



GUIDANCE NOTE 23

**GAS SAFETY
INFORMATION INSTRUCTION AND
TRAINING**

REVISION 1: 2018

British Compressed Gases Association

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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 enhance safe practice, and to prioritise environmental protection in the supply and use 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 7. Documents referenced are the edition current at the time of publication, unless otherwise stated.

TERMINOLOGY AND DEFINITIONS

Bundle (of cylinders)	An assembly of cylinders that are fastened together and which are interconnected by a manifold and carried as a unit. The total water capacity shall not exceed 3000 litres except that bundles intended for the carriage of toxic gases of Class 2 (groups starting with letter T according to ADR (5) 2.2.2.1.3) shall be limited to 1000 litres water capacity.
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> <ul style="list-style-type: none">(i) It is a place which is substantially, (though not always entirely) enclosed.(ii) There will be a reasonably foreseeable risk of serious injury from; flammable or toxic atmosphere, oxygen deficient or enriched oxygen atmosphere.
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.
Pressure receptacle	A collective term that includes cylinders, tubes, pressure drums, closed cryogenic receptacles, metal hydride storage systems, bundles of cylinders and salvage pressure receptacles.
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.

GUIDANCE NOTE 23

GAS SAFETY - INFORMATION INSTRUCTION AND TRAINING

1. INTRODUCTION

The aim of this Guidance Note is to identify and explain the requirement for information, instruction and training for those in workplaces where industrial, food and medical gases may be present.

This Guidance Note is primarily aimed at management and supervisors of personnel who either handle, store, use or transport gases in the workplace.

The *Health and Safety at Work Act* (1) places a duty on the employer to provide “... *such information, instruction, training and supervision as is necessary to ensure, so far as is reasonably practicable, the health and safety at work of his employees*”.

Furthermore *The Management of Health and Safety at Work Regulations* (2) [Regulation 13] require that “*Every employer shall ensure that his employees are provided with adequate Health and safety training.*”

The employer is responsible for ensuring that each individual is competent to carry out each task safely and correctly. This is normally discharged through the line manager.

For additional information on the training of personnel in the gases industry refer to the European Industrial Gases Association (EIGA) Document 23 (6), *Safety training of employees*.

2. SCOPE

This document provides guidance on identifying the minimum knowledge required for the safe interaction of personnel with industrial, food and medical gases. These include scientific, calibration, special and breathing gases.

NOTE: This document only considers the specific hazards associated with gases. It does not cover general workplace health and safety hazards which should be dealt with separately through appropriate workplace risk assessment.

3. THE RELATIONSHIP BETWEEN TRAINING AND COMPETENCE

Across industry, confusion often exists between the concepts of training and competence.

The basic legal requirement is that people should be sufficiently competent at the tasks they are set, to keep themselves and others safe.

Competence in this context may refer to a wide range of attributes required in a job role, some examples being:

- Skills;
- Knowledge;
- Aptitude and attitude;
- Training;
- Education.

Specific job roles may have other competency attributes and the list is not exhaustive.

Training may provide confirmation of, or progress in, achieving **some** of the required attributes within a job role. Competence however, is when the employer is satisfied over the achievement of **all** required attributes. The employer is solely responsible for determining when an employee is competent.

Training may legitimately be one of the ways in which competence is developed. However, it is not the only way and on its own, training will rarely suffice to meet legal obligations.

The legal responsibility for ensuring that people are competent rests with the employer, represented by the line manager. This is because only the employer through the line manager has the powers to:

- Instruct employees (for example, to comply with specific site rules, company policies, company standards, etc.);
- Set individuals to work (that is, can match specific tasks to the competence of specific individuals);
- Supervise, check or audit the performance of an employee whilst performing the work to which they have been set;
- Recruit employees with (for example) suitable academic aptitude, psychological attitude, etc. suitable for the tasks;
- Motivate employees (for example, on a day-to-day basis);
- Provide peer, line management, Safety, Health, Environment and Quality (SHEQ), human resource, coaching and / or technical support;
- Develop and maintain a suitable workplace culture (for example, a safety culture).

Examples of some specific requirements within UK legislation in relation to competence include:

- *Health and Safety at Work Act (1), [Part 1, (2)(c)]* which requires employers to provide “... *such information, instruction, training and supervision as is necessary to*

ensure, so far as is reasonably practicable, the health and safety at work of his employees.”

- The *Construction (Design and Management) Regulations* (4) [Section (8) (1)]. As an example, a Designer “... *must have the skills, knowledge and experience, and, if they are an organisation, the organisational capability, necessary to fulfil the role that they are appointed to undertake, in a manner that secures the health and safety of any person affected by the project.*”
- The *Pressure Systems Safety Regulations* (3) [Section (11) (1)] requires the user of an installed system (or owner of a mobile system) to provide “... *for any person operating the system adequate and suitable instructions*”.

