

Title: Compressed Gas Cylinder Storage and Handling

Policy #: EC-62

Policy Statement:

It is the policy of Beth Israel Deaconess Medical Center that special precautions shall be taken to assure the safe use, transportation, and storage of compressed gas cylinders.

Purpose:

To minimize the potential fire and explosion hazards associated with the use, transportation, and storage of compressed gas cylinders.

This policy serves to comply with standards of National Fire Protection Association (NFPA) 99 and 101, as well as the regulatory requirements of Boston Fire Department and the recommendations of the Compressed Gas Association.

The usage of compressed gas cylinders is common throughout the hospital in areas such as laboratories, respiratory therapy, at the bedside of patients, and in various Maintenance and contractor operations. Compressed gas cylinders are used in many workplaces to store gases that vary from extremely flammable (acetylene) to extremely inert (helium). Many compressed gas cylinders are stored at extremely high pressures (up to 3,000 pounds per square inch gauge or PSIG). A sudden release of these gases can cause a cylinder to become a missile-like projectile. Ruptured cylinders have been known to penetrate concrete-block walls. If handled properly compressed gas cylinders are safe. If handled improperly, the same cylinders can present a severe hazard to you and the surrounding area.

Types of Hazards:

- **Physical Damage:** Cylinders are very hazardous when exposed to damage from falling over, tipping, heat, electric circuits, motion, vibration, or anything that can cause a weakness or crack in the cylinder wall or shell. Such damage can cause the cylinder to rupture and explode sending sharp metal pieces, like shrapnel, blasting through the area.
- **Tipping and Falling:** The most common hazard associated with cylinders occurs when cylinders tip, fall over, or fall off of a bed or stretcher. **When transporting patients on stretchers, wheelchairs, or beds, the oxygen cylinder MUST be in the appropriate cylinder holder and NOT placed on the bed, stretcher, or wheelchair.**

CONTENTS OF CYLINDERS

Labels and Signs

1. Do not rely on color coding for identification of contents as there is no universal color

coding system and colors vary among vendors.

2. Cylinder contents shall be identified prior to use by reading attached labels or stencils naming the components and giving their proportions.
3. Do not, under any circumstances, deface, alter or remove labels. Cylinders without labels must be treated as hazardous waste which generally results in a disposal cost greater than \$2,500.00 per cylinder.
4. Never use a cylinder for which the contents are unknown. If a cylinder can not be positively identified it should be marked "unidentified" and returned to the vendor.

HANDLING AND TRANSPORTING CYLINDERS:

Serious accidents may result from the misuse, abuse, or mishandling of compressed gas cylinders. Workers assigned to the handling of cylinders under pressure should be properly trained. Handle cylinders of compressed gases as high-energy sources and therefore as potential explosives. Observance of the following rules will help control hazards in the handling of compressed gas cylinders:

1. Cylinders must always be transported on wheeled cylinder carts with retaining straps or chains.
2. Cylinders should not be banged, dropped or permitted to strike each other.
3. Never use compressed gas to dust off clothing. This could cause injury to the eyes or body and create fire hazard. Clothing can become saturated and burst into flames if touched by an ignition source such as a spark or cigarette.
4. Push the cylinder carts rather than pull them and transport one cylinder cart per operator.

CYLINDER STORAGE-GENERAL: The points listed below will minimize hazards when storing compressed gas cylinders. All compressed cylinder gases stored at the Medical Center shall comply with the standards regarding compressed gas cylinder storage as detailed in NFPA 99 Standards for Health Care Facilities.

1. Store cylinders upright and secure them with a chain, strap, or cable to a stationary building support (i.e. Structural Beam) or to a cylinder cart to prevent cylinders from tipping or falling.
2. All compressed gas cylinders, either in use or in storage, shall be secured in an upright position by means of a strap or chain in order to prevent falling. The securing device shall be placed at least 2/3 of the way up on the cylinder. Contact the Service Response Center (5-9700) to have securing devices installed by the Maintenance Department.
3. Liquefied flammable gas cylinders should be stored in an upright position, or such that the pressure relief valve is allowed to remain in the gas phase. Use only

approved containers to store and transport liquid nitrogen. Containers should have vented-lids to prevent spillage when carried.

