



HEALTH HOLDING

HAFER ALBATIN HEALTH
CLUSTER
MATERNITY AND
CHILDREN HOSPITAL

Department:	Facility Management and Safety		
Document:	Multidisciplinary Policy and Procedure		
Title:	Compressed Gas Cylinders		
Applies To:	All MCH Staff		
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1. PURPOSE:

- 1.1 The purpose of this procedure is to ensure that all gas cylinders that are received, handled or stored are done so in accordance with safe practices in order to minimize potential hazards.

2. DEFINITIONS:

- 2.1 **Anesthetizing Location:** Any area of a health care facility that has been designed to be used for the administration of any flammable inhalation anaesthetic agent in the course of examination or treatment, including the use of such agents for relative analgesia.
- 2.2 **Combustible Materials that could be found near patients:** hair oils, oil based lubricants, skin lotions, facial tissues, clothing and linen, rubber and plastic articles, gas supply, suction tubing, alcohols and acetone. As much as possible avoid these in the area near where oxygen is being administered.
- 2.3 **Compressed Gas** – Any material or mixture having, when in its container, an absolute pressure exceeding 40psia (an absolute pressure of 276 kPa) at 70° F (21.1° C) or, regardless of the pressure at 70° F (21.1°C) having an absolute pressure exceeding 104 psia (an absolute pressure of 717 kPa)at 130° F (54.4°C).
- 2.4 **Compressed Gas Cylinder** – Any portable pressure vessel of 45.4 kg (100 lb.) water capacity or less designed to contain a gas or liquid that authorized for use at gauge pressures over 276 kPa (40 psi) at 21°C (70° F) by the Department of Transportation.
- 2.5 **'E' sized Compressed Gas Cylinder** – Holds approximately 25 cu.ft. of gas.
- 2.6 **EMRs:** Environmental Monitoring Rounds
 - 2.6.1 **Flammable Anesthetics:** Gases or vapors such as fluroxene, cyclopropane, divinyl ether, ethyl chloride, ethyl ether, and ethylene, which may form flammable or explosive mixtures with air, oxygen, or reducing gases such as nitrous oxide.
 - 2.6.2 **Flammable Compressed Gas:** A compressed gas which forms a flammable mixture when 13% or less (by volume) is mixed with air, or a compressed gas having a flammable range with air wider than 12%, regardless of the lower limitation. These limitations shall be determined at atmospheric temperature and pressure. Flammable gases do not have flash points. Also: Any substance that exists in the gaseous state at normal atmospheric temperatures and pressure and is capable of being ignited and burned when mixed with the proper proportions of air, oxygen, and other oxidizers.
- 2.7 **Flammable Material Storage Cabinet:** A storage cabinet which is constructed in accordance with standards.
- 2.8 **HSE:** Health, Safety and Environment
- 2.9 **"H" sized Compressed Gas Cylinder:** Holds approximately 250 cu. Ft. of gas.
- 2.10 **Medical Air:** Medical air is air supplied from cylinders, bulk containers, medical air compressors or has been reconstituted from oxygen USP and oil free nitrogen NF.
- 2.11 **Oxidizing Gases:** A gas that supports and accelerates combustion of other materials. Oxygen and nitrous oxide are examples. There are many others including halogens.
- 2.12 **Upright Position:** Position includes when compressed gas cylinders axis is inclined as much as 45 degrees from the vertical.

3. POLICY:

- 3.1 It is the policy of hospital that all compressed gas cylinders, either in use or in storage (empty or full), shall be tightly secured by a strap, chain, non –tip base or other approved means.
- 3.2 When securing the compressed gas cylinders, one (1) cylinder is the highest number that can be secured on a single chain / strap securement.
- 3.3 When in use, all cylinders must be equipped with an appropriate regulating device.
- 3.4 Special storage requirement is based on the total volume of compressed gas is in an area.
- 3.5 Partially full compressed gas cylinders containing residual gases shall be considered as full and are subject to the same controls and storage conditions.

