Handling Operations Regulations* <sup>[2]</sup> to make a suitable and sufficient assessment of the risks from the manual handling of loads.

Users shall ensure that no person shall attempt to manually handle (gases, containers, or indeed anything else) unless the person(s) is competent to do so and has appropriate controls in place.

## **9. TRANSPORTING GASES**

Gases are classified as Class 2 dangerous goods. As such, anyone transporting gas containers on the public highway shall comply with the *Carriage of Dangerous Goods and the Use of Transportable Equipment Regulations* <sup>[9]</sup>. These regulations implement the *Agreement Concerning the International Carriage of Dangerous Goods by Road* (ADR) <sup>[10]</sup>, which provides a framework for dangerous goods carriage through compliance with standards for packaging and labelling, and appropriate construction and operating standards for the vehicles and crew.

Where only small quantities of gas containers are being carried, refer to BCGA GN 27 <sup>[31]</sup>, *Guidance for the carriage of gas cylinders on vehicles*.

The driver of the vehicle is legally responsible for the safety of the vehicle and any load being carried. The driver shall ensure that the insurance cover for the vehicle includes cover for the carriage of dangerous goods, in a business or other relevant context.

## **10. RETURN AND DISPOSAL OF CYLINDERS, CONTAINERS AND EQUIPMENT**

The vast majority of gas cylinders in circulation remain the property of the Gas Suppliers. They are supplied to gas Users under a rental or deposit agreements. When such a gas cylinder is empty, or is no longer required, then the simplest and best way to return it is to identify the owner and either return it to the retail outlet from where it was obtained or request that it is collected. Even if the cylinders were not originally supplied to the premises where they are discovered or present, the owner will make arrangements to collect them.

The details of the cylinder or equipment owner will be marked on the item, for example, on the cylinder contents label, they may also be stamped onto the item.

Before undertaking any disposal action, determine who is the legitimate owner.

Where you are the owner of a cylinder or equipment, then take safe and appropriate disposal action in accordance with the manufacturer's instructions. If assistance is required there are several [BCGA member companies](#) who provide services for the recovery and disposal of gas cylinders.

Specialist disposal may be required for certain items, for example, dissolved acetylene cylinders and old vaporiser spacers both of which may have asbestos components, etc. Refer to the original equipment manufacturer for their specialist advice.

Detailed advice on the recovery and disposal of cylinders is available on the BCGA website under '[Cylinder Recovery and Disposal](#)'.

## 11. PERSONAL PROTECTIVE EQUIPMENT

A work activity risk assessment shall determine the requirement for the use of hazard controls, including, where necessary, for personal protective equipment (PPE).

Only after all other levels of control have been determined to be ineffective in controlling risks to a reasonably practicable level, should PPE be considered as a control.

Even with PPE, if the risk is not reduced to as low a level as is reasonably practicable, then the activity should not proceed.

HSE L25 <sup>[11]</sup>, *Personal Protective Equipment at Work*, provides guidance on the *Personal Protective Equipment Regulations* <sup>[6]</sup>. *European Industrial Gases Association (EIGA) 136* <sup>[16]</sup>, *Selection of personal protective equipment*, provides guidance for selecting and using PPE at work.

Where PPE is required, a PPE assessment shall be carried out in accordance with the *Personal Protective Equipment Regulations* <sup>[6]</sup>. This shall be carried out by competent persons.

The selection of PPE shall be appropriate for the hazard, task, location and individuals.

PPE shall be provided by the employer, along with the necessary information, instruction, training and supervision for its use. The employer shall ensure that employees wear any PPE required.

Cleaning and maintenance (including its replacement) shall be included in the PPE management system. Suitable storage shall be provided for PPE when it is not in use.

The effectiveness of the PPE shall be reviewed periodically.

Emergency situations may require different or additional PPE.

Users shall take into account the requirements of other applicable Regulations, such as the *Control of Substances Hazardous to Health (COSHH) Regulations* <sup>[7]</sup>, in relation to assessing risks, along with any relevant equipment publications, manufacturers information and the product(s) safety data sheet.

NOTE: Any equipment that has a personal protective function is classified as PPE, for example, a personal atmospheric monitor.

