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<i>Subject:</i> Compressed Gas Cylinders	<i>Last Review Date</i>	9/28/11
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POLICY:

This Johns Hopkins policy is based on the National Fire Protection Association (NFPA) Code 99 (Health Care Facilities).2005 – Chapters 5 & 9.

Both The Joint Commission and the Centers for Medicare and Medicaid requires that healthcare organizations be compliant with NFPA 99-2005, 9.4.3 It is the policy of Johns Hopkins 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.

When securing the compressed gas cylinders, six (6) cylinders are the highest number that can be secured on a single chain/strap securement.

When in use, all cylinders must be equipped with an appropriate regulating device.

Special Storage requirement is based on the total volume of compressed gas is in an area.

Partially full compressed gas cylinders containing residual gases shall be considered as full and are subject to the same controls and storage conditions.

REFERENCES

2006 *International Fire Code*

CMS notice dated January 12, 2007 Subject: “**Multiple Providers - Hospitals, Ambulatory Surgical Centers, Nursing Homes, Religious Non-Medical Health Care Institutions, Programs of All-Inclusive Care for the Elderly (PACE) Facilities, Critical Access Hospitals, Intermediate Care Facilities for the Mentally Retarded – Medical Gas Storage and Usage Considerations**”

“Featured Q & A Number of “E” sized oxygen cylinders” *Environment of Care® NEWS January 2003: 5.*

“*Hazards of Compressed Gas Cylinders in the Magnetic Resonance Imaging (MRI) Environment*” SA-14---2002
Compressed Gas Association, Inc Safety Alert

Johns Hopkins Safety Policy Manual: HSE 002, 46, 402, 703 & 705

NFPA 99 Standards for Health Care Facilities, 2005 Edition.

NFPA Glossary of Terms 2003 Spring Edition

OSHA 29 CFR 1910.101 Compressed Gases (general requirements)

OSHA 29 CFR 1910.104 Oxygen

DEFINITIONS

Anesthetizing Location: Any area of a health care facility that has been designated to be used for the administration of any flammable or non-flammable inhalation anesthetic agent in the course of examination or treatment, including the use of such agents for relative analgesia.

Calibrating gases: These are gases used in the calibration of medical equipment. Often they are small, disposable compressed gas cylinders which will not fit in the standard compressed gas cylinder racks. Typical components in calibrating gases include ammonia, chlorine, hydrogen sulfide, nitric oxide, nitrogen dioxide and sulfur dioxide.

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.**

Compressed Gas- Any material or mixture having, when in its container, an absolute pressure exceeding 40 psia (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).

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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 is authorized for use at gauge pressures over 276 kPa (40 psi) at 21° C (70° F) by the U. S. Department of Transportation (DOT) or Transport Canada (T.C.).

Cryogenic liquid: liquid with a normal boiling point below -130°F (-90°C). Common industrial gases transported, handled and stored in the liquid state at cryogenic temperatures are Argon, Helium, Hydrogen, Nitrogen, and Oxygen.

See HSE policy # 046 Cryogenic Liquids:

http://www.hopkinsmedicine.org/hse/policies/hse_policies/indiv_sections/HSE046.pdf

“E” sized Compressed Gas Cylinder- holds approximately 25 cu ft of gas.

EMRs: Environmental Monitoring Rounds. Surveys done to assess adherence to federal & state regulations, guidelines, JH policies, etc. They are also a requirement of The Joint Commission.

Flammable Anesthetics: There are currently no flammable compressed gases in use at JHMI as anesthetics.

Flammable Compressed Gas: A compressed gas which forms a flammable mixture when 13 percent or less (by volume) is mixed with air, or a compressed gas having a flammable range with air wider than 12 percent, 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 temperature and pressure and is capable of being ignited and burned when mixed with the proper proportions of air, oxygen or other oxidizers. Flammable compressed gases usually found at Hopkins: Acetylene, Hydrogen, Methane and Propane. Sites where flammable compressed gases are stored must be marked with a yellow caution sign (available from HSE).

See also HSE Policy # 402 – Handling of Flammable Materials:

http://www.hopkinsmedicine.org/hse/Policies/HSE_Policies/indiv_sections/hse402.pdf

HSE: Health, Safety and Environment.

“H” sized Compressed Gas Cylinder: holds approximately 250 cu ft of gas.

Medical Air: Medical air is air supplied from cylinders, bulk containers, and medical air compressors or has been reconstituted from oxygen USP and oil free nitrogen NF.

