CODE OF PRACTICE 32

THE SAFE FILLING OF BEVERAGE GAS CYLINDERS

REVISION 2: 2014

British Compressed Gases Association

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PREFACE

The British Compressed Gases Association (BCGA) was established in l971, formed out of the British Acetylene Association, which existed since l901. 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 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.

This document has been prepared by BCGA Technical Sub-Committee 2. This document replaces BCGA CP 32, Revision 1, 2008. It was approved for publication at BCGA Technical Committee 149. This document was first published on 17/07/2014. For comments on this document contact the Association via the website www.bcga.co.uk.

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* Throughout this publication the numbers in brackets refer to references in Section 9. Documents referenced are the edition current at the time of publication, unless otherwise stated.

TERMINOLOGY AND DEFINITIONS

Beverage	Any potable liquid drink other than water. In the context of this document it includes lager, ales and soft drinks.
Corrosion	Deterioration of the cylinder material by an electro-chemical reaction, when in contact with water or other liquids (e.g. CO_2 and water).
Food	Any substance or product, whether processed, partially processed or unprocessed, intended to be or reasonably expected to be, ingested by humans.
May	Indicates an option available to the user of this Code of Practice.
Mixed gas	Carbon dioxide and nitrogen mixed in different ratios to provide particular taste and visual characteristics.
Risk assessment	A formal assessment of a workplace or operation, performed in order to identify hazards and evaluate the extent of risk presented by the hazard, for the purpose of either eliminating the risk or establishing suitable controls to reduce the risk to an acceptable level.
Shall	Indicates a mandatory requirement for compliance with this Code of Practice.
Should	Indicates a preferred requirement but is not mandatory for compliance with this Code of Practice.

CODE OF PRACTICE 32

THE SAFE FILLING OF BEVERAGE GAS CYLINDERS

1. INTRODUCTION

Gases are used in beverage dispense to operate cellar equipment, to carbonate a drink by adding the fizz, or they are used to push beer out of a pressurized keg. The gases used are air, nitrogen (N_2), carbon dioxide (CO_2) and various mixtures of N_2 and CO_2.

Companies that supply gases for food use, such as for beverage dispense, are defined as food businesses and therefore require to be fully compliant with The Food Safety Act (2) and all applicable food legislation. BCGA Guidance Note 14 (47), *Production, storage, transport and supply of gases for use in food*, provides full details on the regulations relating to the use of gases for use in food.

Good dispense gas is essential for serving the product in the way the drinks supplier intended. Good dispense gas will be supplied in a cylinder that is in good condition and safe to use, in test, that is correctly labelled and with food grade gas guaranteed.

This Code of Practice has been prepared by the British Compressed Gases Association (BCGA) in consultation with the British Beer & Pub Association (BBPA) and the Brewing, Food & Beverage Industry Suppliers Association (BFBi) in order to provide guidance to users of gases in the beverage dispense industry.

BFBi operate a 'Gas Suppliers Accreditation Scheme', and manage a 'Register of Gas Fillers, Suppliers & Installers'. This scheme is designed to provide assurance to retailers that the beverage gas they buy is from an accredited supplier and that it is fit for purpose.

Further guidance on beverage dispense gas cylinders can be found in BCGA Leaflet 10 (50), *Profit through quality. Good gas, good business*, and the BBPA guidance providing *Instructions for the safe operation of gas pressure systems used in the dispensing of beers and lagers* (51).

2. SCOPE

This Code of Practice addresses the safety, quality and operational issues necessary for the filling of beverage gas cylinders. The safety standards laid down are the minimum for safe working practice and the importance of the skill and competence of operators, supervisors and managerial staff is stressed.

3. KEY PROPERTIES OF GASES USED FOR BEVERAGE DISPENSE

With the exception of air, all beverage gases, if released, may produce local oxygen (O_2) deficient atmospheres, which will produce asphyxia if breathed. As a minimum the O_2 concentration in any space should be maintained above 19.5 %, this compares with 21 % O_2 in

air in normal circumstances. A space containing a reduced O_2 atmosphere meets the criteria of a confined space within the meaning of the Confined Spaces Regulations (5). These require that employers carry out an adequate risk assessment and put in place appropriate control measures to protect those accessing or working in the area. For further information refer to HSE L101 (20), *Safe work in confined spaces. Approved code of practice*.

Attempts to rescue persons from confined spaces or where high concentration of an asphyxiant gas may be present should be made only by persons trained in the use of air-supplied breathing apparatus and confined space entry procedures. Refer to Section 8.

In all areas where gases are stored, handled and where filling operations take place ensure that adequate ventilation is provided. BCGA Guidance Note 11 (46), *Reduced oxygen atmospheres. The management of risk associated with reduced oxygen atmospheres resulting from the use of gases in the workplace*, provides additional guidance that can be used in the assessment of risk associated with the use of gases in the workplace, on appropriate control measures to be considered at any workplace where gases are commercially produced, stored or used and, to identify where reduced O_2 atmospheres could occur.

3.1 Carbon dioxide

At normal temperature and pressure, CO_2 is classified as a non-toxic non-flammable gas but it does start to affect breathing at concentrations of about 1 % with effects becoming more serious with increasing concentration. CO_2 is a colourless, odourless gas with a characteristic taste and pungency at higher concentrations. It does not support life or combustion. It is approximately 1.5 times heavier than air, with a density, at 1.013 bar absolute, 15 °C, of 1.87 kg/m³. Gas suppliers usually transport and store CO_2 in bulk as a liquefied gas, at a temperature of approximately –17 °C and a pressure of 20.7 bar.

NOTE: Typically CO_2 is provided for beverage use in gas cylinders, (ADR (17) requires that these cylinders have a minimum test pressure of 190 bar for a filling ratio of 0.68 and 250 bar for a filling ratio of 0.76, however there are a number of premises that use liquid storage tanks which are filled on site.

CO_2 cannot exist as a liquid at atmospheric pressure. When the liquid under pressure is released to the atmosphere, a dense white cloud is formed, containing cold gas, solid CO_2 particles and condensed moisture from the air. The solid CO_2, at -78.4 °C, may settle on adjacent surfaces before subliming to produce more cold gas. As the gas is heavier than air, it will spread along the ground and accumulate in low-lying areas such as pits and trenches. CO_2 will dissolve in water to a limited extent to form a weak acid, but as a gas it is generally un-reactive.

CO_2 is normally present in atmospheric air at a level of approximately 0.040 % (400 ppm). As a normal product of human and animal metabolism, it plays an important role in the control of several vital functions, but is toxic in high concentrations.