## 12. INFORMATION, INSTRUCTION AND TRAINING

The User shall ensure that all personnel are competent to fulfil all aspects of their role.

General recommendations for the competence of personnel are described in BCGA GN 23 <sup>[30]</sup>, *Gas safety. Information, instruction and training*. The employer is solely responsible for determining when an employee is competent.

All persons who will use, handle or be in proximity to gases and gases equipment shall receive suitable information, instruction and training. The employer shall provide an appropriate level of supervision.

### **13. EMERGENCY PLANNING**

Before bringing the hazardous substance(s) to site and commencing any activity, the User shall ascertain the emergency situations which could arise. For each Emergency situation or scenario, the User shall develop and deploy suitable arrangements, for example, an Emergency Operating Procedure, noting that the deployment is likely to require the briefing of relevant persons.

In addition to the many other possible events, gas specific emergency situations might include;

- the creation of a compromised atmosphere, for example, through use, leakage, spillage, etc.;
- catastrophic failure and pressure release;
- an incident within a confined space;
- injury, for example, cold burns, gas injection of the skin, pressure blast, etc.;
- emergencies, prompted or caused by external events, changes and / or by the activities or omissions of others.

### **14. APPLICATIONS**

Whilst there are many applications for which the general requirements of this Guidance Note will apply, several applications are covered in more detail within the appendices:

- cryo-cookery (typically liquid nitrogen), refer to Appendix 1;
- drinks, where gases are used for cooling, fogging and conditioning (typically carbon dioxide, liquid air gases), refer to Appendix 2;
- cryo-treatment (typically liquid air gases), refer to Appendix 3;
- welding, cutting and allied processes, refer to Appendix 4;
- theatrical and local atmospheric effects (typically carbon dioxide, liquid air gases), refer to Appendix 5;
- swimming pools, for effects such as fogging (typically, carbon dioxide, liquid nitrogen), refer to Appendix 6;

- balloon filling (typically helium based mixtures), refer to **Appendix 7**.

## 15. SECURITY

Gases are hazardous substances. The storage and use of all gases shall be controlled, with access allowed only to persons authorised by the User.

Advice on security can be obtained from Gas Suppliers and from BCGA.

## 16. REFERENCES

Document Number	Title
1.	The Health and Safety at Work etc. Act 1974.
2. SI 1992 No. 2793	The Manual Handling Operations Regulations 1992 (as amended).
3. SI 1997 No. 1713	The Confined Spaces Regulations 1997.
4. SI 1998 No. 2306	Provision and Use of Work Equipment Regulations 1998 (PUWER)
5. SI 1999 No. 3242	The Management of Health and Safety at Work Regulations 1999.
6. SI 2002 No. 1144	Personal Protective Equipment Regulations 2002.
7. SI 2002 No. 2677	Control of Substances Hazardous to Health Regulations 2002 (COSHH).
8. SI 2002 No. 2776	The Dangerous Substances and Explosive Atmospheres Regulations 2002 (DSEAR).
9. SI 2009 No. 1348	The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (as amended).
10. ECE/TRANS/300	Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR) (as amended).
11. HSE L25	Personal Protective Equipment at Work.
12. HSE INDG 73	Working alone. Health and safety guidance on the risks of lone working.
13. HSE Entertainment Information Sheet 3	Smoke and vapour effects used in entertainment.