Non-Flammable Compressed Gases: The following non-flammable compressed gases are usually found at Hopkins: Ammonia, Argon, Carbon Dioxide, Carbon Monoxide, Helium, Medical Air & Nitrogen.

“Oxidizing gases”: A gas that supports and accelerates combustion of other materials. The storage area for these gases needs to be labeled with the Oxidizing Gases sign. Oxidizing compressed gases usually found at Hopkins: Carbogen, Heliox, Nitric Oxide, Nitrous Oxide and Oxygen.

RT: Respiratory Therapy

Upright position: Position includes when compressed gas cylinders axis is inclined as much as 45 degrees from the vertical.

WalkObouts: Oxygen cylinder with an integrated regulator. E cylinder WalkObouts are found at JHMI.

PROCEDURES

1. The color of a compressed gas cylinder is not an adequate identification of the contents of the cylinder.
 - A. 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.
 - B. Labels shall not be defaced, altered, or removed.
 - C. The expiration date must be checked prior to using the gas for a patient.
 1. The expiration date can be found on a very small white sticker on the compressed gas tank.

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2. If no expiration date can be found on a compressed gas tank intended for patient use, it should be returned to Oxygen Therapy for replacement.
2. When in use for health care, all compressed gas cylinders must be equipped with an appropriate approved regulating device.
 - A. All regulators must be marked to identify the gas (or group of compatible gases) with which the regulator is to be used.
 - B. Regulators are designed to fit only specific cylinder stems.
 1. Diameter Index Safety system, (DISS) and Pin position (Pin Index Safety system) of the specific compressed gas cylinder of one type of gas.
 2. It is the policy of the Johns Hopkins Hospital that pressure regulators not be altered to allow for use with incompatible cylinders.
 3. If the DISS and PISS do not match cylinders and regulators are not to be used. **Contact Oxygen Services.**
3. Magnetic Resonance Imaging (MRI) special requirements for compressed gas cylinders.
 - A. The Compressed Gas Association, Inc. has the following recommendations:
 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."
 2. "Serious personal injury and property damage has resulted from the use of steel gas cylinders in close proximity to MRI devices."
 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."
 - B. At JHMI the "E" compressed gas cylinders used in MRI are made of aluminum.
 - C. In addition, MRI has as a reserve supply a regular "H" cylinder secured (bolted – NOT chained) to the wall.
4. Strict enforcement of the No Smoking Policy of JHMI does not require the posting of signs where oxygen is in use.
5. Carbonated beverage cylinders are a type of compressed gas cylinder. Precautions listed are applicable
6. Calibrating gas cylinders are a type of compressed gas cylinder.
7. A. Must be secured. This size compressed gas cylinder can be in a rack that fits the cylinder.
8. B. Disposal:
 1. These are the only HSE authorized disposable compressed gas cylinders.
 2. Empty compressed calibrating gas cylinders are to be delivered to the closest Hazardous Waste Disposal Area when this area is open.
 3. The schedule of these areas is available on the HSE website:
http://www.hopkinsmedicine.org/hse/environmental_safety/index.html
 4. See HSE Policy # 703 Management of Hazardous Chemicals for additional directions on transporting these to the Hazardous Waste Disposal Area:
http://www.hopkinsmedicine.org/hse/Policies/HSE_Policies/indiv_sections/hse703.pdf
9. Compressed Gas Cylinders must be secured to prevent falling caused by contact, vibration or seismic activity:
 - A. It is the policy of Johns Hopkins 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. HSE needs to approve any other way of securing a compressed gas cylinder.
 - B. When securing the cylinders, six (6) is the highest number secured on a single chain/strap.
 - C. 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.

