

STORAGE, HANDLING AND TRANSPORTATION OF MEDICAL GAS CYLINDERS - CHW

PROCEDURE [®]

DOCUMENT SUMMARY/KEY POINTS

- Details the safe storage, handling and transportation of medical gas cylinders.
- Identifies manager and worker responsibilities regarding the storage, handling and transportation of compressed gas cylinders.
- Used or nominally empty cylinders shall be afforded the same precautions as full cylinders.
- Medical gases should only be used for the purpose for which they are supplied.
- Medical gas cylinders must only be used in conjunction with a pressure regulator unless the cylinder has an integrated valve regulator.

Related Information

- [SCHN Work Health Safety Risk Management Procedure](#) (No: 2013-9041)
- SCHN [Safe Work Practice Transport & Storage of Medical Gas Cylinders](#)
- BOC Guidelines for Gas Cylinder Safety (www.boc.com.au)
- Coregas Information and Guidelines – [Safety around gases](#)
- AS4332-2004(Reconfirmed 2016): - [The Storage and Handling of Gases in Cylinders](#)

Approved by:	SCHN Policy, Procedure & Guideline Committee	
Date Effective:	1 st September 2023	Review Period: 3 years
Team Leader:	WHS Coordinator	Area/Dept: Health, Safety & Wellbeing

CHANGE SUMMARY

- Updated references and related information.
- Update risk and hazard management details.

READ ACKNOWLEDGEMENT

- Clinical workers, Porters, Laboratory staff and Bio Medical Engineering staff.
- Manager/Supervisor to determine other relevant workers this procedure is applicable to, if any, are to read and acknowledge the document or acknowledge the document only.

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Introduction

- This document will assist staff and managers to ensure correct storage, handling and transportation of medical gas cylinders.
- The Work Health and Safety Act 2011 impose obligations on workers and person conducting a business or undertaking (PCBU) to identify foreseeable work health and safety hazards in the workplace. This procedure will assist in meeting these obligations.

Responsibilities

Managers/Supervisors

- Ensure compliance with the requirements of this procedure.
- Consult with workers and WHS Committee or Health and Safety Representatives in the identification, assessment and control of risks associated with the storage, handling and transportation of medical gas cylinders.
- Investigate any reported incident or injury involving medical gas cylinder.
- Ensure workers receive appropriate training and education if required.
- Supervise workers to ensure compliance with this procedure.

Workers

- A worker has a duty to take reasonable care for their own health and safety while at work and also to take reasonable care so that their conduct does not adversely affect the health and safety of other persons at the workplace.
- Report WHS hazards/risks in the workplace.
- Document incidents or injuries on electronic incident management system (IMS+).
- Comply with WHS instructions, procedures, and safe work practices (SWP's).
- Attend training as required for the management of WHS hazards/risks in the workplace.
- Participate, as required, in the consultative process when workplace safety is being addressed.
- Cooperate with managers in the interests of health and safety.
- Be aware of safety data sheets (SDS's) information for medical gas cylinders.
- Follow relevant SWP's for storage, handling, use and transport of medical gas cylinders.

Types of Medical Gases

There are two types of medical gases commonly supplied and used:

1. Compressed Gases – Nitrous Oxide, Nitric Oxide, Oxygen, Air, Carbon Dioxide, Helium & Entonox.
2. Liquefied Gases – Liquid Oxygen & Liquid Nitrogen


Identification & Labelling of Medical Gas Cylinders

Always use the medical gas cylinder label as the primary means of identification. The contents of the medical gas cylinder appears on the label affixed to the shoulders, body or gas cylinder collar. Gas cylinder shoulders are also colour coded and fitted with different valve outlets to provide product differentiation. Never alter markings, labelling or colour coding of medical gas cylinders. A gas cylinder without a label should not be used and returned to the gas cylinder Supplier. All medical gases are Class 2 Dangerous Goods.


All medical gas cylinders are also fitted with a barcode by the supplier for tracking purposes and should not be tampered with or removed.

Dangerous Goods class


All medical gases are Class 2 Dangerous Goods.




A green diamond indicates that the contents are non-flammable and non-toxic as defined by the Australian Dangerous Goods Code.




A yellow diamond indicates an oxidising gas.