In summary, competence is a multifaceted concept that goes beyond just training provision alone.

The employer is responsible for ensuring that employees are competent to carry out each task safely and correctly. This responsibility is normally discharged through the line manager.

Training should be accompanied by other elements (for example, information, instruction, supervision, experience, etc.) to support the defining of competence.

The initial selection, development and on-going management of employees (and others) is crucial to maintaining and developing their competence, supported by training.

4. IDENTIFYING THE KNOWLEDGE REQUIREMENTS

The employer is responsible for identifying the information, instruction and training required by his employees. The following steps should be undertaken by a competent person acting on behalf of the employer:

- Identify the gases on-site (refer to Section 4.1);
- Identify how and where each gas may be present (refer to Section 4.2);
- Identify the activities and tasks associated with any interaction with the gases (refer to Section 4.3);
- Identify the persons who may be affected (refer to Section 4.4);
- Determine the minimum knowledge requirement (refer to Section 4.5);
- Undertake a knowledge gap analysis for individuals (refer to Section 4.6);
- Remedy the knowledge gap (refer to Section 4.7);
- Carry out a periodic review (refer to Section 4.8).

This process should be undertaken by persons with adequate knowledge and experience of the employer's management processes and of the gases in question.

4.1 Identify the gases on-site

Conduct a survey of the site to identify which gases are stored, generated, piped, used or otherwise present on-site. Guidance is available in BCGA GN 11 (9), *The management of risk when using gases in enclosed spaces*.

4.2 Identify how and where the gas may be present

Identify where the gases may be present, such as the storage containers, the pipework and in what state / phase they are, for example, liquefied, compressed, dissolved, cryogenic, etc.

Examples of stored gases include: pressurised pipework, cylinders, storage tank / vessel, bundles, tube-trailers, dewars, gas generators, etc.

4.3 Identify the activities and tasks associated with gases

Examples include: direct use of gas, maintenance operation and inspection, receipt of gases (bulk or cylinders), storage areas, handling, cylinder exchange (change-out), etc.

4.4 Identify persons who may be affected

There are three classes of persons who may be affected:

- 1) Others. Anyone who may be present or near to gases, for example, office staff or other employees or contractors walking past a store or in proximity to pipework.
- 2) Indirect. Anyone who has a low risk of exposure to gases and would not normally be exposed to gases. This includes anyone who may unintentionally come into contact with gases, for example, those who just handle gas containers, cylinder or bulk storage area personnel, cylinder delivery drivers, etc.
- 3) Direct. Anyone who has a high risk of exposure to gases. This includes anyone who makes / breaks connections (for example, gas welders, laboratory personnel, hospital porters, etc.), anyone who transfers cryogenic fluids, anyone entering a bio-store, anyone handling dry ice, etc.

4.5 Determine the minimum knowledge requirement

Refer to Appendix 1 to establish the minimum knowledge requirement for the task and each individual, refer to Section 5 for the different methods of filling the knowledge gap.

4.6 Undertake a knowledge gap analysis for individuals

Understand the current level of knowledge of each individual. This may be done using training records, dialogue, appraisals, risk assessment and incident investigations.

NOTE: Historical training may have lost its currency for a variety of reasons, for example, knowledge loss, lack of practice, changes in technology, inadequate or misdirected training, new / unfamiliar gases, etc.

Carefully consider the learning needs for each employee, for example, where an individual's primary language is not English then take into consideration their language skills and understanding.

Review and compare each individual's level of knowledge to ensure the (range of) task(s) can be carried out safely and correctly. Check in line with Section 4.5.

For additional guidance on human factors, considerations associated with training and competence refer to EIGA Safety Information Human Factors 2 (7), *Individual training and competence*.

4.7 Remedy the knowledge gap

Proactively plan and provide appropriate information, instruction and training.

Reactively check to ensure the knowledge gap has been closed.

4.8 Periodic review

Review this process (Sections 4.1 to 4.7) periodically and / or when changes have taken place.

Ensure that the provisions have met the employer and the employee(s) needs. Ensure that the employees are sufficiently competent for the full range of tasks to which they will be set.

5. METHODS OF FILLING THE KNOWLEDGE GAP

Having completed the steps outlined in Section 4 and having identified your knowledge requirements and gaps, employers should then determine how to fill the gap.

Selecting the method(s) and means of fulfilment (for example, delivery of courses, issue of information, etc.) shall be performed by a competent person(s).

