

<b>WRHA REGIONAL FACILITIES MANAGEMENT GUIDELINE</b>	
<b>Medical Oxygen Handling and Storage</b>	
1.0	<b>PURPOSE:</b>
1.1	The purpose of this guideline is to provide compliance / best practice for the safe handling and storage of medical oxygen cylinders.
2.0	<b>DEFINITIONS:</b>
2.1	<u>Cylinder holding room</u> means a room or space on a patient / resident care unit designated by the site for holding a working supply of portable oxygen cylinders. For the purpose of this guideline a cylinder that is referred to as “held” shall be considered to be in a holding room or held in an individual cylinder cart for daily patient/ resident use.
2.2	<u>Cylinder storage room</u> means a space or room designated by the site for storage of portable oxygen cylinders. For the purpose of this guideline a cylinder that is referred to as “stored” shall be considered to be in an indoor storage room or outdoor storage space.
2.3	<u>Fire compartment</u> means an enclosed space in a building that is separated from all other parts of the building by enclosing construction providing a fire separation having a required fire-resistance rating.
2.4	<u>Patient care unit</u> means a space used for patient or resident care. A patient care unit normally consists of two fire compartments.
3.0	<b>GUIDELINES:</b>
3.1	The Medical Oxygen Handling and Storage Guideline offer a best practice safety approach to the use of medical oxygen in healthcare facilities. The guideline is based on requirements of NFPA 99 as it offers guidance detail not contained in the Manitoba Fire Code (MFC).
3.1.1	The medical oxygen storage and handling guideline is attached as Appendix A.
3.1.2	Indoor storage requirements of medical oxygen from the Manitoba Fire Code and excerpts from NFPA 99 are attached as Appendix B.
3.1.3	Outdoor storage requirements for medical oxygen from the Manitoba Fire Code are attached as Appendix C.
4.0	<b>REFERENCES:</b>
4.1	Manitoba Fire Code 2010 edition
4.2	NFPA 99 2005 edition

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## **Appendix A - Guideline for Hospital / Personal Care Home Storage and Handling of Medical Oxygen.**

Note: The word patient as used in this guideline refers to both patients in Hospital facilities and residents in Personal Care Home (PCH) facilities.

- 1) This guideline applies to use, handling and storage of Medical oxygen portable “D” and “E” cylinders. The dispensing and use of liquid oxygen in portable containers for patient use is not addressed by this guideline.
- 2) Rooms for indoor storage of medical oxygen must meet the requirements of [MFC 3.2.8.3](#). As most facilities do not have storage space that meets the requirements of MFC 3.2.8.3, outdoor storage should be utilized. Outdoor storage provisions must meet the requirements of [MFC 3.3.5.2](#).
- 3) When medical oxygen is stored outdoors a Hospital or PCH can keep a small working stock of oxygen cylinders in a holding room on a patient unit so that patient oxygen use requirements can be maintained. Requirements for holding rooms / spaces must meet the requirements of [NFPA 99, 9.4.3](#).
- 4) Medical oxygen portable “D” or “E” cylinders must be stored, held and transported in metal racks / cylinder carts. Wooden racks are not permitted for any medical oxygen cylinder storage, holding or transport.
- 5) Cylinders shall not be held or stored with regulators attached. A single portable cylinder may be held in a single cylinder cart with regulator attached for emergency purposes as long as the location of the emergency cylinder is identified with signage.
- 6) Each patient care unit must not exceed a holding limit of 20 portable “D” cylinders or 12 “E” portable” cylinders in the cylinder holding room. Note 1: cylinder limit count includes all portable cylinders present regardless of state (empty or full). Note 2: maximum held portable cylinders shall reflect the practical quantity required. Example: A holding room with 12 portable E cylinders would be considered an excessive supply for one patient who requires oxygen.
- 7) In addition to the requirements of [NFPA 99, 9.4.3](#), a cylinder holding room shall be directly accessible from a main corridor. It is recommended the cylinder holding room be locked to limit access to patient care staff. The cylinder holding room can also be used to store medical supplies or associated unit supplies but not cleaning supplies. The cylinder holding room cannot contain an electrical service panel.
- 8) A single D or E portable cylinder in an approved cylinder cart is permitted in a patient room for use by the patient. Patient portable cylinders are considered to be in use therefore not counted as part of the storage / holding total.
- 9) If the site has a number of patients who require oxygen it may be practical to designate a single central room for storage rather than a number of holding rooms for portable cylinders. A central storage room must meet the requirement of [MFC 3.2.8.3](#).