4. PROCEDURE:

- 4.1 **The color of a compressed gas cylinder is not adequate identification of the contents of the cylinder:**
 - 4.1.1 The name of the gas must be on the cylinder (stencil or attached label) and this must be checked prior to using the gas for a patient.
 - 4.1.2 Labels shall not be defaced, altered, or removed.
 - 4.1.3 The expiration date must be checked prior to using the gas for a patient.
- 4.2 **When in use for health care, all compressed gas cylinders must be equipped with an appropriate approved regulating device:**
 - 4.2.1 All regulators must be marked to identify the gas (or group of Compatible gases) with which the Regulator is to be used.
 - 4.2.2 Regulators are designed to fit only the threads of the compressed gas cylinder of one type of gas.
 - 4.2.3 If the threads do not match the cylinder, do NOT use the cylinder until contents are determined by testing.
- 4.3 **Magnetic Resonance Imaging (MRI) special requirements for compressed gas cylinders:**
 - 4.3.1 The Compressed Gas Association, Inc. Has the following recommendations:
 - 4.3.1.1 Compressed gas cylinders, Cylinder valves, cylinder regulators, other assemblies included with cylinders, or any other equipment used to supply compressed gases shall not be present in the same room as an MRI device unless proven non-magnetic and / or tested and deemed suitable for use in an "MRI
 - 4.3.1.2 Serious personal injury and property damage has resulted from the use of steel gas cylinders in close proximity to MRI device.
 - 4.3.1.3 If you have any questions as to whether a piece of equipment is suitable for use in the MRI environment, the equipment manufacturer or supplier should be contacted.
 - 4.3.2 The "E" compressed gas cylinders used in MRI are made of aluminium.
 - 4.3.3 In addition, MRI has as a reserve supply a regular "H" cylinder secured (bolted – NOT chained) to the wall.
- 4.4 Because the hospital is smoke free institution , because No Smoking signs are posted in the major entrances and because of strict enforcement of "No Smoking" policy , we are not required to post No Smoking signs at the actual location where oxygen is in use. There are other sign requirements listed in this policy.
- 4.5 Carbonated beverages cylinders are a type of compressed gas cylinder. Precautions listed below also apply to carbonated beverage cylinders.
- 4.6 **Compressed Gas Cylinders must be secured to prevent falling caused by contact, vibration or seismic activity:**
 - 4.6.1 It is the policy of the hospital that all compressed gas cylinders, either in use or in storage (empty or full), shall be tightly secured by a strap, chain, non-tip base, within a rack or other approved means. The Health, Safety and Environment needs to approved any other way of securing a compressed gas cylinder.

- 4.6.2 When securing the cylinders, one (1) is the highest number secured on a single chain/ strap as allowed.
- 4.6.3 When a compressed gas cylinder is being transported on a slanted carriage, it must still be secured by a strap, chain, or other approved means.
- 4.6.4 To a therapy apparatus of sufficient size to render the entire assembly stable.
- 4.7 Protective valve caps must be in place when "H" cylinders are not in use.
- 4.8 All cylinders must be equipped where necessary with a hand wheel, valve handle, spindle key, or a special tool to activate the cylinder valve. This shall be attached to the cylinder so that it will immediately be available in the event of an emergency.
- 4.9 **Flammable compressed gases (see HSE 402 for further information):**
 - 4.9.1 Shall be grounded
 - 4.9.2 Shall be stored separately from oxidizing gases.
 - 4.9.3 Must be stored in an approved storage area.
 - 4.9.4 Flammable gas cylinders shall not be stored in a corridor, stairway or any means of egress.
 - 4.9.5 Cylinders of liquefied flammable gas (I.E. Propane) are prohibited from use or storage inside any building .
- 4.10 **All compressed gas cylinders must be returnable to the manufacturer for refill or proper disposal:**
 - 4.10.1 The use of commercially supplied gas in non-refillable, non-returnable cylinders is prohibited.
 - 4.10.2 This restrictions eliminates unnecessary handling and disposal of compressed gas cylinders and their contents, and assures proper disposal of these materials.
 - 4.10.3 Use of non- returnable compressed gas cylinders requires written approval by Health, Safety, and Environment.
- 4.11 Only cylinders constructed, tested, and maintained in accordance with Department of Transportation specifications and regulations shall be permitted to be used in health care facilities.
- 4.12 **Certain rules apply to all compressed gas cylinder storage regardless of the volume of compressed gases present:**
 - 4.12.1 Smoking , open flames, electric heating elements, and other sources of ignition shall be prohibited within storage locations and within 20 feet outside storage locations.
 - 4.12.2 Storage of compressed gas cylinders will occur in such a way that they will be used in a first in / first out rotation.
 - 4.12.3 Full and empty cylinders must be clearly identified as such:
 - 4.12.3.1 If they are stored in the same area, empty cylinders should be separated from full cylinders. This is done in order to prevent delay in an emergency in determining whether tanks are full or empty.
 - 4.12.3.2 Valves shall be closed on all empty compressed gas cylinders in storage.
 - 4.12.4 Temperature in storage areas shall not exceed 125°F.
 - 4.12.5 Storage areas shall not be near elevators, gangways, or in locations where compressed gas cylinders are likely to be hit or have something fall on them.
 - 4.12.6 Compressed gas cylinders storage shall be secured against unauthorized entry.
 - 4.12.6.1 If the storage area opens on a public hall this means the door(s) must be locked.
 - 4.12.6.2 If it opens on a corridor which is not a public hall, it may not need to be locked.
 - 4.12.7 Compressed gas cylinders shall not be exposed to corrosive chemicals or fumes.
 - 4.12.8 All compressed gas cylinders must be stored and used in an upright position with the valve end up. Only special compressed gas cylinders for use in a horizontal position can be placed in that position. The "E" Compressed gas cylinders are designed to use in the horizontal or vertical position.
 - 4.12.9 Precautionary Signs which must be readable from a distance of 5 ft. shall be displayed on each door or gate of the storage room or enclosure (outside storage of compressed gases).
 - 4.12.9.1 Storage locations containing medical gases other than oxygen and medical air shall have.