<b>Document Number</b>	<b>Title</b>
14. HSE Entertainment Information Sheet 17	Stunts, fights and other potentially hazardous production activities.
15. EIGA 23	Safety training of employees.
16. EIGA 136	Selection of personal protective equipment.
17. BCGA Code of Practice 4	Gas supply and distribution systems (excluding acetylene).
18. BCGA Code of Practice 7	The safe use of oxy-fuel gas equipment (individual portable or mobile cylinder supply).
19. BCGA Code of Practice 26	Bulk liquid carbon dioxide storage at users' premises.
20. BCGA Code of Practice 30	The safe use of liquid nitrogen dewars.
21. BCGA Code of Practice 36	Cryogenic liquid storage at users' premises.
22. BCGA Code of Practice 39	In-service requirements of pressure equipment (gas storage and gas distribution systems).
23. BCGA Code of Practice 43	The safe filling of gas cylinders.
24. BCGA Code of Practice 44	The storage of gas cylinders.
25. BCGA Code of Practice 46	The storage of cryogenic flammable liquids.
26. BCGA Guidance Note 3	Safe cylinder handling and the application of the manual handling operations regulations to gas cylinders.
27. BCGA Guidance Note 11	The management of risk when using gases in enclosed workplaces.
28. BCGA Guidance Note 13	DSEAR Risk assessment guidance for compressed gases.
29. BCGA Guidance Note 14	Production, storage, transport and supply of gases for use in food.
30. BCGA Guidance Note 23	Gas safety. Information, instruction and training.

<b>Document Number</b>	<b>Title</b>
31. BCGA Guidance Note 27	Guidance for the carriage of gas cylinders on vehicles.
32. BCGA Guidance Note 30	The safe use of gases in the beverage dispense industry.
33. BCGA Technical Information Sheet 7	Guidelines for the safe transportation, storage, use and disposal of solid carbon dioxide (dry ice).
34. BCGA Technical Information Sheet 13	Gas cylinders. Decanting gases.
35. BCGA Leaflet 7	The dangers of misusing gases.

Further information can be obtained from:

UK Legislation	<a href="http://www.legislation.gov.uk">www.legislation.gov.uk</a>
Health and Safety Executive (HSE)	<a href="http://www.hse.gov.uk">www.hse.gov.uk</a>
European Industrial Gases Association (EIGA)	<a href="http://www.eiga.eu">www.eiga.eu</a>
Liquid Gas UK	<a href="http://www.liquidgasuk.org">www.liquidgasuk.org</a>
British Compressed Gases Association (BCGA)	<a href="http://www.bcgaco.uk">www.bcgaco.uk</a>
British Compressed Air Society (BCAS)	<a href="http://www.bcas.org.uk">www.bcas.org.uk</a>
British Aerosol Manufacturers' Association (BAMA)	<a href="http://www.bama.co.uk">www.bama.co.uk</a>
Medicines and Healthcare products Regulatory Agency (MHRA)	<a href="http://www.mhra.gov.uk">www.mhra.gov.uk</a>

## CRYO-COOKERY

When preparing food, the use of a cryogen (a very low temperature gaseous, liquid or solid substance) is a hazardous activity.

**WARNING:** The use of a cryogen has potential to cause severe cold burns, both internally and externally, as well as damage to internal organs if ingested.

The User shall ensure that a cryogen cannot be ingested under any circumstances.

Cooking with cryogenics makes use of the physical and chemical processes that occur while processing foods at very low temperatures. When food preparation is done at cryogenic temperatures it is often referred to as molecular gastronomy, cryogenic or cryo-cookery.

Cryogenic cookery may involve nitrogen (N<sub>2</sub>) which as a liquid is at -196 °C, but other gases such as carbon dioxide (CO<sub>2</sub>) are also used. Solid CO<sub>2</sub> (also known as dry ice) has a temperature of -78 °C.

The use of cryogenics can be visually spectacular and may be used as part of an entertainment provided at restaurants, exhibitions, trade fairs and other related events.

Users will be required to meet Gas Suppliers product stewardship requirements for the safe use of the product(s) they supply. This may include:

- safe and secure storage;
- safe workplace(s);
- the safe transportation and movement of the cryogen, including manual handling;
- equipment, which is designed and rated for use with cryogenics at cryogenic temperatures;
- maintaining the quality and condition of the cryogen, including its pressure. For use with food, a food grade cryogen is required. The quality of the cryogen needs to be assured from initial receipt, through storage to end use;
- competence and safety of all persons involved in or who could be affected by the activity;
- appropriate consideration of emergency procedures;
- conducting a risk assessment and putting in place safe operating procedure(s).

**NOTE:** The Gas Supplier will require evidence that the User has safe systems in place to manage the cryogen, a written version of the risk assessment / safe operating procedure may be sufficient.