- 10) Medical oxygen in (H) cylinders are not permitted to be stored or held indoors with the exception of cylinders attached to a manifold used to supply piped oxygen. If an H cylinder is absolutely essential as emergency oxygen supply source it is recommended the cylinder be kept in an outdoor storage area. See [MFC section 3.3.5.2](#) for further detail.
- 11) When medical oxygen is not in use the flow of oxygen must be shut off. This applies to both piped and cylinder supply sources.
- 12) Patients who are being transported by stretcher or similar apparatus and require the use of medical oxygen must have a cylinder carrying bag or cylinder holding fixture securely fastened to the transport apparatus.
- 13) Patients requiring the use of medical oxygen who are independently mobile must be issued a wheeled medical oxygen cart or an approved cylinder holding fixture that is securely attached to wheelchair or mobility assist device. Under no conditions may a patient be permitted to carry an oxygen cylinder in a carry bag or by a shoulder strap.
- 14) Patients who are independently mobile but require the use of medical oxygen must be instructed of the hazards of oxygen use in the presence of an ignition source such as spark or open flame. Patients who smoke must not be permitted to take their oxygen supply with them into the area where smoking is permitted.

## Appendix B - Indoor Storage of Medical Oxygen

### Requirements from the Manitoba Fire Code if Medical Oxygen is stored indoors:

*(Note: The following is an exact copy of the Fire Code.)*

#### 3.2.8.3. Indoor Storage of Poisonous, Corrosive or Oxidizing Gases

1) Cylinders of Class 2.3 toxic or corrosive gases or Class 2.2 (5.1) oxidizing gases stored indoors shall be located in a room that

- a) is separated from the remainder of the *building* in conformance with Sentence 3.3.6.3.(2) of Division B of the NBC,
- b) is located on an exterior wall,
- c) can be entered from the exterior, and whose *closures* leading to the interior of the *building* are in conformance with Sentence 3.3.6.3.(2) of Division B of the NBC, and
- d) is provided with ventilation to the outdoors.

2) Cylinders of gases described in Sentence (1) shall not be stored in a room containing combustible materials.

### Requirements from Manitoba Building Code for rooms used to store Medical Oxygen:

#### 3.3.6.3

- 2) Where required by the NFC, cylinders of Class 2.3 toxic or corrosive gases or Class 2.2 (5.1) oxidizing gases stored indoors shall be located in a room
- a) that is separated from the remainder of the *building* by a gas-tight *fire separation* having a *fire-resistance rating* of at least 1 hour,
  - b) that is located on an exterior wall of the *building*,
  - c) that can be entered from the exterior, and
  - d) whose *closures* leading to the interior of the *building* are
    - i) equipped with self-closing devices that keep the *closures* closed when not in use, and
    - ii) constructed so as to prevent the migration of gases from the room into other parts of the *building*.

