

Other Gases

DIN No	TD5/017	Issue Date	2 October 2000
Open Government Status	Fully Open	Review Date	31 October 2003

BRITISH COMPRESSED GASES ASSOCIATION

GUIDANCE NOTES AND CODES OF PRACTICE

by M Gregson

Q1. What is BCGA?

BCGA is the trade association representing companies involved in:

- industrial gas production and distribution
- cylinder manufacture
- production of gas control equipment

The term industrial gases refers to gases such as acetylene, argon, ammonia, carbon dioxide, chlorine, hydrogen, oxygen, nitrogen, etc. These gases are used for a wide range of purposes including chemical, medical, welding/cutting, food/drink and electronics. BCGA does not represent the users of compressed air or the natural gas industries.

Q2. What guidance has BCGA published?

BCGA publishes guidance notes, technical reports and codes of practice on the safe handling and storage of industrial gases. The guidance notes are generally accepted as industry standards. They are prepared by technical committees drawn from member companies. Revisions are frequently made to existing codes to ensure they reflect new developments and new or changes in standards and legislation. New codes of practice are prepared, if appropriate.

The current list of **BCGA publications** is given in **Appendix 1**. In 2000 several codes of practice are due for revision. New or recently revised items that may be of particular interest to process safety specialists are:

- TR1 The probability of fatality in oxygen enriched atmospheres due to spillage of liquid oxygen. R2 (LOX): 1999
- TR2 Replacement substances for the cleaning of oxygen system components: 1999
- GN7 The safe use of individual portable or mobile cylinder gas supply equipment: 2000
- CP30 The safe use of liquid nitrogen dewars up to 50 litres: 2000
- TIS4 Acetylene manifold systems for welding, cutting and allied processes: general requirements: 1999

BCGA publications can be obtained from:

British Compressed Gases Association,
14, Tollgate,
Eastleigh,
Hampshire
SO53 3TG
Tel: 023 8064 1488

Fax: 023 8064 1477

Website: www.bcgga.co.uk

Q3. Does HSE have any input into BCGA guidance?

Only BCGA members sit on the BCGA technical committees. Nevertheless HSE is regularly involved in discussions with BCGA and has the opportunity to comment on guidance and codes of practice prior to publication.

Q4. Is there any HSE guidance on compressed gases?

HSE has produced the following guidance on compressed gases:

- HSG 139 The safe use of compressed gases in welding, flame cutting and allied processes
- HSG 71 Chemical warehousing, the storage of packaged dangerous substances
- HSE 8 (rev 2) Take care with oxygen - Fire and explosion hazards in the use of oxygen
- INDG 297 Safety in gas welding cutting and similar processes
- INDG 308 The safe use of gas cylinders
- INDG327 Take care with acetylene

Q5. What other guidance on compressed gases is available?

In Europe, guidance on compressed gases has been published by the Industrial Gases Council (IGC) which is part of the European Industrial Gases Association (EIGA). EIGA are developing a web site with the intention of making their publications available free of charge. In the meantime, **IGC documents (see Appendix 2)** can be obtained (with difficulty) from Mrs H Weber, P.S.A. - Publications du Soudage et de ses Applications, PARIS NORD II - B.P.50362, F -95942 Roissy Charles de Gaulle Cedex - FRANCE Tel +33 1 49 90 36 00, Fax +33 1 49 90 36 50

In America, guidance on compressed gases has been published by the Compressed Gas Association (**CGA**). An extensive publication listing can be found on <http://www.cganet.com>.

(See also appendix 3)

The National Fire Protection Association (**NFPA**) have also published guidance on compressed gases (**Appendix 4**).

**APPENDIX 1
BRITISH COMPRESSED GASES ASSOCIATION
LIST OF PUBLICATIONS - MARCH 2000**

GUIDANCE NOTES

- GN1 Guidance Notes on the Preparation of Major Emergency Procedures: 1977 (reprinted 1997)
- GN2 Safe Practice for the Storage of Gases in Transportable Cylinders Intended for Industrial Use. Revision 2: 1997
- GN3 Application of the Manual Handling Operations Regulations to Gas Cylinders
- GN4 The Safe Use of CO₂ and CO₂/N₂ Cylinders in the Beverage Dispense Industry
- GN5 The Safe Application of Oxygen Enriched Atmospheres when Packaging Food: 1998
- GN6 Avoidance and Detection of Internal Corrosion of Gas Cylinders
- GN7 The Safe Use of Individual Portable or Mobile Cylinder Gas Supply Equipment: 2000
- GN8 Catalogue of BCGA Members' Cylinder Test Marks. Revision 2: 1998
- GN9 The Application of the Confined Spaces Regulations to the Drinks Dispense Industry: 2000