- 4.12.10 Their door(s) labelled with a sign containing the following information.
- 4.12.10.1

<p>CAUTION</p> <p>MEDICAL (OXIDIZING) GASES STORED WITHIN</p> <p>NO Smoking or Open Flame</p> <p>Room may have Insufficient Oxygen</p>
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- 4.12.10.2 Storage locations containing only oxygen or medical air shall have their door(s) labeled with a sign containing the following information
- 4.2.11 Storage conditions of Compressed Gas Cylinders is determined by the volume of compressed present in that specific location.
- 4.12.11.1 NFPA allows for up to a total volume of 300 cu.ft. of compressed (for example, oxygen)
In an area (for example, a nursing unit) for immediate use. Once you exceed the 300cu.ft.,you have special storage requirements.
- 4.12.11.2 The average "E" sized compressed gas cylinder holds approximately 25 cu.ft.of gas, and simple division will show that $300/25=12$. So 12 is the maximum number of "E" cylinders which can be stored without special storage requirements.
- 4.12.11.3 The average "H" sized cylinder contains approximately 250 cu.ft. of compressed gas. If you do not have special storage available, you can only have one "H" cylinder plus one or two "E" cylinders.
- 4.2.12 A compressed gas cylinder placed next to a patient's bed and intended to be used within a short time would not be considered as being in storage.
- 4.2.13 Special storage for non-flammable gases with volume greater than 300 cu.ft. but less than 3000 cu.ft. have the following storage requirements:
- 4.2.13.1 Shall be within an enclosed interior space of noncombustible construction.
- 4.2.13.2 Cylinders containing oxidizing gases shall be stored separately from flammable gases or liquids.
- 4.2.13.3 Oxidizing gases shall be separated from combustibles or materials by one of the following :
- 4.2.13.3.1 A minimum distance of 5 ft. if the entire storage location is protected by an automatic sprinkler system designed in accordance with NFPA 13.
- 4.2.13.3.2 An enclosed cabinet of non-combustible construction having a minimum fire protection rating of ½ hour.
- 4.2.13.3.3 A wooden storage rack designed to secure compressed gas cylinders is expected from this requirement (i.e. it is not considered to be combustible).
- 4.2.13.4 Special storage for non-flammable gases with volume greater than 3000 cu.ft. (12"H" cylinders or 120 "E" cylinders) have the following storage requirements in addition to the requirements previously outlined in 11 C and 2.:
- 4.2.13.4.1 A room dedicated to compressed gas storage or outside storage.
- 4.2.13.4.2 The storage locations for oxygen, nitrous oxide and mixtures of these gases shall be segregated from the following:
- 4.2.13.4.2.1 Anesthetizing locations
- 4.2.13.4.2.2 Areas involved in critical patient care
- 4.2.13.4.2.3 Locations storing flammables
- 4.2.13.4.2.4 Rooms containing open electrical contacts or transformer
- 4.2.13.4.2.5 Storage tanks for flammable or combustible liquids
- 4.2.13.4.2.6 Engines
- 4.2.13.4.2.7 Kitchens
- 4.2.13.4.2.8 Areas with open flames
- 4.2.13.4.3 Be easily accessible when cylinders have to be moved.