The competency for the actual fulfilment may be available in-house, otherwise external assistance will be required, refer to Section 6.

Ultimately, the employer is responsible for ensuring the employee is competent and, where necessary, has received suitable information, instruction and training.

Initial competence development should, where necessary, be supported by refresher activity (for example, training, reminder information, re-instruction, etc.). This should be at suitable intervals, commensurate with the skills and knowledge required for the role and hazards of the gases and / or processes involved.

The information, instruction and training, shall cover the actions to take in an emergency and / or non-routine situations.

All competence development activity shall be supported by documented evidence confirming what has been undertaken or provided to the individual identified on the documentation.

Records shall be kept of all competence development (for example, information, instruction and training) provided and of the competence level(s) achieved.

There are several methods available for filling the competence gap.

5.1 Information

Provide relevant information. This could include substance Safety Data Sheet (SDS), Operating Manuals, Manufacturer's literature, Safety Labels, BCGA publications and other industry best practice documents, Health and Safety Executive (HSE) guidance, etc.

5.2 Instruction

Written or verbal instruction(s) from a knowledgeable and authorised person (by the employer). Usually this is a manager within your own organisation. Third-party manufacturer's instructions may also be used by employers, passed on to their employees

5.3 Training

Formal structured delivery with specific goals, aimed at increasing competence in-line with the criteria in this document. This training can be achieved via various means and methods, for example, classroom, on-the-job, computer based, interactive, academic, etc.

5.4 Supervision

Activity overseen or audited by a competent person(s) on the performance, behaviour, safety and competence of a person or team.

5.5 Coaching

A formal or informal method of improving knowledge through discussion with a competent person by focussing on a specific objective(s).

5.6 Mentoring

Formal use of experienced person to assist a relatively inexperienced individual in their career development.

5.7 Peer to peer discussion

Discussion and or demonstration with a colleague (buddy) not necessarily at a management or senior level.

6. SELECTION OF PROVIDERS

There are a number of options available for choosing a provider to assist with delivery of competence development material. In some cases in-house provision may be appropriate, alternatively training can be provided by a third party or by a mixture of the two.

Before selecting a third party provider, consider:

- What are the outcomes that you want the provider to deliver?

It is recommended that a programme is carried out under a formalised system where specific outcomes (such as an acceptable level of competency) has to be achieved;

- Does the provider have the ability and knowledge to deliver your outcomes?

Training, information provision, etc. shall reflect the best practices and procedures covered by current legislation, HSE guidance and industry information, for example, BCGA publications.

Appropriate methods, lesson plans and risk assessments to support the training should be provided.

Training shall be carried out by appropriately knowledgeable and experienced trainers.

- The geographical location(s) for the training to take place;
- Availability of employees, for example, shift workers, etc.;
- Availability of suitable training aids, including specialist equipment on which employees are being trained;
- The language skills and the mental capacity of employees. Therefore the style and technique(s) used to deliver training;
- The input of the employer during training, to ensure the training dovetails seamlessly with the overall competence assurance regime of the employer (for example, the employer's instructions to his employees may need to be referenced during a third-party training course);
- Confirmation of delivery, such as the requirement for Attendance Certificates, completion of training logs or certification in line with a recognised technical or other standard.

If in-house training is an option then consider:

- Who will deliver the training, their competency and their resource to do so;
- The use of computer based training packages.

If a third party training provider is considered then it is recommended that the course content and the outcome is discussed and agreed in detail prior to any contractual agreement.

There are several BCGA member companies who provide training and / or a range of associated services. Their details are on the BCGA website – www.bcg.co.uk – under 'Member Services'.

BCGA GN 20 (10), *Guidance for BCGA training providers*, provides guidance on the general expectations of BCGA training providers in the planning, content, delivery and evaluation of their training services and products.

7. REFERENCES

	Document Number	Title
1.		The Health and Safety at Work etc. Act 1974.
2.	SI 1999 No. 3242	The Management of Health and Safety at Work Regulations, 1999.
3.	SI 2000 No. 128	The Pressure Systems Safety Regulations 2000
4.	SI 2015 No. 51	The Construction (Design and Management) Regulations 2015
5.	ECE/TRANS/257	European Agreement concerning the international carriage of dangerous goods by road (ADR) (as amended).
6.	EIGA Document 23	Safety training of employees.
7.	EIGA Safety Information Human Factors 02	Individual training and competence
8.	BCGA Code of Practice 7	The safe use of oxy-fuel gas equipment (individual portable or mobile cylinder supply)
9.	BCGA Guidance Note 11	The management of risk when using gases in enclosed spaces.
10.	BCGA Guidance Note 20	Guidance for BCGA training providers.
11.	Leaflet 11	Safety checks for vacuum insulated cryogenic tanks.
12.	Leaflet 12	Liquid gas storage tanks. Your responsibilities.