Technical Reports

- TR1 A Method for Estimating the Offsite Risks from Bulk Storage of Liquefied Oxygen. R1 (LOX): 1984
- TR2 The Probability of Fatality in Oxygen Enriched Atmospheres due to Spillage of Liquid Oxygen. R2 (LOX): 1999
- TR3 Replacement Substances for the Cleaning of Oxygen System Components: 1999

Codes of Practice

- CP3 Guidance for the Safe Disposal of Transportable Gas Containers at Waste Disposal Centres, Scrap Metal Merchants and Similar Organisations. Revision 3: 1993

- CP4 Industrial Gas Cylinder Manifolds & Distribution Pipework/Pipelines (excluding acetylene). Revision 2: 1998
- CP5 The Design & Construction of Manifolds using Acetylene Gas from 1.5 bar to a Maximum Working Pressure of 25 bar (362 lbf/in₂). Revision 1: 1998
- CP6 The Safe Distribution of Acetylene in the Pressure Range 0-1.5 bar (0-22 lbf/in₂). Revision 1: 1998
- CP7 The Safe Use of Oxy-Fuel Gas Equipment (Individual Portable or Mobile Cylinder Supply). Revision 2: 1996
- CP8 The Safe Storage of Gaseous Hydrogen in Seamless Cylinders & Similar Containers: 1986
- CP11 Procedures Required to be in Use in Test Stations that Undertake the Periodic Inspection, Testing & Maintenance of Transportable Gas Containers. Revision 3: 1994
- CP12 The Safe Use of Non-Refillable Gas Containers (Cylinders): 1984
- CP15 The Safe Re-rating of Existing BS 5045: Part 1 1982 PART 1 Containers to Amendment AMD 5145: 1986 Containers for Permanent Gases. Revision 1: 1996
- CP15 The Safe Re-rating of Existing BS 5045: Part 1 1982 PART 2 Containers to Amendment AMD 5145: 1986 Containers for Hydrogen Trailer Service. Revision 1: 1996
- CP16 Movement of Static Storage Tanks for Non-Flammable, Non-Toxic Gases by Road: Revision 1: 1998
- CP17 The Repair of Hand-held Blowpipes & Gas Regulators used with Compressed Gases for Welding, Cutting & Related Processes. Rev 1:1998
- CP18 The Safe Storage, Handling & Use of Special Gases in the Micro-Electronics Industry, Revision 1: 1995. (Published jointly with the Federation of the Electronics Industry (FEI))
- CP19 Bulk Liquid Oxygen Storage at Users' Premises. Revision 2: 1996
- CP20 Bulk Liquid Oxygen Storage at Production Sites. Revision 1: 1996
- CP21 Bulk Liquid Argon or Nitrogen Storage at Users' Premises. Revision 1:1998
- CP22 Bulk Liquid Argon or Nitrogen Storage at Production Sites: 1996
- CP23 Application of the Pressure Systems and Transportable Gas Containers Regulations 1989 to Industrial and Medical Pressure Systems Installed at Consumer Premises: 1992
- CP24 Application of the Pressure Systems and Transportable Gas Containers Regulations 1989 to Operational Process Plant: 1992
- CP25 Revalidation of Bulk Liquid Oxygen, Nitrogen, Argon and Hydrogen Cryogenic Storage Tanks. Rev 1: 1998
- CP26 Bulk Liquid Carbon Dioxide Storage at Users' Premises: Rev 1:1999
- CP27 Transportable Vacuum Insulated Containers of not more than 1000 litres volume: 1994
- CP28 Vacuum Insulated Tanks of not more than 1000 litres volume which are Static Installations at User Premises: 1997
- CP29 The Design and Operation of Cylinder and Tube Trailers for the Safe Transport of Compressed Gases by Road: 1999
- CP30 The Safe Use of Liquid Nitrogen Dewars up to 50 litres: 2000
- CP31 Safe Storage and Use of Cylinders in Mobile Workshops and Service Vehicles: 1997
- Leaflet:** Carriage of Gas Cylinders by Road in Cars and Vans - Guidance for Drivers at Work: 1996
- Leaflet:** The Safe Handling of Gas Cylinders at Waste Facilities

Technical Information Sheets

TIS No 3 1993: Dimensions for three-seat cutting nozzles

TIS No 4 1999: BS EN ISO 14114 Acetylene Manifold Systems for Welding, Cutting & Allied Processes