The Health and Safety Executive (HSE) Guidance Note EH 40 (18), *Workplace Exposure Limits*, provides a work exposure limit for the concentration of CO_2 in air. Currently this is 0.5 % by volume (5000 ppm), calculated as an 8-hour time-weighted average. A short-term work exposure limit of 1.5 % by volume (15000 ppm), calculated as a 15 minute time weighted average concentration, is also given.

The effects of inhaling varying concentrations of CO_2 are given in Table 1, but it should be appreciated that the reactions of some individuals can be very different from those shown.

The effects of CO_2 are entirely independent of the effects of O_2 deficiency. The O_2 content in the atmosphere is therefore not an effective indication of the danger. For example, a potentially fatal CO_2 concentration of 14 % can exist with a normal O_2 content.

O_2 depletion monitors **do not** provide protection for monitoring atmospheres where CO_2 may be present. Filter respirators give **NO PROTECTION** in atmospheres containing dangerous concentrations of CO_2. Separate gas sensors shall be provided for CO_2 enrichment and for O_2 deficiency,

Further information on the physiological effects of CO_2 is given in the European Industrial Gases Association (EIGA) Safety Information Sheet 24 (39), *Carbon Dioxide Physiological Hazards*, and EIGA Document 164 (37), *Safe handling of liquid carbon dioxide containers that have lost pressure*.

CO_2 Concentration Volume %	**Effects and symptoms**
1	Slight and unnoticeable increase in breathing rate.
2	Breathing becomes deeper; rate increases to 50% above normal. Prolonged exposure (several hours) may cause headache and feeling of exhaustion.
3	Breathing becomes laboured; rate increases to twice the normal. Hearing ability reduced, headache experienced with increase in blood pressure and pulse rate.
4 - 5	Breathing laboured at four times the normal rate. Symptoms as above, with signs of intoxication after ½ hour exposure and slight choking feeling.
5 - 10	Characteristic pungent odour noticeable. Breathing very laboured, leading to physical exhaustion. Headache, visual disturbance, ringing in the ears, confusion probably leading to loss of consciousness within minutes.
10 - 100	Loss of consciousness more rapid, with risk of death from respiratory failure. Hazard to life increased with concentration, even if no oxygen depletion.

Table 1: The effects of inhaling CO_2

3.2 Nitrogen

N_2 is classified as a non-toxic, non-flammable gas that is chemically non-reactive. It is odourless and does not support life. It is slightly lighter than air.

N_2 can produce local O_2 deficient atmospheres, which will cause asphyxia if breathed. This is especially true in confined spaces and areas of little or no air movement. Asphyxia due to O_2 deficiency is often rapid with no prior warning to the victim. The effects of inhaling reduced concentrations of O_2 are given in Table 2.

O_2 Concentration Volume %	Effects and symptoms
19.5	Minimum safe level of O_2 (as recommended by HSE).
< 18	Potentially dangerous.
< 10	Risk of unconsciousness followed by brain damage or death due to asphyxia is greatly increased.
< 6	Immediate loss of consciousness occurs.
0	Inhalation of only 2 breaths of N_2, or other inert gas containing no oxygen, causes immediate loss of consciousness and death within 2 minutes

Table 2: The effects of inhaling reduced concentrations of O_2

O_2 depletion monitors should be considered where a significant risk of depleted O_2 levels has been identified. Before detector / monitoring equipment is specified the site shall be assessed to establish the level of risk involved, where the gas may originate from and accumulate to (taking into consideration the properties of the gas) and an appropriate location(s) for the detector / monitor measurement head. Appropriate gas detection or monitoring equipment that incorporate warning alarms should be used to test the workplace atmosphere before entry and during occupancy. Fixed equipment is preferable to personal equipment. Gas detector / monitor displays and warning signs shall be sited so that they are clearly visible to personnel before entering the affected area. Detection equipment should be subject to a formal planned maintenance schedule that includes the calibration of detectors and functional testing, alarm and interlock checks, and the routine replacement of components.

3.3 Air

Air is classified as a non-toxic, non-flammable gas, but it does support combustion. It is odourless and colourless. Air does support life.

3.4 Mixed gases

These gases shall be treated as if they exhibit the properties of all the component gases, unless their hazard classification demonstrates otherwise.

4. GAS CYLINDER AND PRODUCT IDENTIFICATION

All gas cylinders in beverage gas service are required to comply with the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations (11). These regulations implement the European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR) (17), which provides a framework for dangerous goods to be carried internationally in road vehicles. These regulations require compliance with standards for the packaging and labelling of the dangerous goods, as well as appropriate construction and operating standards for the vehicles and crew. This includes the design, construction, testing, filling, labelling and marking standards required for gas cylinders. Gases are classified as Class 2 dangerous goods.

Gases for food use, such as for beverage dispense, require to be fully compliant with The Food Safety Act (2) and all applicable food legislation.

BCGA Guidance Note 14 (47) provides guidance on the regulations applicable for food safety.

4.1 Labels

The cylinder label shall always be used as the primary means of identifying the contents of a gas cylinder. The label shall meet the requirements of ADR (17). The label is to align with the product Safety Data Sheet, refer to Section 4.5.

European Regulation 2008/84 (16) on the specific purity criteria for food additives other than colours or sweeteners, details the requirements for labelling of foods. It includes a requirement that their packaging shall bear a list of all ingredients in descending order of their percentage by weight of the total. This is reinforced in the Food Additives, Flavourings , Enzymes and Extractive Solvents (England) Regulations (12).

All cylinders supplied for beverage dispense applications shall be labelled in accordance with the Food (Lot Marking) Regulations (4). All cylinders provided for drinks dispense will have a product traceability label attached to the cylinder, valve or valve guard. Usually this is a small label with a series of numbers and letters, and / or a barcode. This will allow the supplier to trace the cylinder, using the cylinder serial number and its contents in the event of any quality concerns. These labels are changed every time a cylinder is filled. Do not use a cylinder for drinks dispense if it does not have this label attached.

Cylinders containing CO_2 and N_2 mixtures for the beverage dispense industry should be labelled and / or stencilled putting the CO_2 component first, e.g. 30 % CO_2 / 70 % N_2.

The filler of the gas cylinder is responsible for attaching a label correctly identifying the content of the gas cylinder.

BCGA Technical Information Sheet (TIS) 6 (48), *Cylinder identification. Colour coding and labelling requirements*, provides information on UK practice for cylinder labelling.