Further information can be obtained from:

UK Legislation	www.legislation.gov.uk
Health and Safety Executive (HSE)	www.hse.gov.uk
European Industrial Gases Association (EIGA)	www.eiga.eu
British Compressed Gases Association (BCGA)	www.bcgaco.uk

RECOMMENDATIONS FOR TRAINING

NOTES:

For full details refer to Section 4.4

1. Others. Anyone who may be present or near to gases
2. Indirect User. Anyone who has a low risk of exposure to gases and would not normally be exposed to gases.
3. Direct User. Anyone who has a high risk of exposure to gases.

Key to colour code:

Topic selection typically required
Topic selection potentially required – dependent on role and/or gases in use
Topic selection not generally required

Table A1-1: Compressed gas cylinders including LPG cylinders		Others Note 1	Indirect user Note 2	Direct user Note 3
Industry Documents & Legislation	BCGA			
	UKLPG			
	‘Best practice’ documents.			
Gas properties and potential hazards.				
Personal protective equipment requirement.				
Composition of the air.				
Compliance with environmental legislation				
The hazard of pressure.				
Storage of gas cylinders:	External.			
	Secure.			
	Ventilation.			
	Control of ignition sources.			
	Layout.			
	Signage.			
	Fire extinguishers.			
	Receipt of cylinders.			
House-keeping & reporting.				
Recognition of leaks				
Gas detection (smell / visual / sound / monitor).				
Emergency Procedures.				
Actions in the event of a gas leak				
Actions in the event of a fire				
Evacuation procedures				
Involvement of emergency services.				

Hazards of oxygen deficiency (asphyxia).	Confined / enclosed areas.			
	Poor ventilation.			
	Inert / flammables.			
Hazards of oxygen enrichment:	Hazards posed by oils and greases.			
	Risk of increased likelihood of fire.			
Flammability hazards (including pyrophoric gas hazards).				
Toxics (including toxic hydrides).				
Corrosives (including reactive fluorides and chlorides).				
Incompatibility between gases and materials, e.g. Acetylene and copper				
Gas cylinders:	Production design and filling.			
	Content identification.			
	Inherent instability, weight, size, shape.			
Cylinder manual handling techniques including churning and the hazards of incorrect handling techniques.				
Gas equipment: (As per cylinder/ type gas)	Regulators.			
	Hoses.			
	Safety devices, e.g. Flashback arrestors.			
	Pipework.			
	Selection of correct gas control equipment.			
Before-use safety assessment of work area.				
Practical training elements:				
Pre-use checks.				
Correct connections.				
Leak check procedures.				
Removal and exchange of cylinders.				
Safe shut down procedures.				

Table A1-2: Transportation of gases		Others Note 1	Indirect user Note 2	Direct user Note 3
Carriage of Dangerous Goods legislation				
Industry documentation				
Open and closed vehicles.				
Signage – options.				
Recognition of vehicles carrying gases.				
Recognition of an unsecured load.				
Ventilation.				
Driver responsibilities and training.				
Dangerous Goods Safety Advisor (DGSA), requirement and role.				
ADR load limits & documentation.	Cylinders only.			
	LPG only.			
	Mixed gases.			
Empty vehicles – signage – removing cylinders.				
Cylinder checking.				
Record keeping and documentation.				

Table A1-3: Oxy-fuel gas equipment <i>In addition to relevant compressed gas cylinder training topics</i>		Others Note 1	Indirect user Note 2	Direct user Note 3
Work area risk and safety assessment:	Appropriate fire extinguishers present.			
	Permits to work / hot work permits, as required.			
	Safe location away from traffic routes / forklift trucks / overhead cranes / other hazardous materials etc.			
Work place hazards:	Heat.			
	Fume.			
	Noise.			
Backfires and flashbacks:	How flashbacks occur.			
	Avoidance.			
Torches & Nozzles:	Torch design and selection.			
	Correct nozzle selection.			
Practical training elements:				
Work area safety checks:	Correct set-up of an oxy-fuel gas unit.			
	Pre-use visual checks on gas equipment.			
	Correct setting of working pressures.			
	Correct leak testing.			
Safe light up procedure:	Purging of hoses and torch before light up.			
	Flame setting.			
Basic cutting practice.				
Safe shut-down procedures.				
Actions in the event of:	Flashback.			
	Sustained backfire.			