APPENDIX 2 List of IGC Publications

No	Subject
2/91	Guidelines for safe operations in gas cylinder filling stations
3/92	Safe charging systems for acetylene generators and other handling systems for calcium carbide
4/93	Fire hazards of oxygen and oxygen enriched atmospheres
5/86	Code of practice for supply equipment and pipelines distributing non flammable gases and vacuum services for medical purposes
5/99	Guidelines for disposal of acetylene cylinders
6/77	Oxygen/fuel gas cutting machine safety
6/93	Code of practice: Safety in storage, handling and distribution of liquid hydrogen
9/78	Code of practice for acetylene pipelines based upon working ranges
14/80	Code of practice for safety in gas systems for shielded arc and plasma processes

15/96	Gaseous hydrogen stations
16/85	Liquid oxygen storage installations at user's premises
17/85	Liquid nitrogen and liquid argon storage installations at user's premises
19/84	High pressure flame arrestors and flow cut off devices used in acetylene cylinder filling plants
20/83	Distribution of oxygen, acetylene and methylacetylene mixtures at user's works
21/85	Bulk liquid oxygen storage at production sites.
22/87	Safety guidelines for the operation and maintenance of acetylene plants
25/85	Bulk liquid nitrogen: argon storage at production sites
26/82	Determination of the permissible charge for individual acetylene cylinders
27/93	Code of practice: Centrifugal compressors for oxygen service
28/85	Glossary of terms for gas cylinders
29/85	Catalogue of manufacturer's marks stamped on compressed, liquefied or dissolved gas cylinders
30/99	Disposal of gases - code of practice
31/85	Gas cylinders symposium
32/87	Safety, Motivation and Training (Symposium)
33/86	Cleaning of equipment for oxygen service - Guidelines
34/87	Refillable acetylene cylinders
35/87	Porous masses for dissolved acetylene cylinders presently manufactured
36/90	Catalogue of control marks stamped on compressed, liquefied or dissolved gas cylinders
38/88	Safe disposal of acetylene cylinders
39/99	Safe preparation of gas mixtures - code of practice (in preparation)
40/90	Work permit systems
41/89	Guidelines for transport of vacuum insulated tank containers by sea
42/89	Prevention of hose failures in high pressure gas systems
43/90	Hazards associated with the use of activated charcoal cryogenic gas purifiers
44/90	Hazards of inert gas
45/91	8th Symposium: Safety in transport: People and products
50/94	9th Symposium: Safety is good business: Managing and planning for safety progress. Systems and techniques.
51/94	Code of practice: plant and equipment release procedure
52/94	A guideline for EIGA members and third party companies who regularly transport 'gas cylinders. Load Securing
53/94	Training material safe handling of gas cylinders and pallets
54/95	Road vehicle safety programme
56/97	CO ₂ - Tanker driver manual
57/97	Recommendations for avoidance of neck and shoulder cracking of aluminium alloy cylinders
58/98	Safety and the human factor
59/99	Prevention of excessive pressure in cryogenic tanks during filling
60/98	Prevention of major accidents - Guidance on compliance with Seveso II Directive
61/98	Safe use of gas cylinders in marine service
62/98	Methods to avoid and detect internal gas cylinder corrosion
63/99	Prevention of tow-away accidents
64/99	Guidance on the use of residual pressure valves
65/99	Safe operation of reboilers/condensers in air separation units
66/99	Refrigerated CO ₂ storage at users' premises
67/99	CO ₂ cylinders at users' premises
68/99	Prevention of CO ₂ backfeed contamination
69/99	Transport emergency instructions
70/99	Carbon dioxide source certification, quality standards and verification
71/00	Safety in the supply chain