#### **Comment**

*Note: Class 2.2(5.1) oxidizing gases refer to Medical Oxygen*

*It is evident from the above requirements that most if not all medical oxygen storage rooms or spaces (especially those on patient units) do not meet Code requirements. To correctly storage oxygen, the Manitoba Fire Code requires a ground floor fire separated room built with one side of the room being an exterior wall with provision for outdoor access. This requirement has not been included in the design and building of most Winnipeg Region Healthcare facilities. For most facility medical oxygen usage requirements, the authority having jurisdiction (AHJ), Winnipeg Fire and Paramedic Service (WFPS) Fire Prevention Branch, are willing to permit the use of NFPA 99 as a guide to the creation of holding rooms or spaces for medical oxygen used in patient care areas as opposed to storage rooms.*

*NFPA 99 is a United States Fire safety standard for Health Care Facilities. It is not directly referenced by either the Manitoba Fire or Building Codes. The AHJ has agreed to permit NFPA*

99 to be used as a guide as the Manitoba Code does not sufficiently address the use of medical oxygen in a medical facility.

### **NFPA 99 Requirements (used to form the basis of requirements for a holding room or space)**

**9.4.3** Storage for nonflammable gases with a total volume compressed equal to or less than 8.5 m<sup>3</sup> (300 ft<sup>3</sup>) shall comply with the requirements in 9.4.3.1 and 9.4.3.2.

*Comment: A Medical Oxygen E cylinder holds .68 m<sup>3</sup>. A Medical Oxygen D cylinder holds .425m<sup>3</sup>. This section details the criteria for on-unit oxygen storage with a limit of 12 “E” cylinders or 20 “D” cylinders. (8.5 / .68 = 12.5) or (8.5/.425 = 20)*

**9.4.3.1** Individual cylinder storage associated with patient care areas, not to exceed 2100 m<sup>2</sup> (22,500 ft<sup>2</sup>) of floor area, shall not be required to be stored in enclosures.

*Comment This clause along with the volume limit of clause 9.4.3 forms the basis of a patient care holding room for medical oxygen cylinders.*

**9.4.3.2** Precautions in handling these cylinders shall be in accordance with 9.7.2.

**9.4.3.3** When small-size (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.

**9.4.3.4** An individual cylinder placed in patient room for immediate use by a patient shall not be required to be stored in an enclosure.

**9.4.3.5** Cylinders shall not be chained to portable or movable apparatus such as beds and oxygen tents.

#### **Comment:**

*Code limitation of patient / resident care unit – Manitoba Fire code does not permit a single patient care fire compartment to be greater than 1000 m<sup>2</sup>. As patient care areas are divided into two fire compartments, clause 9.4.3.1 can apply except be limited to 2000 m<sup>2</sup> instead of 2100 m<sup>2</sup>. That means for a patient care unit (with two fire compartments) a limit of 8.5 m<sup>3</sup> of oxygen or 12 E or 20 D cylinders are permitted to be held. If additional oxygen cylinders are required they should be stored either outdoors or in a purpose built storage room meeting the requirements of the Manitoba Fire Code.*

*Storage of Medical oxygen H cylinders as emergency oxygen source -- H cylinders have a volume of 7.8 m<sup>2</sup>. If held on a patient care unit an additional 1 E or 1 D cylinder would be all that could be permitted to stay within the limit of 8.5m<sup>2</sup>. As this is impractical a site shall develop an alternate storage area (preferably outdoors) for H cylinders.*

### **NFPA 99 Cylinder Handling Precautions (additional safe handling information)**

#### **9.7.2 Special Precautions for Handling Oxygen Cylinders and Manifolds.**

Handling of oxygen cylinders and manifolds shall be based on CGA G-4, *Oxygen*.

**9.7.2.1** Oxygen cylinders, containers, and associated equipment shall be protected from contact with oil or grease. Specific precautions shall include the following:

- (1) Oil, grease, or readily flammable materials shall never be permitted to come in contact with oxygen cylinders, valves, regulators, gauges, or fittings.
- (2) Regulators, fittings, or gauges shall never be lubricated with oil or any other flammable substance.
- (3) Oxygen cylinders or apparatus shall never be handled with oily or greasy hands, gloves, or rags.