Table A1-4: Oxy-fuel gas equipment Mobile systems, annual inspections <i>In addition to oxy-fuel gas equipment user training</i>		Others Note 1	Indirect user Note 2	Direct user Note 3
Regulators:	Design and function of single and multi-stage regulators.			
	Visual checks and inspection.			
	Functional tests.			
	Life expectancy – Date check.			
Flame arrestors:	Design and function of flame arrestors.			
	Visual checks and inspection.			
	Reverse flow test.			
	Life expectancy – Date check.			
Hoses:	Visual checks and inspection.			
	Hose care.			
	Hose check valves: Function, purpose and test			
Torches and nozzles:	Visual checks and inspection.			

Table A1-5: Liquefied Petroleum Gas (LPG) <i>In addition to relevant compressed gas cylinder training topics</i>		Others Note 1	Indirect user Note 2	Direct user Note 3
Health and first-aid:	Cold burns			
	Burns.			
	Asphyxiation.			
	Carbon monoxide poisoning.			
Practical training elements:				
Connection to equipment / process / hand-tools.				
LPG hand operated equipment / tools:	System before use checking.			
	Leak testing.			
	Correct light up.			
	Correct shutdown.			
	Unattended lit tools/equipment.			
LPG forklift trucks	Safe cylinder removal.			
	Connection of new cylinder.			
	Leak checking procedures.			
	Personal protective equipment.			
	Manual handling.			

Table A1-6: Inert gases Including MIG / TIG <i>In addition to relevant compressed gas cylinder oxy-fuel training topics</i>		Others Note 1	Indirect user Note 2	Direct user Note 3
Work activity hazards:	Radiation.			
	Electric currents.			
	Particulate and non-particulate fume.			
	Arc light – Wearing appropriate PPE.			
Differences in regulators:	Fixed pressure regulators.			
	Flow gauges.			
	Regulators registering litres per minute.			
Practical training elements				
Connecting equipment.				
Before use visual checks.				
BCGA CP 7 (8) test procedure and checks:	Fixed pressure regulator visual checks (flow bobbin).			
	Single stage regulator (flow gauge device) visual checks.			
	Hose visual checks.			

Table A1-7: Cryogenic gases		Others Note 1	Indirect user Note 2	Direct user Note 3
Properties of cryogenic gases.				
Constituents of ambient air.				
Gas detection and alarms.				
Hazards posed by cryogenics:	Cryogenic burns.			
	Expansion rates.			
	Oxygen deficiency and enrichment.			
	Embrittlement.			
The hazard of pressure.				
Work area safety checks.				
Cryogenic spillage:	Emergency procedures.			
	First aid.			
Cryogenic vessels:	Design, function and operation.			
	Key safety features.			
	Product identification			
	Valve identification.			
	Venting.			
	Safe handling and movement.			
	Safe storage.			
	Maintenance			
Additionally for Dewars:	Ice plugs			
	Vulnerability to spillage.			
Practical training elements:				
Safe operating procedures and vessel pressures.				
Gas detection and ventilation.				
Decanting procedures:	PPE.			
	Before use safety assessment of work area.			
	Vessel / equipment preparation.			
	Pre-fill checks.			
	Controlling the fill.			
	Post fill procedures.			

Table A1-8: Static cryogenic bulk storage vessels		Others Note 1	Indirect user Note 2	Direct user Note 3
Hazards and properties of cryogenic liquids relevant to use:				
Constituents of the air:	Behaviour of gases.			
	Specific gravities.			
Bulk vessel types overview:	Vacuum insulated Vessel (VIV).			
	Vacuum Insulated Tank (VIT).			
	Vacuum Insulated Evaporator (VIE)			
Examination, inspection and maintenance requirements				
Recognition of normal versus excessive venting.				
Hazards from a release of gas:	Asphyxiation, depletion and enrichment.			
	Mists and vapour clouds.			
	Cold burns.			
	First aid treatment.			
Gas monitoring.	Oxygen.			
	Carbon dioxide.			
Dry ice:	Sublimation properties.			
	Temperature.			
Storage compound:	Security / fencing.			
	Ventilation.			
	Control of ignition sources.			
	Vehicle barriers			
	Signage / notices			
	BCGA documents (e.g. Leaflets 11 (11) & 12 (12))			
Personal protective equipment.				
Practical training elements				
Visual observations:	Tank pressure and contents indication.			
	Pressure relief devices.			
	Excessive ice build-up around operating controls.			
	Frosting on tank surface.			
	Gas escaping from outer jacket.			
	General condition and security.			
	Signage.			
	Starting up.			
	Shutting down.			



British Compressed Gases Association

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