4.2 Colour coding of cylinders

Labels, in accordance with Section 4.1, are the mandated way to identify the contents of a gas cylinder. Colour coding is a secondary method used to identify the properties of the gas in the cylinder. Colour codes are applied to the shoulder, or curved part, at the

top of the cylinder in accordance with BS EN 1089-3 (23), *Transportable gas cylinders. Gas cylinder identification (excluding LPG). Colour coding*. This is an optional standard, however it is followed by BCGA members and its use is recommended by EIGA to provide a harmonised colour coding system for cylinders. The use of colour codes has been introduced progressively as new cylinders are purchased or re-tested by the gas companies and the majority of gas cylinders in use in the beverage gas industry now conform to this standard. BCGA Technical Information Sheet (TIS) 6 (48), provides comprehensive information on UK practice for cylinder colour coding.

NOTE: BS EN 1089-3 (23) is not a mandatory standard and whilst it is followed by BCGA members other companies may use different colour schemes. The preceding British Standard, BS 349 (22), *Specification for identification of the contents of industrial gas containers*, is now obsolete, though some UK cylinders may still be colour coded in line with it. Previously industry practice was to paint a CO_2 gas cylinder body in black and the shoulder black or French grey. For N_2 gas cylinders industry practice was to paint the body French grey and the shoulder black. For mixed gas cylinders industry practice was to paint the body French grey and the shoulder black or bright green. There may still be cylinders in circulation painted in that way.

Within BS EN 1089-3 (23) there is no recommendation for a body colour. For a body colour BCGA recommends the use of Dusty Grey (RAL 7037).

Cylinders containing gases for beverage dispense, should be colour coded in accordance with Table 3.

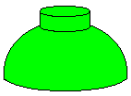
Gas	**Cylinder**	**Colour**	
Carbon dioxide	Body		Not specified
	Shoulder		Dusty Grey - RAL 7037
Nitrogen	Body		Not specified
	Shoulder		Jet Black - RAL 9005
Carbon dioxide & Nitrogen	Body		Not specified
	Shoulder		Yellow Green - RAL 6018

Table 3: Gas cylinders. Colour codes.

4.3 Identification of beverage gas systems

At customer premises individual beverage gas systems, including their pipework, are identified by the colour identification codes shown in Table 4. To assist the end user in connecting the correct gas cylinder to the beverage gas system the colour code is duplicated on beverage gas cylinders. These colours will be displayed close to the valve outlet, e.g. on the valve outlet cap, valve handwheel, collar or by using a special label.

There are different connections for CO_2 and for mixed gases. However the connections for all types of mixed gases are the same and care is to be taken to ensure that the identification marks for a particular mixed gas are used appropriately.

Gas	Colour
Air (for equipment use)	Blue
CO_2 100 %	Grey
30 % CO_2 / 70 % N_2	Green
50 % CO_2 / 50 % N_2	Purple
60 % CO_2 / 40 % N_2	White

Table 4: Beverage gas system colour identification codes.

These colours are in addition to colour coding of cylinders, described in Section 4.2, or valve guard colours depicting cylinder ownership. The location of the colour shall be agreed between supplier and customer.

4.4 Cylinder inspection and test

ADR (17) requires that gas cylinders are regularly inspected and tested to ensure they continue to be safe for the products they contain at the high pressures in which they are stored. It is mandatory for every cylinder to have been initially inspected and tested by the cylinder's manufacturer to ensure its serviceability before use, this is followed by regular periodic inspection and tests to ensure its continued serviceability whilst in service. These tests have to be carried out by a UK Competent Authority approved and appointed inspection body. The date that these inspection and tests are carried out is stamp-marked on the cylinder.

NOTE: Cylinders are subject to varying inspection and test intervals. These are defined within ADR (17). For beverage gases this is typically a ten year interval.

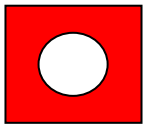
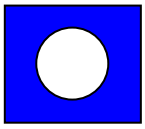
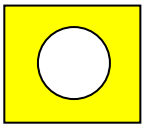
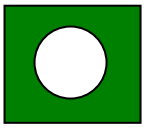
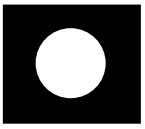
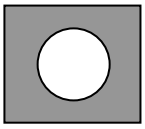
To help identify its next periodic inspection and test date a cylinder test ring is fitted to beverage gas cylinders. Cylinder test rings are one method that provides a quick, visual reference. They consist of a plastic disc, fitted between the cylinder and the valve, colour coded and shaped to indicate the year when the next periodic inspection and test is due. This ring may also give an indication of the month. Some companies use two separate plastic rings to indicate the month and year.

Table 5 provides a visual guide to the colour and shape of cylinder test rings.

Only complete cylinder rings are allowed to be used. If there is evidence of deliberate damage to a ring, e.g. split rings, the cylinder is to undergo inspection and test before filling is allowed.

The filler of the gas cylinder is responsible for ensuring the cylinder is in-date for its periodic inspection and test prior to filling a cylinder.

In addition, it is a requirement of ADR (17) that the cylinder is in-date for its periodic inspection and test when being transported to the end user.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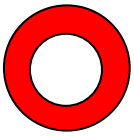	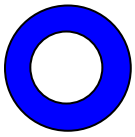	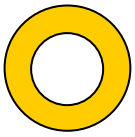	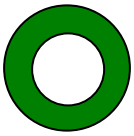		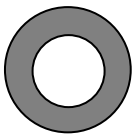
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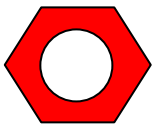	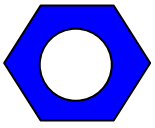	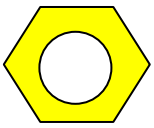	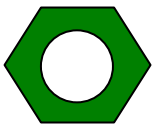		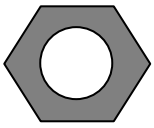
2019	**2020**	**2021**	**2022**	**2023**	**2024**

Table 5: Cylinder test rings

NOTES:

1. Cylinder test rings are based on a system described in ISO 6406 (29), *Gas Cylinders - Seamless steel gas cylinders. Periodic inspection and testing*.

2. The sequence of colour and shape of the annual cylinder test rings is repeated on an 18-year cycle, hence 2025 is a repeat of 2007.

4.5 Safety Data Sheet

It is a legal requirement that the gas supplier provides a Safety Data Sheet to the customer whenever a product is supplied for the first time, in accordance with the Chemicals (Hazard Information and Packaging for Supply) Regulations (CHIP) (10). The exact requirements for Safety Data Sheets are included in the REACH Regulations (14). Users have a responsibility to ensure that all personnel handling the product have the Safety Data Sheet made available to them.