APPENDIX 3
CGA Publications

- C-1 Methods for Hydrostatic Testing of Compressed Gas Cylinders
- C-3 Standards for Welding on Thin Walled Steel Cylinders
- C-4 ANSI Method of Marking Portable Compressed Gas Containers to Identify the Material Contained
- C-5 Cylinder Service Life - Seamless Steel High Pressure Cylinders
- C-6 Standards for Visual Inspec of Steel Compressed Gas Cylinders
- C-6.1 Standards for Visual Inspec of High Pressure Aluminium Compressed Gas Cylinders
- C-6.2 Guidelines for Visual Inspec & Requal of Fiber Reinforced High Pressure Cylinders
- C-6.3 Guidelines for Visual Inspec & Requal of Low Pressure Aluminium Compressed Gas Cylinders
- C-6.4 Methods for External Visual Inspection of Natural Gas (NGV) Fuel Containers and their installations
- C-7 Guide to the Preparation of Precautionary Labelling & Marking of compressed Gas Containers
- C-8 Standard for Requal of DOT-3HT Seamless Steel Cylinders
- C-9 Standard Color Marking of Compressed Gas Containers Intended for Medical Use
- C-10 Recomm Procedures for Changes of Gas Service for Compressed Gas Cylinders
- C-11 Recomm Practices for Inspec of Compressed Gas Cylinders at Time of Manufacture
- C-12 Qualification Procedure for Acetylene Cylinder Design
- C-13 Guidelines for Periodic Visual Inspec & Requal of Acetylene Cylinders
- C-14 Procedures for Testing of DOT Cylinder/Safety Relief Device Systems
- C-15 Procedures for Cylinder Design Proof & Service Performance Tests
- C-16 CGA Registration Program for Cylinder Owner Symbols
- C-16.1 CGA Cylinder Owner's Registration Symbols & Company Names
- CGA-341 Standard for Insulated Cargo Tank Specification for Cryogenic Liquids
- C-18 Methods for acoustic emission requalification of seamless steel compressed gas tubes
- E-1 Standard Connection for Regulator Outlets, Torches & Fitted Hose for Welding & Cutting Equip
- E-2 Hose Line Check Valve Standards for Welding & Cutting
- E-3 Pipeline Regulator Inlet Connection Standards
- E-4 Standard for Gas Pressure Regulators
- E-5 Torch Standard for Welding & Cutting
- E-6 Standard for Hydraulic Type Pipe Line Protective Devices
- E-7 ANSI for Medical Gas Regulators & Flowmeters
- E-9 Standard for Medium Pressure (3000 PSIG) Flexible PTFE - Lined Pigtails for Compressed Gas Service
- E-10 Maintenance of medical gas and vacuum systems in health-care facilities
- G-1 Acetylene
- G-1.1 Commodity Specification for Acetylene
- G-1.2 Recommendations for Chemical Acetylene Metering
- G-1.3 Acetylene Transmission for Chemical Synthesis
- G-1.5 Carbide Lime - Its Value & Its Uses
- G-1.6 Recomm Practices for Mobile Acetylene Trailer Systems
- G-1.7 Standard for Storage & Handling of Calcium Carbide in Containers
- G-1.8 Guidelines for the operation and closure of lime ponds
- G-2 Anhydrous Ammonia
- G-2.1 ANSI Safety Requirements for the Storage & Handling of Anhydrous Ammonia ANSI K61.1
- G-2.2 Guideline Method for Determining Minimum of 0.2% Water in Anhydrous Ammonia
- G-3 Sulfur Dioxide
- G-4 Oxygen
- G-4.1 Cleaning Equip for Oxygen Service
- O2-DIR 1998 Directory of cleaning agents for oxygen service
- G-4.3 Commodity Specification for Oxygen
- G-4.4 Industrial Practices for Gaseous Oxygen Transmission & Distribution Piping Systems
- G-4.6 Oxygen Compressor Installation Guide
- G-4.8 Safe Use of Aluminium Structured Packing for Oxygen Distillation
- G-4.9 Safe use of brazed aluminium heat exchangers for producing pressurized oxygen