- 4.2.13.4.4 Be heated by indirect means (e.g. steam, hot water) if heat is required.
- 4.2.13.4.5 Be provided with racks, chains, or other fastenings to individually secure all cylinders, whether connected, unconnected, full, or empty, from falling.
- 4.2.13.4.6 Have racks, shelves, and supports where provided, constructed of non-combustible materials or limited-combustible materials.
- 4.2.13.4.7 Shall be vented to prevent the accumulation of medical gases from leaks and operations of cylinders. This storage area shall be provided with dedicated mechanical ventilation systems that draw air from within one(1) ft. of the floor and operate continuously. Venting systems for gas storage locations should not be interconnected with other facility air handling systems.
- 4.2.13.5 Outside Bulk Compressed Gas Storage:
 - 4.2.13.5.1 Security Fence intact and entrance is locked.
 - 4.2.13.5.2 Signs prohibiting Smoking within twenty five (25) feet of outdoor storage are posted and enforced.
 - 4.2.13.5.3 Spaces are properly maintained (no combustible, very little dust and no excess materials).
 - 4.2.13.5.4 Reserve Oxygen system is present.
 - 4.2.13.5.5 Compressed gas cylinders are secured.
 - 4.2.13.5.6 Depending on structures (roads, parking) in the immediate vicinity of the bulk storage area, appropriate "No Parking" signs are posted and enforced.
- 4.2.13.6 Use of compressed gas cylinders in construction carts and hand trucks being used for compressed gas cylinders shall be constructed for the intended purpose, be self – supporting and be provided with chains or strap to restrain the cylinders. Construction carts used in operating rooms need to be grounded.
- 4.2.13.7 Anaesthesia in Operating Rooms:
 - 4.2.13.7.1 If the sole source of supply of non-flammable medical gases, such as nitrous oxide and oxygen, is a system of cylinders attached directly to and supported by the device (anesthesia cart) used to administer these gases, it is recommended that two cylinders of each gas be attached to the administering device.
 - 4.2.13.7.2 Anaesthesia carts need to be grounded.
- 4.2.13.8 Education:
 - 4.2.13.8.1 Informal ("just in time") education is given by both Respiratory Therapy and HSE when they assess the actions of staff and determine that it is needed. Education given as a part of EMRs is this type of teaching.
 - 4.2.13.8.2 Formal education on the safe use of compressed gas cylinders is available through HSE and through Respiratory Therapy.
 - 4.2.13.8.3 Two posters "The Sleeping Giant" and "Wanted Poster" are attachments to this policy. It is suggested that these educational signs be posted in any area being used for storage of compressed gas cylinders.

5. MATERIALS AND EQUIPMENT:

- 5.1 Gas Cylinder

6. RESPONSIBILITIES:

- 6.1 FMS Staff

- 6.2 Utility
- 6.3 All Health Care Provider

7. APPENDICES:

N/A

8. REFERENCES:

- 8.1 2000 International Fire Code
- 8.2 Featured Q & A Number of 'E' sized oxygen cylinders " Environment of Care NEWS January 2003
- 8.3 "Hazards of Compressed Cylinders in the Magnetic Resonance Imaging (MRI) Environment " SA-14 – 2002
- 8.4 Compressed Gas Association, Inc. Safety Alert
- 8.5 John Hopkins Safety Manual: HSE 002, 310 and 402
- 8.6 NAPA Glossary of Terms 32003 Spring Edition
- 8.7 OSHA 29 CFR 1910.101
- 8.8 Thomas W. Gardner Health Care Facilities Handbook Quincy NFPA National Fire Protection Association, 2002.

9. APPROVALS:

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