There are particular circumstances where additional safety measures are required which shall require further specific risk assessment. This will include:

- activities with cryogenics conducted in front of or in close proximity to third parties, such as audiences;
- activities where food is consumed. At the point of consumption of any food or drink cooked with, or in close proximity to, a cryogen, the food shall be safe to consume.

The presence and use of cryogenics shall be incorporated into the overall safety management arrangements on each site. When carrying out the risk assessment and putting in place safe operating procedure(s), take into consideration:

- how the presence of cryogenics is integrated with other relevant requirements (some of which may already exist, although these may require review), for example, COSHH Regulations<sup>[7]</sup>, the *Provision and Use of Work Equipment Regulations* (PUWER)<sup>[4]</sup>, fire safety, emergency procedures, first aid, etc.;

Where the cryogen is an asphyxiant, the risk assessment shall ascertain the suitability of the available ventilation and the requirement for atmosphere monitoring equipment (gas detectors), refer to BCGA GN 11<sup>[27]</sup>;

- compliance with relevant food safety regulations and food hygiene requirements where cryogenics come into contact with foods (including those used within food preparation). For information on food gases refer to BCGA GN 14<sup>[29]</sup>, *Production, storage, transport and supply of gases for use in food*;
- the arrangements and facilities for the delivery of the cryogen. This should be to a dedicated area, with suitable access for the gas delivery vehicle, with space to safely off-load, be off the public highway, have adequate ventilation, etc.;
- the storage arrangements for the cryogen. The store shall be secure, with controlled access, adequate ventilation, identified by appropriate safety signs and warning notices and meet the requirements for containing both a hazardous substance and a food;
- the provision of suitable equipment. Equipment used for conveying, or near, cryogenic liquids (and some cold gases) shall be designed and rated for use with cryogenics at cryogenic temperatures. The manufacturer's specifications and ratings shall be verified as suitable for the temperatures (and other parameters) required.

NOTE: Some materials become brittle when very cold, which may shatter on contact.

All vessels containing cryogenic liquid shall either be open to the atmosphere (freely and safely vented) or be appropriately engineered, rated and equipped with suitable pressure relief devices. Similar advice applies to vessels used for cold gases or for other substances which might generate pressure in specific circumstances.

NOTE: As a cryogenic liquid evaporates it will release a large quantity of gas by volume (for example, 1 litre of liquid nitrogen will vaporise into approximately 700 litres of gas). In an enclosed area or vessel this may rapidly increase the internal pressure.

Before use, all equipment for cryogenic service shall be:

- free from contaminants, such as oils and greases;
- completely dry, with no moisture.
- competent persons. The skill sets of food preparation experts and those who serve the food to consumers are completely different to those required by cryogenic gas technicians. Technical health and safety expertise is often lacking. The hazards of the activity are often under-estimated. The importance of risk assessment and hazard management is often ignored;
- the use of cryogenics. Cryogen food preparation areas should be well away from any sources of heat, for example, stoves and naked flames. A source of heat will increase the rate of evaporation and may lead to a sudden build-up of pressure or a release of an asphyxiant gas.

The work area shall be clear of other items which may impede handling;

- the protection of persons not involved, and / or those nearby;
- the disposal of excess or spent cryogen. Cryogenics shall never be poured down a sink or a drain. The disposal process shall allow the cryogen to vaporise harmlessly, outdoors, in a well ventilated area.

For the use of liquid nitrogen in dewars, refer to BCGA CP 30 <sup>[20]</sup>.

For the use of solid CO<sub>2</sub>, refer to BCGA TIS 7 <sup>[33]</sup>, *Guidelines for the safe transportation, storage, use and disposal of solid carbon dioxide (dry ice)*.

## **DRINKS – COOLING, FOGGING AND CONDITIONING**

A cryogen (a very low temperature gaseous, liquid or solid substance) used for the preparation of drinks is a hazardous activity.

**WARNING:** The use of a cryogen has potential to cause severe cold burns, both internally and externally, as well as damage to internal organs if ingested.

The User shall ensure that a cryogen cannot be ingested under any circumstances.