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- D. When small-size cylinders (A, B, D, or E) cylinders are in use, they shall be attached to a cylinder stand or to a therapy apparatus of sufficient size to render the entire assembly stable.
 - E. **Cylinders shall not be chained to portable or movable apparatus such as beds.**
10. Protective valve caps must be in place when “H” cylinders are not in use.
 11. All cylinders except WalkObouts must be equipped where necessary with a tank wrench to activate the cylinder valve.
 - A. This shall be attached to the cylinder so that it will immediately be available in the event of an emergency.
 - B. Tank wrenches are available through Materials Management for compressed gas cylinders with traditional stems and regulators
 12. Flammable compressed gases: (see HSE 402 for further information)
 - A. Shall be grounded.
 - B. Shall be stored separately from oxidizing gases.
 - C. Must be stored in an approved storage area or flammable cabinet.
 - D. Flammable gas cylinders shall not be stored in a corridor, stairway or any means of egress.
 - E. Cylinders of liquefied flammable gas (I.E. Propane) above ten pounds are prohibited from use or storage inside any building.
 13. All compressed gas cylinders must be returnable to the manufacturer for refill or proper disposal.
 - A. The use of commercially supplied gas in non-refillable, non-returnable cylinders is prohibited except as noted in D below.
 - B. This restriction eliminates unnecessary handling and disposal of compressed gas cylinders and their contents; and assures proper disposal of these materials.
 - C. Use of non-refillable, non-returnable compressed gas cylinders requires written approval by Health, Safety and Environment, 2024 E. Monument Street, x5-5918.
 - D. This approval has been provided in this document for calibrating compressed gas cylinders only.
 14. Only cylinders constructed, tested, and maintained in accordance with US Department of Transportation (DOT) specifications and regulations shall be permitted to be used in healthcare facilities.
 15. Certain rules apply to all compressed gas cylinder storage regardless of the volume of compressed gases present.
 - A. Smoking, open flames, electric heating elements and other sources of ignition shall be prohibited within storage locations and within 20 ft outside storage locations.
 - B. Storage of compressed gas cylinders will occur in such a way that they will be used in a first in/first out rotation.
 - C. Full and empty cylinders must be clearly identified as such.
 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.
 2. Valves shall be closed on all empty compressed gas cylinders in storage.
 - D. Temperature in storage areas shall not exceed 125° F.
 - E. 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.
 - F. Compressed gas cylinders shall be protected from tampering of unauthorized individuals
 1. If the storage area opens on a public hall in a remote area, this means the door(s) must be locked.
 2. If it opens on a corridor which is not a public hall or a public corridor which is observable from the Nurses’ Station, it may not need to be locked.
 - G. Compressed gas cylinders shall not be exposed to corrosive chemicals or fumes.
 - H. Nothing can be stored on top of compressed gas cylinders.
 - I. All compressed gas cylinders except as noted below, must be stored and used in an upright position with the valve end up. Only special compressed gas cylinders designed for use in a horizontal position can be placed in that position.
 1. The “E” sized oxygen compressed gas cylinders are designed to be used in the horizontal or vertical position.

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2. The very small calibrating gas compressed gas cylinders can be stored in a horizontal position.
- J. **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).** Storage locations containing oxidizing gases shall be labeled with the following sign.

CAUTION
OXIDIZING GAS
CYLINDERS STORED IN THIS ROOM

16. Storage conditions of Compressed Gas Cylinders is determined by the volume of compressed present in that specific location:
- A. NFPA allows for up to a total volume of 300 cu ft of compressed gas (for example, oxygen) in an area (for example, a nursing unit) for immediate use. Once you exceed the 300 cu ft, you have **special storage** requirements.
 1. 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.
 2. 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.
 - B. 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. It is “in use”.
 - C. The E cylinder of Oxygen on the Emergency Cart is “in use” – not in storage.
 - D. **Special** storage for nonflammable gases with **volume greater than 300 cu ft. but less than 3000 cu ft** have the following storage requirements:
 1. Shall be within an enclosed interior space of noncombustible or limited-combustible construction,
 2. Cylinders containing oxidizing gases shall be stored separately from flammable gases or liquids.
 3. Oxidizing gases shall be separated from combustibles or materials by one of the following;
 - a. A minimum distance of 20 ft.
 - b. A minimum distance of 5 ft **if the entire storage location is protected by an automatic sprinkler system designed in accordance with NFPA 13.**
 - c. An enclosed cabinet of noncombustible construction having a minimum fire protection rating of ½ hour.
 - d. A wooden storage rack designed to secure compressed gas cylinders is exempted from this requirement (i.e. it is not considered to be a combustible).

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- E. **Special storage for nonflammable 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 16 D 1 and 2:**
1. A room dedicated to compressed gas storage or outside storage.
 2. The storage locations for oxygen, nitrous oxide and mixtures of these gases shall be segregated from the following::
 - a. Anesthetizing locations
 - b. Areas involved in critical patient care
 - c. Locations storing flammables
 - d. Rooms containing open electrical contacts or transformers
 - e. Storage tanks for flammable or combustible liquids
 - f. Engines
 - g. Kitchens
 - h. Areas with open flames
 3. Be easily accessible when cylinders need to be moved
 4. Be heated by indirect means (e.g., steam, hot water) if heat is required.
 5. Be provided with racks, chains, or other fastenings to secure all cylinders, whether connected, unconnected, full, or empty, from falling.
 6. Have racks, shelves, and supports, where provided, constructed of non-combustible materials or limited-combustible materials.
- F. Shall be vented to prevent the accumulation of medical gases from leaks and operations of cylinders. This storage area shall be provided with dedicated air handling 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.
- G. Outside Bulk Compressed Gas Storage:
1. Security Fence intact and entrance is locked.
 2. Signs prohibiting Smoking within twenty-five (25) feet of outdoor storage are posted **and enforced**.
 3. Spaces are properly maintained
 4. Reserve Oxygen system is present.
 5. Compressed gas cylinders – if present – are secured.
 6. Depending on structures (roads, parking) in the immediate vicinity of the bulk storage area, appropriate “No Parking” signs are posted **and enforced**.
17. 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 appropriate chains or strap to restrain the cylinders. Construction carts used in operating rooms need to be grounded.
18. Education:
- A. 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 part of EMRs is this type of teaching.
 - B. Formal education on the safe use of compressed gas cylinders is available through HSE and through Respiratory Therapy.
 - C. 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.