Class 2.1



2.2



2.2/5.1

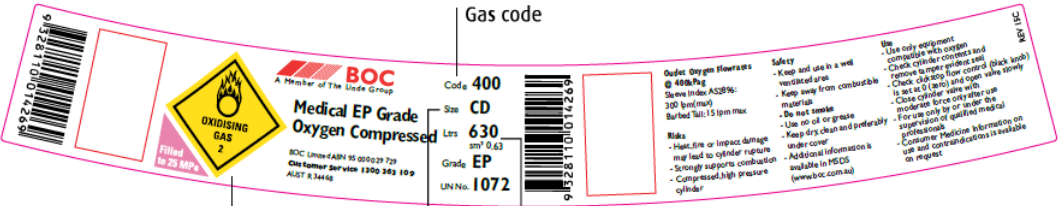


2.3

Gases of Class 2.1 shall be segregated from those of Class 2.3 and 2.2/5.1 by at least 3m

Gases of class 2.3 shall be segregated from gases of Class 2.1 or 2.2/5.1 by at least 3m

Cylinder labelling identification



The label includes the following information:

- Gas code:** 400
- Size:** CD
- Content:** 630 litres
- Grade:** EP
- UN No.:** 1072
- Class diamond:** Oxidising Gas 2
- Size:** 630 litres

Reference: BOC Medical Gases Cylinder Identification guide

Where gases are stored in excess of the placard quantities as specified in the [Schedule 11 of the WHS Regulation 2017](#), placarding is required to be erected.

Use of a Medical Gas Cylinder

Preparation for use

- Medical [gas cylinders](#) should always be restrained at all times by using a gas cylinder trolley, wall bracket, stand or specific gas cylinder holder.
- Always confirm the medical gas type by checking the gas cylinder identification label, the cylinder label must be used as the primary means of gas identification.
- Inspect the medical gas cylinder that it is free of oil, grease or other lubricants.
- Always remove the disposable security seal from valve and discard. Do not attach regulators over the disposable security seal.
- Ensure the valve opening is clean and free from foreign matter. Do not 'crack' open the valve prior to use as the gas cylinder may become unstable.
- Always attach a pressure regulator before opening the gas cylinder, ensuring pin indexing of valve and regulator match. Check regulator is within service period and if out of date contact the gas cylinder Supplier (CHW clinical areas to contact BME Inhalation Therapy).
- Take care when fitting a pressure regulator to avoid bumping the valve into the open position.
- Ensure connection face on the yoke, manifold or regulator is clean and that a seal is in place and in good condition, if in doubt replace.
- The yoke, manifold or regulator yoke can now be attached. Hand tighten the connection to the valve.
- Open the medical gas cylinder valve slowly. Valve should be opened fully and in then closed one quarter turn to enable subsequent users to distinguish between open or closed.
- Check the medical gas cylinder contents prior to active use, via the reading on the pressure gauge, to ensure you have sufficient gas for your application.

Leaks

- Leaks from gas cylinders are potentially very dangerous, depending on the properties of the gas. If a medical gas cylinder is found to be leaking than appropriate measures should be put in place to limit risk.
- Leaks may occur at the connection between the valve and yoke. These leaks can be verified by closing the cylinder valve and noting any fall in the reading of the pressure gauge.
- Leaking medical gas cylinders must be segregated from other cylinders in a well-ventilated area and immediately contact BME Inhalation Therapy or the gas cylinder Supplier.

After Use

- Cylinder valves should be closed directly after use and when cylinders are empty.
- Release remaining pressure in regulator, provided there are no sources of ignition present.
- Cylinder valves only need to be hand tightened to close. Excessive force will result in damage to the valve.
- Remove regulators and flow meters before leaving empty cylinders for collection.

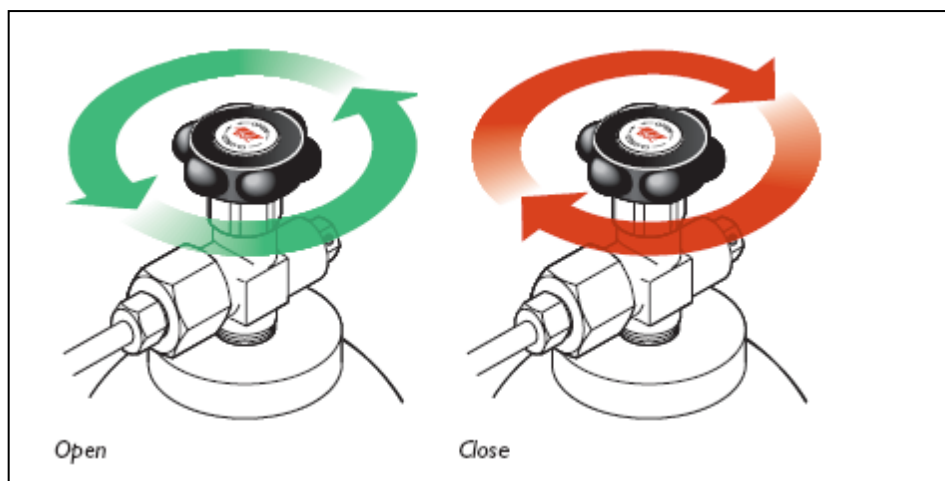
Cylinder Valves and Regulators

The gas cylinder valve is the primary safety mechanism on a gas cylinder and shall not be tampered with. It is a device used to contain the contents of the cylinder that is under pressure. Cylinder valves are fitted with pressure relief valves of different types (depending on the gas cylinder) to protect against catastrophic failure of the cylinder valve.