NOTE: The CHIP (10) Regulations brings national legislation into line with the transitional arrangements set out in European Regulation (EC) No 1272/2008 (15) on the Classification, Labelling and Packaging of Substances and Mixtures (CLP). The CLP (15) Regulation entered into force across all EU member states, including the UK, on 20 January 2009. The CLP (15) Regulation has applied to substances that are placed on the market since 1 December 2010. It is not mandatory to use the CLP (15) classification system to classify chemical mixtures (preparations) until 1 June 2015. The CHIP (10) Regulations will be repealed from 1 June 2015, from when suppliers must comply with the CLP (15) Regulation.

5. PRODUCT QUALITY

The Food Safety Act (2) and its subsidiary regulations apply to all companies filling gases for beverage dispense. BCGA Guidance Note 14 (47) provides guidance on gases for use in food.

All food gases shall be traceable to a 'Registered Premises'. All plants filling cylinders for beverage dispense applications shall be registered as food premises under EC Regulation 852/2004 [Article 6(2)] (13), on the hygiene of foodstuffs. This regulation requires that if you run a food business you must register with the local authority.

Food businesses shall have in place an effective management system for controlling quality. The quality system will ensure that the product in the filled cylinders conforms to specification. This will include sample post fill checks as well as calibration regimes for pressure gauges and / or weigh scales, refer to Section 6. The quality management system will specify a retention period for records.

All food gases shall be traceable. The quality system shall enable suppliers of food gases to identify suspect products in case of customer complaint or quality failure in order to recall affected products. All cylinders supplied for beverage dispense applications as part of a lot shall be marked or labelled so as to enable the lot to be identified in accordance with the Food (Lot Marking) Regulations (4).

Gases supplied for filling cylinders in beverage dispense applications shall conform to an appropriate specification for use in foods.

EIGA Document 70 (33), *Carbon dioxide source qualification quality standards and verification*, provides recommendations on good practice and guidance on the key characteristics of the quality and purity of CO_2 for use in foods and beverages, as well as the quality assurance and quality control procedures necessary to ensure compliance. This document also provides recommendations for the qualification of plants used to produce CO_2 for use in foods and beverages. These recommendations are intended to assist CO_2 suppliers to achieve compliance with applicable regulatory standards such as the European Directives.

The International Society of Beverage Technologists (ISBT) document on *Beverage Grade Nitrogen (Cryogenic Source) Quality Guidelines And Analytical Methods Reference* (52), focuses on defining the purity grade of N_2 appropriate for use in associated, non-carbonated beverages along with providing recommended practices for its commercial processing, safe handing, transport, storage, sampling, sample shipping and analytical testing.

Where the gases are in the form of a gas mixture, they shall be based on component specifications, each of which complies with relevant legislation.

All cylinders supplied with beverage gases shall be labelled in accordance with Section 4.1.

6. THE SAFE FILLING OF BEVERAGE GAS CYLINDERS

6.1 General requirements

Gas cylinders shall only be filled by reputable companies, at specially-equipped centres, with qualified staff using appropriate procedures. Refer to ADR (17) and BCGA Code of Practice 43 (43), *The safe filling of gas cylinders*, for further information.

Filling systems and their associated pressure systems shall be operated in compliance with the Pressure Systems Safety Regulations (PSSR) (7). The PSSR (7) require that a Written Scheme of Examination is drawn up by a Competent Person. The Written Scheme of Examination shall cover the examination, operation and maintenance of the pressure system. Refer to BCGA CP 23 (41), *Application of the Pressure Systems Safety Regulations 2000 to industrial and medical pressure systems installed at user premises*. Maintenance schedules are to be in place and safe operating procedures are to be clearly identified.

It is recommended that an automatic cut-off should be fitted in the fill line to stop the fill operation once the pre-determined fill pressure or weight is achieved.

Each centre shall have standard operating procedures in place for pre-fill, fill and post-fill inspections. Refer to Sections 6.2, 6.3 and 6.4.

The specification of all beverage gases shall meet the appropriate food standards. Refer to Section 5.

Where products are filled or sold by weight compliance is required with the Weights and Measures Act (1).

Pressure gauges and weigh scales used for the filling of gas cylinders shall be properly maintained and regularly calibrated. Formal calibration every 12 months for pressure gauges and 6 months for weigh scales is recommended with a Certificate of Calibration obtained.

To reduce operator error it is recommended that pressure gauges and weigh scales display the same units as those stamped on the cylinders being filled i.e. bar. To allow easy differentiation of the required fill pressure it is recommended that the gauge face is at least 100 mm in diameter, with the fill pressure at between ½ to ⅔ of full-scale deflection.

One successful calibration methodology is to have a calibrated master pressure gauge, which is not used for routine cylinder filling. This master gauge is used on a regular basis e.g. weekly, to check all the other pressure gauges in use. This master gauge should be kept in a clean and secure location. Similarly weigh scales can be checked using a known control weight. Daily checks are recommended. Records of all checks are to be kept.

Where pressure gauges or weigh scales are found to be out of calibration a procedure is required to ensure any cylinders, that may have been filled whilst the gauges or scales are out of calibration, are assessed for their fitness for use.

Gas suppliers may be requested to fill cylinders that are owned by customers or other third party organisations. Such cylinders should undergo a series of checks before filling takes place to ensure the safety of the gas company personnel who will fill them and to ensure that the cylinders are legal and safe for eventual use by the end user. Further information is available in EIGA Document 182 (38), *Pre-fill inspection of customer owned cylinders*. Refer to Section 6.2.

Grinding operations are not approved on cylinders. Remove from service any cylinders where there is evidence of grinding.

NOTE: Standards such as BS EN 1968 (26), *Transportable gas cylinders. Periodic inspection and testing of seamless steel gas cylinders*, allow defects to be removed by grinding, however this practice is discouraged by the UK Competent Authority.

Information stamped onto the shoulder of each gas cylinder, for example, the date of periodic test, the fill pressure or the serial number, should be clearly visible to the filler. If this information cannot be determined, or there is evidence that this information has been tampered with, then the cylinder shall not be filled with gas. The filling centre should have a clear procedure that details what marks should be visible on a cylinder before filling and what action to take when such markings cannot be seen.

The compatibility of the cylinder and its valve with the intended gas product shall be checked. All materials shall be compatible with the product and shall not introduce contaminants that would present a risk to food safety.

Gas cylinders can suffer from internal corrosion if used incorrectly and this is particularly relevant to beverage gas cylinders. For the potential causes and procedures to minimise internal corrosion refer to Section 6.5. Where the cylinder has been subject to internal contamination or corrosion, it shall be cleaned and inspected to ensure that, when filled with a beverage gas, contamination of the gas does not take place, there is no risk to food safety and that the cylinder body is serviceable and safe for continued use.