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RESPONSIBILITIES

Departmental Management	Enforce this policy
Health, Safety and Environment	Evaluate requests for use of non-refillable, non-returnable compressed gas cylinders. Monitor the proper use storage and transport of compressed gas cylinders during EMRs and other audits
Health, Safety and Environment and Respiratory Therapy	Provide formal education on safe storage of compressed gas cylinders Educate personnel handling compressed gas cylinders
All Staff	Store, transport and handle all compressed gas cylinders in accord with this policy. Enforce the “No Smoking” policy for the entire institution.
Security	Enforce No Parking areas around outside Bulk Oxygen

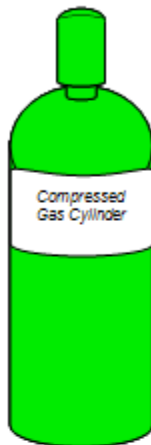
REVIEW CYCLE

Annual

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WANTED

- Known to be armed and dangerous if not restrained by a chain or stand.
- If it falls and the nozzle CRACKS, it has been known to go straight through cinder block walls without stopping!
- Good at disguising itself as a mild mannered, indispensable Oxygen Tank.



Additional aliases: Nitrous Oxide tank, Compressed Air Tank, Argon Tank, CARBONATED BEVERAGE CYLINDER, Etc.

Generic Name: Compressed Gas Cylinder

Nick Name: UNGUIDED MISSILE

Special Handling Instructions:

- Must never be allowed into an MRI unit unless it is made of aluminum!
- Compressed gas cylinders must be secured by a strap, chain or appropriate rack or holder

More dangerous when it is part of a gang.

A "gang" is defined as thirteen (13) or more of the "E" (small) compressed gas cylinders **OR** one (1) "H" and three (3) "E" compressed gas cylinders.

IF YOU HAVE A "GANG", CHECK HSE POLICY # 018 IMMEDIATELY TO DETERMINE PROPER STORAGE CONDITIONS! Storage conditions depend on the total volume of compressed gas cylinders in your area.

**If Found Unrestrained, Must Be Restrained Immediately!
Your Reward for Properly Restraining a Compressed Gas Cylinder May Be Saving a Life – Possibly Your Own!**

Oxygen Therapy
Emergency 410-283-7913
Non Emergency 410-955-6350

For Assistance or Questions
Please Call Health, Safety & Environment (HSE)
410-955-5918

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The Sleeping Giant

Many of us are surrounded by compressed gas cylinders. Here is a reminder of just what respect they command.



TREAT ME WITH RESPECT, I AM A SLEEPING GIANT

GET TO KNOW ME

I can contain very high pressure.
I wear a label to identify the gas I am holding.
My color does not tell you what gas I contain.
I am only one piece of a two-part system. Without a correct regulator or manifold I cannot function safely.

KNOW HOW TO USE ME

Know how to safely install and remove me from your system.
Make sure I am properly secured when in use and when stored.
Open my valve slowly when I am to be used.
Close my valve when you are done.
Know the dangers of my contents, read the MSDS, and follow proper procedures when using me.

WHEN THINGS GO WRONG

If my valve or regulator snaps off, all my power is unleashed through an opening no larger than a pencil.
I will jet away faster than any dragster.
I will smash through brick walls.
I will spin, ricochet, crash and splash through anything in my path.

TO BE MY MASTER REMEMBER

Secure me,
Cap me, and
Always follow recommended safety procedures.

Oxygen Therapy
Emergency: 410-283-7913
Non Emergency: 410-955-6350

For more information, contact your nearest CGA member:

Health Safety and Environment
2024 Building, Suite B-200
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www.hopkinsmedicine.org/hse