NOTE: Cylinder valves on flammable gases have a left hand thread to attach the regulator. This is to distinguish them from non-flammable gases.

The thread size of an Air or Nitrogen cylinder valve differs from Oxygen so that they cannot be mistaken in medical applications.

Cylinder valves open in an anticlockwise direction and close in a clockwise direction. Valves shall never be opened without a regulator and flow meter attached. Always open cylinder valves slowly.



Correct operation of gas cylinder head valve tap

The regulator is the next most important safety device to be fitted to a gas cylinder before use. It allows for the high pressure of the cylinder contents to be brought down to a usable working pressure. Regulators come as single stage for short term applications and two stages for long term applications.

Regulators are also constructed from different materials, mainly brass or stainless steel.

- The application will define the required regulator. If you are unsure of which kind of regulator to use, consult Bio Medical Engineering Inhalation Therapy or the gas cylinder Supplier.
- Regulators are designed to be fitted directly to the cylinder valve. No other fittings, connections or lubricants shall be used to connect a regulator to a gas cylinder valve.
- Regulators for flammable gases are left hand threaded and have a notch cut out of faces on the securing nut to distinguish them from non-flammable gas regulators.

Risks and Hazard Management

Gas cylinders can be hazardous due to both their physical (size and weight) and chemical characteristics. Hazards from gases are also subject to the chemical properties of each gas. These may be one or more of the following:

- Fire or explosion from the release of flammable gases near ignition sources (e.g. acetylene or LPG). Refer to Manufacturer/Supplier safety data sheet (SDS) for Upper and Lower Explosive Limits (UEL and LEL)
- Spontaneous combustion from oxidizing gases (e.g. oxygen or nitrous oxide)
- Exposure limits for all gases, especially toxic or corrosive gases (e.g. anhydrous ammonia); refer to SDS for Time Weighted Exposure Limit (TWA) and Short Term Exposure Limit (STEL)
- Asphyxiation from non-toxic, non-flammable gases by displacement of oxygen (e.g. nitrogen, carbon dioxide or argon)
- Incorrect storage
- Leaks
- Faulty equipment/connections
- Physical risks
- Manual handling
- Sudden release of gas if cylinder is damaged (torpedo effect).
- Pressure – compressed gas cylinders are filled to a pressure of 200-300 atmospheres
- Gas Density

Read, understand, and follow the markings on the gas cylinder, the label(s) on the gas cylinder, and the SDS to avoid misuse. The SDS must be read to identify:

- Product information and use
- Details of the Supplier of the product and emergency contact details
- Chemical and physical hazards for each gas cylinder
- Globally Harmonised System Labelling elements – hazard and prevention statements

- Composition information on ingredients
- Appropriate safe storage and handling practices
- Personal Protective Equipment
- First aid measures
- Fire-fighting measures and accidental release measures
- Density of the gas
- Exposure limits
- Physical and chemical properties
- Stability and reactivity
- Toxicological and Ecological Information
- Disposal considerations
- Transport requirements
- Regulatory Information and other information

Each compressed gas cylinder has a unique hazards based on its contents. Some are filled with inert gases – especially those used in arc welding. Many gases are flammable, explosive, toxic, or a combination.

NOTE: When gases are released and expand, a drop in temperature occurs. In some cases (e.g. carbon dioxide) the rapid release and expansion of gas can cause a cold hazard (e.g. frostbite) to exposed persons.

This procedure outlines some controls to be implemented for pre-identified hazards relating to storage, handling & transport of medical gas cylinders. If further hazards are identified (e.g. local department/ward hazards) then a risk assessment must be carried out and recorded to identify hazards and the need for any additional control measures.

Safe Work Procedures have been developed for tasks that routinely involve the use and handling of gases from pressurised cylinders. Anyone working with gas cylinders needs to be given information, training and effective supervision regarding the hazards from gas cylinders, safe storage and handling information, readily available SDS's and what to do in an emergency.