4. Oxygen and nitrous oxide cylinders should be kept at a minimum of 20 feet away from fuel-gas cylinders, such as acetylene and combustible materials, or separated by a non-combustible barrier (such as a wall) at least 5 feet high with a fire-resistance rating of at least one-half hour.
5. Flammable gas cylinders should not be stored with oxygen, or nitrous oxide cylinders, or adjacent to oxygen charging facilities.
6. Store cylinders in a dry, well-ventilated area away from flames, sparks, or any source of heat or ignition.
7. Storage rooms for cylinder gases must have some means of ventilation exterior to the storeroom. The ventilation method used is dependent upon the quantity stored. For more information on which type of ventilation is necessary please contact BIDMC Dept. of Environmental Health & Safety (2-0614).
8. All cylinder storage areas should have the required precautionary signs, such as "Storage of flammable, oxidizer, or toxic materials." Storage rooms should also have the NFPA Diamond Placard identifying compressed gas storage. Contact the BIDMC Dept. of Environmental Health and Safety, (2-0614) for signage requirements, as well as clarification on any other matters regarding compressed gas cylinder storage.
9. Place cylinders in a location where they will not be subject to mechanical or physical damage, heat, or electrical circuits to prevent possible explosion or fire.
10. Segregate empty cylinders from full cylinders. If multiple types of gases are stored in the same room, the cylinders must be grouped by the type of gas contained in each cylinder.
11. Caps used for valve protection should be kept on the cylinders at all times, except when the cylinder is actually being used or charged.
12. Never plug, remove, or tamper with any pressure relief device.
13. Cylinders should not be exposed to an open flame or to any temperature above 125F. Cylinders shall be kept away from heat sources such as, radiators, steam or hot water piping. Excessive pressure due to heat may cause cylinders safety valve to vent and empty the tank.
14. Compressed gas cylinders (empty or full) must not be stored in stairways.
15. Use regulators and pressure gauges only with gases for which they were designed and intended. Do not attempt to repair or alter cylinders, valves or attachments. Adapters or homemade modifications are dangerous.
16. Close the main cylinder valves tightly when not in use.
17. When empty cylinders are to be returned to the vendor, mark them "Empty" or "MT" and cap the tank if indicated.

CYLINDER STORAGE-OXYGEN & NITROUS OXIDE: Due to the fact that oxygen and nitrous oxide gases support combustion very readily, special precautions must be taken when storing these types of gases.

1. Oxygen and nitrous oxide cylinders should never be stored with other cylinders of flammable gases such as acetylene, propane, or MAP gases (liquefied petroleum gas (LPG) mixed with methylacetylene-propadiene.
2. Never use oil or grease as a lubricant on valves or attachments. Putting oil or grease on the high pressure side of oxygen can result in an explosion.
3. Never use a rag that may contain oil or other substances to clean an oxygen or nitrous oxide tank. The rag can burst into flames by spontaneous combustion.
4. Keep cylinders and fittings away from oil and grease, and do not handle such cylinders or apparatus with oily hands, gloves or clothing.
5. Particles of dust and dirt shall be cleared from cylinder valve openings by slightly opening and closing the valve before applying any fitting to the cylinder.
6. Store at least 20 feet away from any flammable or combustible materials (especially oil and grease) or separate from them by a noncombustible barrier at least 5 ft. high and having a fire resistance rating of at least 1/2 hour.
7. Small oxygen cylinders stored and handled in patient care areas may exceed storage limits allowed by the NFPA standards. The National Fire Protection Association (NFPA) 99, allows 300 cubic feet of non-flammable compressed gas (*i.e.* oxygen) available for immediate use in a "smoke zone" area without taking special precautions with regard to separation or enclosure. A 3,000 psi "E" size cylinder typically holds approximately 36 cubic feet of gas, so the quantity limit per smoke zone is 8 cylinders. For more information on location and extent of smoke zones, contact Environmental Health & Safety (2-0616).

ACETYLENE AND PROPANE CYLINDERS

1. Always store upright because they are partially filled with acetone.
2. Wait at least 30 minutes before using a cylinder which has been stored or handled in a non-upright position.
3. The outlet line of an acetylene cylinder should be protected with a flash arrestor.
4. Never exceed the pressure limit indicated by the warning red line of an acetylene pressure gauge.
5. Use the correct kind of tubing to transport the gaseous acetylene. Some tubing such as copper can result in an explosion.
6. The Boston Fire Department does not permit the use of propane cylinders that are less than 5 pounds. All propane cylinders must be fitted with a flash arrestor in line.

DISPOSAL AND RETURN

1. Contact the manufacturer to determine how to properly dispose of non-reusable

cylinders. Compressed gas cylinders must be returned to the appropriate vendor if possible. Under **NO** circumstances should compressed gas cylinders be disposed of in dumpsters. Pressurized cylinders in dumpsters or landfills could be accidentally punctured which may cause an explosion. Most compressed gas cylinders used in hospitals have serial numbers to facilitate tracking of cylinders disposed of properly or improperly.

EDUCATION

All Medical Center personnel responsible for storage of compressed gas cylinders, shall familiarize themselves with this policy, the relevant sections of NFPA 99 Standards for Health Care Facilities, Boston Fire Department requirements, as well as completing any competencies required by Beth Israel Deaconess Medical Center for handling compressed gas cylinders. Copies can be obtained by contacting the Respiratory Care Dept. or Dept. of Environmental Health & Safety. Education requirements will be administered and monitored by the Respiratory and Environmental Health & Safety Departments.

Vice President Sponsor: Marsha Maurer, SVP Patient Care Services and Chief Nursing Officer

Approved By:

EOC Committee: 11/9/19

**W. Armstrong and K. Murray
Co-Chairs**

**Requestor Name: Joseph E. Previtera, RRT Respiratory Care Department
Alana Dale, Environmental Health and Safety Officer**

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Eliminated:

References:

- 1. NFPA 99 2005 *Standards for Health Care Facilities*.**
- 2. NFPA 101 *Life Safety Code – 2006 Edition***
- 3. FDA. *Avoiding the Hazards of Medical Gases*, July/August 2000 FDA Consumer Magazine. www.fda.gov/fdac/features/2000/400_gas.html**