Cylinders in CO_2 service shall not be used for mixed gas or N_2 unless converted in accordance with Section 6.6. Where conversion takes place, the suitability of the pressure rating of the cylinder shall be taken into account to ensure safe service.

Cylinders in mixed gas or N_2 service, shall not be used for CO_2 unless converted in accordance with Section 6.6.

When filling a cylinder the filler shall be aware of, and take into account, the developed pressure. Refer to Section 6.7.

Temperature compensation is required when filling any cylinder by pressurisation. In the UK gas cylinders are rated at a fill temperature of 15 ^{o}C. The filling temperature is to be monitored and a method of calibrating the fill pressure is to be established to ensure that the gas cylinder rated pressure at 15 ^{o}C is not exceeded.

Valves used for beverage gas cylinders follow international design codes. However it is strongly recommended that valves fitted to beverage gas cylinders should incorporate a

residual pressure valve (RPV) with a non-return valve. For additional guidance refer to EIGA Document 64 (32), *Use of residual pressure valves*. Refer to Section 6.5.

Beverage gases utilise valve outlets in accordance with BS 341 (21), *Transportable gas container valves. Valve outlet connections*. The valve outlet used for CO_2 cylinders is BS 341 (21) No. 8. The valve outlet for mixed gas cylinders is BS 341 (21) No. 3. Adaptors shall never be used to convert from one outlet thread to another.

CO_2 cylinder valves are fitted with bursting discs that are designed to rupture and safely relieve the excess pressure that can be produced in CO_2 cylinders as a result of overfilling or excessive ambient temperature conditions.

NOTE: Industry has experienced the rupture of bursting discs during the filling process. Often the root cause of the problem is identified as inaccurate scales. It is recommended that company quality assurance procedures include a calibration check of the scales at frequent intervals, e.g. every shift, and sample post fill checks.

Mixed, or permanent, gas cylinder valves do not normally have bursting discs fitted. There is no legal requirement to fit bursting discs and therefore gas suppliers may make their own decisions about their use.

NOTE: If mixed, or permanent, gas cylinder valves are filled in error with CO_2, then without a bursting disc fitted, protection against excess pressure is absent, and safety could be compromised. Company procedures for filling shall ensure that this cannot happen.

Gas chilling equipment may use CO_2 liquid off-take cylinders. When supplied to the same location as normal gaseous off-take CO_2 cylinders, the liquid off-take cylinders should be fitted with special valves with an outlet connection in accordance with ISO 5145 (28) No. 16, *Cylinder valve outlets for gases and gas mixtures. Selection and dimensioning.*

NOTE: Some CO_2 cylinders are fitted with dip tubes, designed to allow liquid off-take. These cylinders are identified by a white line painted on the side of the cylinder, and / or an 'indicator' ring under the valve. Refer to Figure 1. These cylinders are not used in conventional beverage dispense systems, as liquid CO_2 would be delivered into the dispense system possibly resulting in the failure of downstream equipment.

Figure 1.

CO_2 cylinder fitted with a dip tube. Indicated by a white line and the use of a white indicator ring. The white ring may have additional identification such as the words "DIP TUBE" embossed on to it.

Under no circumstances shall any cylinder within the scope of this Code of Practice be top filled. All such cylinders shall be completely vented prior to filling.

There shall be a safe method of venting down any over-filled cylinders. A cylinder may be over-filled, either by over pressurisation or by exceeding the filling ratio for liquefied gases. If the over-filling is marginal the excess contents can be vented. If gross over-filling occurs, the cylinder should be completely vented and then returned for inspection by a competent person to assess if it is fit for further service. The cylinders should not be moved whilst overfilled. Venting should be carried out at the filling position, where it is safe to do so. It is recommended that a venting line is fitted to each filling line so that an overfilled cylinder can be vented to a safe place without having to disconnect it from the filling line or move it in any way.

There is to be a procedure established for handling cylinders which are not deemed suitable for filling, for example, cylinders out of test, excessive corrosion, contamination, etc. These cylinders are to be removed from the filling area.

Once a cylinder has been filled the valve outlet is to be sealed. The purpose of the seal is to prevent contamination of the valve outlet, but it will have the secondary benefit of giving the customer confidence that the cylinder is being delivered in a condition where it is ready for use, and will provide evidence that the contents have not been tampered with.

Filling records are to be maintained. These are to identify:

- When a cylinder is filled;
- The product with which it was filled;
- Batch / lot identification;
- Quality control checks and results.

EIGA Document 83 (34), *Recommendations for safe filling of CO_2 cylinders and bundles*, provides additional information.

6.2 Pre-fill inspection

Before filling a pre-fill inspection shall be carried out. This shall conform with the requirements of the following standards:

- BS EN 1919 (24), *Transportable Gas Cylinders. Cylinders for liquefied gases (excluding acetylene and LPG). Inspection at time of filling*.
- BS EN 1920 (25), *Transportable Gas Cylinders. Cylinders for compressed gases (excluding acetylene and LPG). Inspection at time of filling*.
- BS ISO 24431 (31), *Gas cylinders. Cylinders for compressed and liquefied gases (excluding acetylene). Inspection at time of filling*.

NOTE: BS ISO 24431 (31) is being revised and will in due course incorporate information on the inspection at time of filling for liquefied and compressed gases, and cylinders of composite construction. BS EN 1919 (24) and BS EN 1920 (25) will then be withdrawn.

The pre-fill inspection is to include the following:

- The owner of the cylinder shall be identified. The owner's permission is required before a cylinder can be filled.

- The cylinder is manufactured to a design approved for use by the competent authority in the UK, is permitted for filling and is suitable for the storage of gas under pressure.

- A check that the gas cylinder and valve are considered safe for use in Europe, refer to EIGA Document 86 (35), *Gas cylinders and valves with restricted use in the EU*.

- The external condition of the cylinder shall be checked to ensure that it is free from unacceptable damage or unacceptable corrosion. In case of doubt refer to standards such as BS EN 1968 (26). The cylinder is to be clean prior to filling.

- The cylinder has the correct colour scheme(s) for the intended gas service; refer to Section 4.2 and Section 4.3.

NOTE: Any painting (taking suitable care to protect the valve) shall be completed before filling commences. Adequate controls shall be established to ensure temperature / time limits are not exceeded.

- The cylinders shall be within their due date for periodic inspection and test. Gas cylinders are only allowed to be filled if they are in-date for their periodic inspection and test. The testing of cylinders and the method of identifying the periodic inspection and test date is detailed in Section 4.4.