Storing Gas Cylinders

- All medical gases cylinders, including empty cylinders, must be protected from being knocked over or falling.
- Never leave medical gases cylinders unrestrained.
- Keep all medical gas cylinders in secured holders or storage rack to protect against impact damage.
- If the medical gas cylinder is stored with the regulator connected to the cylinder, the valve and regulator must be turned off.

- Medical gas cylinders storage area shall be separated by a wall from other areas in the clinical area.
- The total capacity of indoor medical gas cylinders should not exceed minor storage quantity per 200m² of floor area.
- Placarding and signage needs to be displayed to meet the requirements of the WHS Regulation.
- Hazardous chemicals may adversely affect gas cylinders in an emergency so refer to SDS and ChemAlert system for correct storage and segregation of incompatible substances. For this reason gas cylinders must be kept separately from other minor stores of gases or dangerous goods and combustible liquids by a minimum distance of 5 meters or by using an appropriate fire rated barrier.
- Gas cylinders must also be segregated from other incompatible gases by at least 3m or more. It is recommended that Class 2.3 toxic gas and corrosive gases are stored away from all other gas cylinders and Class 2.1 Flammable gas is segregated during storage from all oxidising gases.
- Medical gases cylinders must be kept away from oils and grease.
- Ignition sources shall not be located in a store containing flammable gases.
- Medical gas cylinders should not be located where they may block stairs, exits, ladders or walk ways.
- Ensure an up to date and accurate inventory is kept on ChemAlert system of medical gas. Keep inventory quantities as low as possible.
- Rotate cylinders in storage to ensure that they are not stored for excessive periods.
- Full medical gases cylinders must be stored separately from empty and in use medical gas cylinders.

Cleaning/Porter Services Department must be contacted if there are an excess of cylinders for the number of storage racks or holders available in the clinical area.

Bulk Cylinder Storage

- Bulk gas cylinder stores should be located outdoors, preferably in a secure cage protected from sunlight. Storage indoors is not recommended unless the building has been designed for that purpose with appropriate fire rated walls and ventilation. Where gas cylinders are stored indoors, additional safety considerations and control measures need to be implemented include security of bulk gas cylinder storage.
- It is recommended that if you store significant quantities of gas in cylinders that you refer to [AS 4332-2004 \(Reconfirmed 2016\) - The Storage and Handling of Gases in Cylinders](#) for guidance.

Manifest of Hazardous Chemicals

- Requirements for management of placarding and manifest quantities of hazardous chemicals (including medical gas cylinders) are detailed in relevant SafeWork NSW Code of Practices and Guidelines. The hospital needs to include a list of bulk gas

storage areas (including contents and quantities), site plan, and emergency plan for Fire & Rescue NSW, and notification to SafeWork NSW.

Handling and Transportation

- Do not lift medical gases cylinders by the caps or regulator.
- Do not handle medical gases cylinders with oily hands.
- Medical gases cylinders must not be dropped or rolled.
- Medical gases cylinders and their fittings must be checked regularly for leaks.
- A suitable trolley or lifting device shall be used for moving cylinders.
- Medical gas cylinders should be securely restrained during transportation and positioned so that the valve and the regulator are protected from being knocked or damaged. Do not restrain gas cylinders around the neck or valve- restrain them around the main cylinder body at a height that will prevent them from falling over.
- Storage of medical gas cylinders in Ambulance vehicles must be secured using the installed bracket and approved method for securing the gas cylinder in the vehicle.
- Large gas cylinders (e.g. G or F sized cylinders) can be bulky, heavy, and awkward to handle, they require special care and equipment in handling and securing so they don't fall or tip over and cause injury.
- Ideally cylinders should be transported standing up and firmly secured. Flammable and Liquid withdrawal cylinders should always be transported in upright position.
- If cylinders are transported lying down then suitable support devices are required to prevent the cylinders from rolling. Also settling time will be required for the cylinder before use, place the cylinder in the upright position and wait 60 minutes before using.

Bibliography

- AS4332:2004 (Reconfirmed 2016) - The Storage and Handling of Gases in Cylinders
- Australian Standard AS2030.1-2009 Gas cylinders
- Guidelines for Gas Cylinder Safety, BOC Gases
- SafeWork NSW - [Placarding for storage of hazardous chemicals](#)
- SafeWork NSW Code of Practice – [Hazardous Manual Tasks August'19](#)
- SafeWork NSW Code of Practice – [Managing risks of hazardous chemicals in the workplace, December 2022](#)
- SafeWork NSW [Notifications for Schedule 11 Hazardous Chemicals and Abandoned Tanks Guidance Material \(SW08219\)](#)
- Work Health and Safety Act 2011
- Work Health and Safety Regulation 2017

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