There is a hazard to those handling the cryogen, those nearby and the drinks consumer. Before a cryogen is introduced into the workplace appropriate risk assessment shall be carried out to ensure the necessary activities in their entirety can be completed safely. This includes delivery, storage, handling and use of the cryogen. Refer to the advice in Appendix 1 (cryo-cookery).

All cryogenes which may come into contact with drinks (including those used within drink preparation) shall comply with the relevant food safety regulations and food hygiene requirements. For information on food gases refer to BCGA GN 14 <sup>[29]</sup>.

Glass-chill applications (conditioning) are only acceptable where they are proven to be intrinsically safe by design.

All glassware (or equivalent receptacle material) used with a cryogen or in a glass chill application shall be suitable for the service temperature and pressure conditions. As an example, glassware shall be certified by the manufacturer for the service temperature.

Only authorised persons shall have access to a cryogen.

Advice on cryogenic liquids, refer to BCGA CP 30 <sup>[20]</sup>.

Advice on gases used in beverage dispense is available in BCGA GN 30 <sup>[32]</sup>.

For the use of solid CO<sub>2</sub>, refer to BCGA TIS 7 <sup>[33]</sup>.

## CRYOGENIC TREATMENT

Medical or veterinary cryogenic treatment, as recognised by BCGA, is that which is carried out:

- under the supervision of a registered practitioner;
- using a cryogen suitably certified for a medical application, typically liquid nitrogen;
- in compliance with the appropriate medical best practice.

The principle hazards associated with cryogenic treatment are the extreme cold and the release of an asphyxiant gas.

Where a cryogen is used for medical or veterinary purposes then it shall meet any specific requirements for good manufacturing practice (GMP) and good distribution practice (GDP) as mandated by the *Medicines and Healthcare products Regulatory Agency* (MHRA).

Where a cryogen is intended to be used for non-medical treatments, Users will be required to meet Gas Suppliers product stewardship requirements for the safe use of the product(s) they supply. This may include:

- confirmation by the User that the cryogen is not for medical use;
- safe and secure storage;
- safe workplace(s);
- the safe transportation and movement of the cryogen, including manual handling;
- equipment which is designed and rated for use with cryogenics at cryogenic temperatures;
- maintaining the quality and condition of the cryogen, including its pressure. The quality of the cryogen needs to be assured from initial receipt, through storage to end use;
- the competence and safety of all persons involved in or who could be affected by the activity;
- appropriate consideration of emergency procedures;
- conducting a risk assessment and putting in place safe operating procedure(s). A written version of this may provide sufficient evidence to the Gas Supplier for safe use of the cryogen.

- health screening of potential recipients prior to the exposure.

Chambers used for body therapy shall be indirectly cooled through the use of heat exchangers to chill the air in which a person is placed. This protects the person from asphyxia and contact with the cryogen.

The presence and use of cryogens shall be incorporated into the overall safety management arrangements on each site. When carrying out the risk assessment and putting in place safe operating procedure(s), take into consideration:

- how the presence of cryogens is integrated with other relevant requirements (some of which may already exist, although these may require review), for example, COSHH Regulations<sup>[7]</sup>, the *Provision and Use of Work Equipment Regulations* (PUWER)<sup>[4]</sup>, fire safety, emergency procedures, first aid, etc.;
- the suitability of the available ventilation and the requirement for atmosphere monitoring equipment (gas detectors), refer to BCGA GN 11<sup>[27]</sup>;
- the arrangements and facilities for the delivery of the cryogen. This should be to a dedicated area with suitable access for the gas delivery vehicle and space to safely off-load, be off the public highway, have adequate ventilation, etc.;
- the storage arrangements for the cryogen. The store shall be secure, with controlled access, adequate ventilation, identified by appropriate safety signs and warning notices and meet the requirements for containing a hazardous substance;
- the provision of suitable equipment. Equipment used for storing, conveying, or near, cryogenic liquids (and some cold gases) shall be suitable for the extremely cold temperatures in accordance with the manufacturer's specifications and ratings. These shall be verified as suitable for the temperatures (and other parameters) required;