G-5	Hydrogen
G-5.3	Commodity Specification for Hydrogen
G-5.4	Standard for Hydrogen Piping at Consumer Locations
G-5.5	Hydrogen vent systems
G-6	Carbon Dioxide
G-6.1	Standard for Low Pressure Carbon Dioxide Systems at Consumer Sites
G-6.2	Commodity Specification for Carbon Dioxide
G-6.3	Carbon Dioxide Cylinder Filling & Handling Procedures
G-6.4	Safe Transfer of Low Pressure Liquefied Carbon Dioxide in Cargo Tanks, Tank Cars, & Portable Containers
G-6.5	Standard for Small Stationary Low Pressure Carbon Dioxide Systems
G-6.6	Standard for Elastomer-Type Carbon Dioxide Bulk Transfer Hose
G-6.7	Safe handling of carbon dioxide containers that have lost pressure
G-6.9	Dry ice
G-7	Compressed Air for Human Respiration
G-7.1	ANSI Commodity Specification for Air
G-8.1	Standard for Nitrous Oxide Systems at Consumer Sites
G-8.2	Commodity Specification for Nitrous Oxide
G-9.1	Commodity Specification for Helium
G-10.1	Commodity Specification for Nitrogen
G-11.1	Commodity Specification for Argon
G-12	Hydrogen Sulfide
CGA-338	Design guidelines for MC-338 cargo tanks
CGA-341	Standard for insulated cargo tank. Specification for nonflammable cryogenic liquids
HB-3	Handbook of Compressed Gases
P-1	Safe Handling of Compressed Gases in Containers
P-2	Charac & Safe Handling of Medical Gases
P-2.5	Transfilling of High Pressure Gaseous Oxygen to be Used for Respiration
P-2.6	Transfilling of Liquid Oxygen to be Used for Respiration
P-2.7	Guide for the Safe Storage, Handling & Use of Portable Liquid Oxygen Systems in Health Care Facilities
P-5	Suggestions for the Care of High-Pressure Air Cylinders for Underwater Breathing
P-6	Standard Density Data, Atmospheric Gases & Hydrogen
P-7	Standard for Requal of Cargo Tank Hose Used in the Transfer of Compressed Gases
P-8	Safe Practices Guide for Air Separation Plants
P-8.1	Safe Installation & Operation of PSA & Membrane Oxygen & Nitrogen Generators
P8-2	Air separation unit and trailer filling. Validation guideline and oxygen USP and nitrogen NF
P-9	The Inert Gases: Argon, Nitrogen & Helium
P-10	Standard for Vinyl Chloride Monomer Tank Car Manway Cover & Protective Housing Arrangement & Emergency Safety Kit
P-11	Metric practice Guide for the Compressed Gas Industry
P-12	Safe handling of Cryogenic Liquids
P-13	Safe Handling of Liquid Carbon Monoxide
P-14	Accident Prevention in Oxygen-Rich & Oxygen-Deficient Atmospheres
P-15	Filling of Industrial & Medical Non-Flammable Compressed Gas Cylinders
P-16	Recomm Procedures for Nitrogen Purging of Tank Cars
P-17	Procedures for Pneumatic Retesting of Cargo & Portable Tanks
P-18	Standard for Bulk Inert Gas Systems at Consumer Sites
P-19	Hazard Ratings for Compressed Gases
P-20	Standard for the Classification of Toxic Gas Mixtures
P-21	Guidelines for the Development of Pre-Trip Inspec. Check List & Reports for MC 338/TC 338 & TC 341 Cargo Tanks
P-22	The Responsible Management & Disposition of Compressed Gases & Their Containers

P-23	Standard for Categorizing Gas Mixtures Containing Flammable and Nonflammable Components
P-24	Guide to the Preparation of Material Data Safety Sheets
P-25	Guide for flat-bottomed LOX/LIN/LAR storage tank systems
P-26	Guidelines for inspection and repair of MC-330 and MC-331 anhydrous ammonia cargo tanks (formerly TB-2)
P-28	Risk Management Plant Guidance. Document for bulk liquid hydrogen systems
P-29	Application of OSHA PSM and EPA RMP to the compressed gas industry
P-32	Safe storage and handling of silane and silane mixtures
S-1.1	Pressure Relief Device Standards - Part 1 - Cylinders for Compressed Gases
S-1.2	Pressure Relief Device Standards - Part 2 - Cargo & Portable Tanks for Compressed Gases
S-1.3	Pressure Relief Device Standards - Part 3 - Compressed Gas Storage Containers
S-7	Method for Selecting Pressure Relief Devices for Compressed Gas Mixtures for Cylinders
V-1	CGA Standard for Compressed Gas Cylinder Valve Outlet & Inlet Connections
V-5	Diameter Index Safety System
V-6	Standard Cryogenic Liquid Transfer Connections
V-6.1	Standard Carbon Dioxide Transfer Connections
V-7	Standard Method of Determining Cylinder Valve Outlet Connections for Industrial Gas Mixtures
V-7.1	Standard method of determining cylinder valve outlet connections for medical gases
V-9	ANSI, CGA Standard for Compressed Gas Cylinder Valves

APPENDIX 4 NFPA publications

50 Bulk oxygen systems at consumer sites	1996
50A Gaseous hydrogen systems at consumer sites	1999
50B Liquefied hydrogen systems at consumer sites	1999
51 Design and installation of oxygen-fuel gas systems for welding, cutting and allied processes	1997
52 Compressed natural gas (CNG) vehicular fuel systems	1998
53 Oxygen enriched atmospheres	1999
55 Compressed and liquefied gases in portable cylinders	1998

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