- The valve shall be inspected. It shall be suitable for the gas service and have the correct valve outlet. It shall be free from unacceptable damage and external contamination. Where necessary, valves shall be cleaned; use approved cleaning materials that will not present a risk to food safety or the integrity of the valve.

- All cylinders shall be checked for residual pressure. If fitted, the functionality of the RPV shall be checked. For cylinders not fitted with an RPV a check for residual pressure shall be made. All cylinders should have retained a residual pressure of nominally 2 to 5 bar(g). Where the residual pressure is less than this, procedures shall be established to ensure that the cylinders are internally dry and completely free of contaminants, particularly liquids such as beer, soft drink concentrate and cleaning fluid. Appropriate control measures should be employed, such as purging or internal inspection before filling.

NOTE: The use of automated residual pressure checking is recommended, if not available then manual prod testing shall be carried out.

- A cylinder valve guard is fitted, it is secure and is serviceable.

- The cylinder is to be correctly marked and labelled for the intended gas service. Where applicable, the previous contents are to be accurately identified. If a change in gas service is required refer to Section 6.6. Previous batch labels shall be removed or rendered illegible.

- The cylinder is suitable for the product and the filling pressure. The safe filling pressure shall be established and checked against the intended filling pressure. For liquefied gases, verify the tare weight.

6.3 Filling

Filling is to be carried out in a clean, well-ventilated area, away from sources of ignition. All filling equipment is to be designed, constructed and suitable for use with the fill gas.

During the filling process the filler is to ensure that:

- Cylinder valves are always opened and closed slowly.

- Cylinders are filled at a rate that prevents excessive temperature rises. Temperature compensation may be required when filling any cylinder by pressurisation. For compressed gases the internal pressure at 65 ºC shall not exceed the test pressure. For high pressure liquefied gases the filling ratio shall ensure that the settled pressure at 65 ºC does not exceed the test pressure.

- The valve is not blocked.

- That the operation is progressing satisfactorily e.g. temperature rise checks of cylinder.

- That the valve does not leak in the open position, for example, by the use of a gas compatible leak test fluid.

In the event of any leakage, then filling is to be stopped and the cylinder / connections vented. The leak shall be rectified before proceeding. Leaks are not to be rectified whilst the system is pressurised. Residual or excess gases are to be vented to a safe location.

6.4 Post fill checks

The filler is to ensure that:

- The cylinder is within its safe operating limits. It is not overfilled or over pressurised. In the event of inadvertent overfilling, any excess gas must be removed in a safe manner and the cylinder checked for further fitness for service.

- For liquefied gases, immediately after disconnecting from the filling line, the weight shall be checked by use of a scale capable of determining the gas content of that cylinder within the allowable tolerances according to the cylinder water

capacity. The weight of the cylinder is not to exceed the total weight allowed for the cylinder and gas combination.

- The valve is closed.
- A check for leaks is carried out.
- The valve outlet port is sealed.
- The valve guard is secure.
- The contents are correctly identified and all relevant labels are fitted, refer to Section 4.1.

6.5 Cylinder corrosion preventive measures

The ingress of moisture / water and other contaminants into beverage dispense cylinders will cause internal corrosion and can lead to catastrophic failure if undetected.

Water / liquid contaminants may be found in cylinders used for beverage dispense, due to:

- Backfeed from the customer's product or cleaning fluids.
- The ingress of rainwater, due to the cylinder valves being left open after use.
- Submersion of a cylinder in water with the valve left open.
- Condensation of humid air sucked into a cylinder due to temperature changes if the valve is left open.
- Being filled with a poor quality gas (wet gas).

Contaminants can cause internal corrosion of the cylinder. For example, water, which combines with CO_2 to form a dilute carbonic acid electrolyte, will cause general and pitting corrosion in a steel cylinder. There is also some evidence that stress corrosion cracking can be experienced in steel cylinders where water has been present; this can lead to sudden failure of the cylinder or valve. Some soft drinks syrups and cleaning fluids containing phosphates, sulphates, chlorides and quinine compounds can also be particularly corrosive to cylinders.

The risk of moisture / water and other contaminants entering a cylinder should be minimised by one of the following:

- Using a cylinder fitted with a residual pressure valve, which incorporates a non-return device (strongly recommended, particularly for cylinders in mixed gas service).
- Ensuring that the filling procedures prevent the filling of contaminated cylinders.

- Instructing users to ensure that cylinder valves are always closed when not in use or disconnected.

- Following a hydraulic test, ensuring that water is not left inside a cylinder and the cylinder is thoroughly dried.

- Before valves are fitted, ensuring that cylinders are not left open to the elements between testing and filling.

All sites shall have suitable procedures for the fitting of cylinder valves and shall use only calibrated torque wrenches. Valves that are over-tightened can lead to overstressing of the cylinder neck threads; this can cause problems such as sustained load cracking in some aluminium alloy cylinders.

A residual pressure valve incorporates a device that retains a positive gas pressure inside the cylinder. This pressure prevents the possible ingress of humid air into the cylinder should the valve be left open. The non-return feature prevents back flow from the customer's process whenever the cylinder is at a lower pressure than the application (involving a fluid) to which it is connected.

Where a residual pressure valve is fitted the filler shall not interfere with or remove the device. The use of a residual pressure valve will have been assessed by the cylinder owner (gas supplier) and will form part of the construction requirements of the cylinder and valve assembly and the overall quality control plan under their duties within the Provision and Use of Work Equipment Regulations (PUWER) (6).

Further information on this important topic is available in BCGA Guidance Note 6 (45) - *Avoidance and detection of internal corrosion of gas cylinders*.

6.6 Cylinder conversions

The filling centre shall have a quality management system in place to control and document cylinder service conversions. This may require approval by a Notified Body. Cylinder conversions shall be authorised by a competent person.

The conversion of a cylinder from one gas service to a different gas service requires that a detailed review is undertaken by a competent person. The conversion is to be in accordance with BS EN ISO 11621 (30), *Gas cylinders. Procedures for change of gas service*, to ensure that the new gas, or a different composition mixture of the original gases, may be safely filled into the cylinder. This is particularly critical with CO_2 and mixed gas cylinders where the permissible filling pressure is not the same for the different products. Other concerns in the conversion process include the type of valve and factors that may adversely affect product quality.

Cylinders specifically designed for CO_2 service with test pressures of 250 bar or under shall not be considered for mixed gas service as the pressure rating is unsuitable for the potential developed pressure of mixed gas.

6.7 Developed pressures

Cylinders containing N_2 and CO_2 mixtures will develop higher pressures than a cylinder containing N_2 alone. Refer to Chart 1.