#### NOTES:

1. Some materials become brittle when very cold, which may shatter on contact. Controls will be needed to ensure that this does not happen.
  2. As a cryogenic liquid evaporates it will release a large quantity of gas by volume (for example, 1 litre of liquid nitrogen will vaporise into approximately 700 litres of gas). In an enclosed area or vessel this may rapidly increase the internal pressure, which may exceed safe limits.
- the cleanliness of cryogenic equipment. Equipment shall be:
    - free from contaminants, such as oils and greases;
    - completely dry, with no moisture

### **APPENDIX 3**

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- the location of the equipment. It shall be located well away from any sources of heat, for example, naked flames, heaters and radiators. A source of heat will increase the rate of evaporation and may lead to a sudden build-up of pressure or a release of an asphyxiant gas. The work area shall be clear of other items which may impede handling;
- the protection of persons not involved, and / or those nearby;
- the disposal of excess or spent cryogen. Cryogens shall never be poured down a sink or a drain. The disposal process shall allow the cryogen to vaporise harmlessly, outdoors, in a well ventilated area.

## **WELDING, CUTTING AND ALLIED PROCESSES**

Where gases are used for welding, cutting and allied processes, refer to BCGA CP 7 <sup>[18]</sup>, *The safe use of oxy-fuel gas equipment (individual portable or mobile cylinder supply)*.

Regardless of the status of the User, whether at work, a hobbyist, amateur or otherwise, the BCGA advice is that the User shall operate fully in line with the *Health and Safety at Work etc. Act* <sup>[1]</sup>.

## THEATRICAL AND LOCAL ATMOSPHERE EFFECTS

There are a variety of different methods of producing theatrical fogging effects, some of which incorporate gases. The gases used include liquid carbon dioxide, solid carbon dioxide (dry ice) and liquid nitrogen.

**WARNING:** Introducing gases into any enclosed area is a hazardous activity. This is due to the dangers from asphyxiation (lack of oxygen) and reduction in visibility, leading to an increased risk of slips, trips and falls.

Before a gas is introduced into the workplace appropriate risk assessment shall be carried out to ensure the necessary activities in their entirety can be completed safely. The risk assessment shall take account of:

- the type of gas(es) and their properties;
- the cold effects of the gas(es) and fogging;
- the nature of the fogging activity, such as release quantity, frequency and location;
- the nature of the enclosed area, such as size, ventilation;
- specific low lying areas, for example, under stage technical areas, orchestra pits, access to changing areas, etc.;
- the numbers of persons present;
- the presence of vulnerable persons.

The use of these gases in enclosed spaces is subject to (and, unless carefully managed, may breach) the *Confined Space Regulations* [3]. Where gases may come in direct contact with people there are the potential hazards of asphyxiation and cold burns.

Using gases to produce fogging effects shall only be carried out:

- once all controls identified in the risk assessment are implemented;

Where controls, such as audible alarms are used, they shall be effective, i.e. can be relied upon if used at events including loud music such as concerts, discos, etc.

- where the storage, handling, use and removal of the gases and the gas equipment can be safely and securely achieved;
- using only appropriate equipment. All equipment shall be specifically designed for the activity and used in accordance with the Manufacturer's instructions;

Refer to HSE Entertainment Information Sheet 3 <sup>[13]</sup>, *Smoke and vapour effects used in entertainment*.

Regardless of the status of the User, whether at work, a hobbyist, amateur or otherwise, the BCGA advice is that the User shall operate fully in line with the *Health and Safety at Work Act* <sup>[1]</sup>.

**SWIMMING POOLS - FOGGING**

Under no circumstances shall swimming pool fogging be attempted using a gas or cryogen.

The introduction of a cryogen or gas into a swimming pool will create a lethal atmosphere at the water surface.

## **BALLOON FILLING**

Helium (and helium enriched mixtures) are typically used for filling balloons.

Helium gas is an asphyxiant. Inhalation can be fatal, helium displaces oxygen and carbon dioxide from within the lungs.

Always fill balloons in accordance with the supplier's instructions.

This gas shall not be used for any other purpose.

Refer to BCGA Leaflet 7 <sup>[35]</sup>, *The dangers of misusing gases*.



**British Compressed Gases Association**

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