BCGA has agreed values for the maximum developed pressure for the most commonly used mixtures and settled pressures. Refer to Table 6.

These developed pressures should be used as maxima when selecting cylinder specifications or converting cylinders for service with CO_2 / N_2 mixtures, refer to Section 5.2. Additional information is available in BCGA CP 35 (42), *Filling ratios and developed pressures for liquefied and compressed gases*.

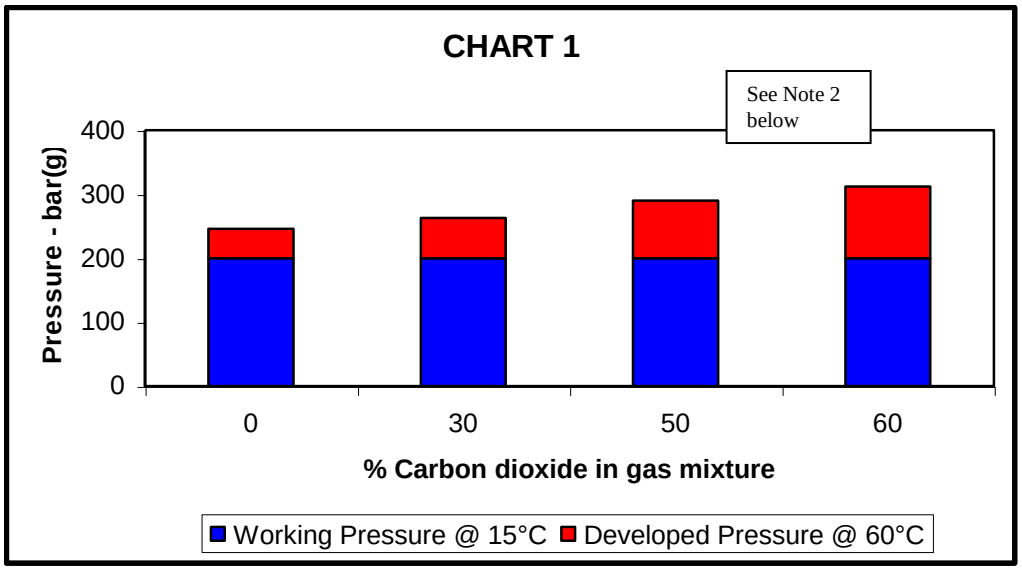

Chart 1: Pressure differences

CO_2 % V/V	N_2 % V/V	Working Pressure at 15 °C - bar(g)	Developed Pressure at 60 °C - bar(g)	Minimum Cylinder Test Pressure [1] - bar(g)
30	70	137	174	206
30	70	150	193	228
30	70	200	263	310
50	50	137	188	222
50	50	150	209	246
50	50	200	290	342
60	40	137	202	238
60	40	150	226	266
60	40	180 [2]	279	329

Table 6: Maximum developed pressures

NOTES:

1. The minimum cylinder test pressures are based on typical cylinders manufactured to BS 5045 (27) only. Cylinders manufactured to other codes should be selected with due regard to the developed pressure data given, though the relationship with test pressure may vary from that given above. Great care shall be

exercised in ensuring that cylinders are suitable for the mixed gas application intended.

2. The 60/40 mixture is unstable at settled pressures above 180 bar and is not normally supplied. This is to avoid any possibility of the two gases separating into layers.

3. ADR (17) allows the developed pressure at 65 °C to equal the test pressure of the cylinder.

7. THE SAFE HANDLING OF GAS CYLINDERS

7.1 Personal protective equipment

Personal Protective Equipment (PPE) is to be provided as required by the Personal Protective Equipment at Work Regulations (8). PPE may only be considered as a control to achieve an acceptable level of residual risk after other levels of control have been addressed. A risk assessment will determine the requirement for the use of hazard controls, including PPE. Where PPE is required a PPE Assessment is to be carried out. Due regard is to be given to the requirements of the Control of Substances Hazardous to Health (COSHH) Regulations (9), any relevant equipment publications, manufacturers information and the product Safety Data Sheet. The PPE shall be selected for a particular task and location and must be appropriate and chosen to effectively reduce the overall risk. Thus there are different PPE requirements for differing products, different tasks and possibly different personnel.

HSE L25 (19), *Personal Protective Equipment at Work,* provides guidance on the Personal Protective Equipment at Work Regulations (8). EIGA Document 136 (36), *Selection of personal protective equipment,* provides guidance for selecting and using PPE at work.

Safety glasses shall be used when connecting or disconnecting gas cylinders.

For cylinder handling the use of protective gloves is essential. Safety shoes shall be worn and boots with metatarsal protection are strongly recommended.

In certain locations, or site conditions, other additional protective clothing may be obligatory, e.g. hard hat, ear defenders, breathing apparatus.

7.2 Cylinder handling

The Manual Handling Operations Regulations (3) require first that an assessment of manual handling operations is conducted. Following the assessments, training should take place. Where the assessment indicates that the work exceeds guideline limits, wherever practicable the operation should be mechanised or handling aids provided. BCGA Guidance Note 3 (44), *Safe cylinder handling and the application of the manual handling operations regulations to gas cylinders,* defines the principles of safe practice for handling and moving cylinders and provides a basic understanding of the Manual Handling Operations Regulations (3) relating to gas cylinders. BCGA TIS 17 (49), *Model risk assessment for manual handling activities in the industrial gas industry,* can be used to assist in developing a site risk assessment.

The following points are of note:

(i) PPE including gloves and foot protection shall be used. Refer to Section 7.1.

(ii) Purpose-designed trolleys should be used for moving cylinders, wherever practicable.

(iii) Do not lift cylinders by using the valve protection device unless they have been designed for that purpose. Do not use ropes, chains or slings to suspend cylinders unless the supplier has installed appropriate lifting attachments such as lugs. Suitable cradles, platforms or pallets to hold the cylinders may be used for lifting. Refer to EIGA SI 25 (40), *Crane transport of cylinder packages*.

(iv) For moving over even floors and only for short distances the familiar manual 'churning' method may be used.

(v) Cylinders shall not be rolled along the ground since this may damage or even open the valve and will also damage identifying marks and symbols.

(vi) A cylinder shall not be moved with the valve open.

(vii) Cylinders shall not be used as work-supports or rollers.

(viii) When not being moved all cylinders shall be secured.

8. TRAINING

All staff who are required to handle and fill gas cylinders, including operating pressure equipment such as the filling system, should have the necessary skills and knowledge to carry out their job safely and are to have received appropriate training under a formalised system, including induction and continuation training. It is the duty of the employer to ensure their staff are adequately trained and to establish competency. All training is to be documented and records kept.

Training is to be provided on:

(i) The gas cylinders being filled, their valves and accessories.

(ii) The filling system.

(iii) The manual handling of gas cylinders. Refer to Section 7.2.

(iv) The hazards and key properties of beverage gases. Refer to Section 3.

(v) Ventilation and monitoring systems, including gas detection.

(vi) The correct storage of gas cylinders.

(vii) Actions in the event of an emergency.

(viii) Actions to rescue persons from confined spaces or where high concentration of an asphyxiant gas may be present.

9. REFERENCES

Document Number		Title
1		Weights and Measures Act 1985
2		Food Safety Act 1990
3	SI 1992: No 2793	Manual Handling Operations Regulations 1992.
4	SI 1996: No. 1502	Food (Lot Marking) Regulations 1996
5	SI 1997: No 1713	The Confined Spaces Regulations 1997
6	SI 1998: No 2306	The Provision and Use of Work Equipment Regulations 1998 (PUWER).
7	SI 2000: No 128	Pressure Systems Safety Regulations 2000 (PSSR).
8	SI 2002: No 1144	Personal Protective Equipment at Work Regulations 2002.
9	SI 2002: No 2677	Control of Substances Hazardous to Health Regulations 2002 (COSHH).
10	SI 2009: No. 716	The Chemicals (Hazard Information and Packaging for Supply) Regulations 2009. (CHIP 4)
11	SI 2009: No. 1348	The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (as amended).
12	SI 2013: No.2210	The Food Additives, Flavourings, Enzymes and Extractive Solvents (England) Regulations 2013.
13	European Regulation EC No 852/2004	Regulation on the hygiene of foodstuffs.
14	European Regulation EC No 1907/2006	Registration, Evaluation, Authorisation and restriction of CHemicals (REACH).
15	European Regulation EC No 1272/2008	The Classification, Labelling and Packaging of Substances and Mixtures (CLP).
16	European Regulation EC No 2008/84	Specific purity criteria for food additives other than colours or sweeteners (as amended).

	Document Number	Title
17	ECE/TRANS/225	European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR).
18	HSE Guidance Note EH 40	Workplace Exposure Limits.
19	HSE L25	Personal Protective Equipment at Work.
20	HSE L101	Safe work in confined spaces. Approved code of practice.
21	BS 341 Part 3	Transportable gas container valves. Valve outlet connections.
22	BS 349	Specification for identification of the contents of industrial gas containers. NOTE: Superseded by BS EN 1089-3.
23	BS EN 1089 Part 3	Transportable gas cylinders. Gas cylinder identification (excluding LPG). Colour coding.
24	BS EN 1919	Transportable gas cylinders. Cylinders for liquefied gases (excluding acetylene and LPG). Inspection at time of filling.
25	BS EN 1920	Transportable gas cylinders. Cylinders for compressed gases (excluding acetylene). Inspection at time of filling.
26	BS EN 1968	Transportable gas cylinders. Periodic inspection and testing of seamless steel gas cylinders.
27	BS 5045 Part 1: 1982 Part 3: 1984	Transportable gas containers: Part 1: Specification for seamless steel gas containers above 0.5 litre water capacity. Part 3: Seamless aluminium alloy. NOTE: Part 1 and 3 of this standard have been superseded but the original reference material remains valid.
28	BS ISO 5145	Cylinder valve outlets for gases and gas mixtures. Selection and dimensioning.
29	ISO 6406	Gas Cylinders - Seamless steel gas cylinders. Periodic inspection and testing.
30	BS EN ISO 11621	Gas cylinders. Procedures for change of gas service.
31	BS ISO 24431	Gas cylinders. Cylinders for compressed and liquefied gases (excluding acetylene). Inspection at time of filling.

Document Number		Title
32	EIGA IGC Document 64	Use of residual pressure valves.
33	EIGA IGC Document 70	Carbon dioxide source qualification quality standards and verification.
34	EIGA IGC Document 83	Recommendations for safe filling of CO_2 cylinders and bundles.
35	EIGA IGC Document 86	Gas cylinders and valves with restricted use in the EU.
36	EIGA IGC Document 136	Selection of personal protective equipment.
37	EIGA IGC Document 164	Safe handling of liquid carbon dioxide containers that have lost pressure.
38	EIGA IGC Document 182	Pre-fill inspection of customer owned cylinders.
39	EIGA Safety Information Sheet 24	Carbon dioxide physiological hazards.
40	EIGA Safety Information Sheet 25	Crane transport of cylinder packages.
41	BCGA Code of Practice 23	Application of the Pressure Systems Safety Regulations 2000 to industrial and medical pressure systems installed at user premises.
42	BCGA Code of Practice 35	Filling ratios and developed pressures for liquefied and compressed gases.
43	BCGA Code of Practice 43	The safe filling of gas cylinders.
44	BCGA Guidance Note 3	Safe cylinder handling and the application of the manual handling operations regulations to gas cylinders.
45	BCGA Guidance Note 6	Avoidance and detection of internal corrosion of gas cylinders.
46	BCGA Guidance Note 11	Reduced oxygen atmospheres. The management of risk associated with reduced oxygen atmospheres resulting from the use of gases in the workplace.

Document Number		Title
47	BCGA Guidance Note 14	Production, storage, transport and supply of gases for use in food.
48	BCGA Technical Information Sheet 6	Cylinder identification. Colour coding and labelling requirements.
49	BCGA Technical Information Sheet 17	Model risk assessment for manual handling activities in the industrial gas industry.
50	BCGA Leaflet 10	Profit through quality. Good gas, good business.
51	BBPA Booklet	Instructions for the safe operation of gas pressure systems used in the dispensing of beers and lagers.
52	ISBT N_2 Quality Guideline	Beverage Grade Nitrogen (Cryogenic Source) Quality Guidelines And Analytical Methods Reference.

Further information can be obtained from:

UK Legislation	www.legislation.gov.uk
Health and Safety Executive (HSE)	www.hse.gov.uk
British Standards Institute (BSI)	www.bsigroup.co.uk
European Industrial Gases Association (EIGA)	www.eiga.eu
British Compressed Gases Association (BCGA)	www.bcga.co.uk
The British Beer & Pub Association (BBPA)	www.beerandpub.com
Brewing Food and Beverage Industry Suppliers Association (BFBi)	www.bfbi.org.uk
The British Soft Drinks Association (BSDA)	www.britishsoftdrinks.com
The International Society of Beverage Technologists (ISBT)	www.bevtech.org

British Compressed Gases Association

www.bcga.co.uk