**9.7.2.2** Equipment associated with oxygen shall be protected from contamination. Specific precautions shall include the following:

- (1) 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.
- (2) The high-pressure valve on the oxygen cylinder shall be opened slowly before bringing the apparatus to the patient or the patient to the apparatus.
- (3) An oxygen cylinder shall never be draped with any materials such as hospital gowns, masks, or caps.
- (4) Cylinder-valve protection caps, where provided, shall be kept in place and be hand-tightened, except when cylinders are in use or connected for use.
- (5) Valves shall be closed on all empty cylinders in storage.

**9.7.2.3** Cylinders shall be protected from damage. Specific procedures shall include the following:

- (1) Oxygen cylinders shall be protected from abnormal mechanical shock, which is liable to damage the cylinder, valve, or safety device.
- (2) Oxygen cylinders shall not be stored near elevators, gangways, or in locations where heavy moving objects will strike them or fall on them.
- (3) Cylinders shall be protected from the tampering of unauthorized individuals.
- (4) Cylinders or cylinder valves shall not be repaired, painted, or altered.
- (5) Safety relief devices in valves or cylinders shall never be tampered with.
- (6) Valve outlets clogged with ice shall be thawed with warm — not boiling — water.
- (7) A torch flame shall never be permitted under any circumstances to come in contact with cylinder valves or safety devices.
- (8) Sparks and flame shall be kept away from cylinders.
- (9) Even if they are considered to be empty, cylinders shall never be used as rollers, supports, or for any purpose other than that for which the supplier intended them.
- (10) Large cylinders (exceeding size E) and containers larger than 45 kg (100 lb) weight shall be transported on a proper hand truck or cart complying with [9.5.3.1](#).
- (11) Freestanding cylinders shall be properly chained or supported in a proper cylinder stand or cart.
- (12) Cylinders shall not be supported by radiators, steam pipes, or heat ducts.

**9.7.2.4** Cylinders and their contents shall be handled with care. Specific procedures shall include the following:

- (1) Oxygen fittings, valves, regulators, or gauges shall never be used for any service other than that of oxygen.
- (2) Gases of any type shall never be mixed in an oxygen cylinder or any other cylinder.
- (3) Oxygen shall always be dispensed from a cylinder through a pressure regulator.
- (4) The cylinder valve shall be opened slowly, with the face of the indicator on the regulator pointed away from all persons.

- (5) Oxygen shall be referred to by its proper name, oxygen, not air, and liquid oxygen referred to by its proper name, not liquid air.
- (6) Oxygen shall never be used as a substitute for compressed air.
- (7) The markings stamped on cylinders shall not be tampered with because it is against federal statutes to change these markings without written authority from the Bureau of Explosives.
- (8) Markings used for the identification of contents of cylinders shall not be defaced or removed, including decals tags, stenciled marks, and the upper half of the shipping tag.
- (9) The owner of the cylinder shall be notified if any condition has occurred that might permit any foreign substance to enter a cylinder or valve, giving details and cylinder number.
- (10) Neither cylinders nor containers shall be placed in proximity of radiators, steam pipes, heat ducts, or other sources of heat.
- (11) Very cold cylinders or containers shall be handled with care to avoid injury.

**9.7.2.5** Oxygen equipment that is defective shall not be used until one of the following tasks has been performed:

- (1) It has been repaired by competent in-house personnel.
- (2) It has repaired by the manufacturer or his or her authorized agent.
- (3) It has been replaced.

**9.7.2.6** Regulators that are in need of repair or cylinders having valves that do not operate properly shall never be used.

#### **9.5.3.1 Carts and Hand Trucks.**

**9.5.3.1.1 Construction.** Carts and hand trucks for cylinders and containers shall be constructed for the intended purpose, be self-supporting, and be provided with appropriate chains or stays to retain cylinders or containers.

## **Appendix C - Outdoor Storage of Medical Oxygen Storage Requirements from Manitoba Fire Code**

### **3.3.5.2. Location**

- 1) Where cylinders of Class 2 gases are stored outdoors, they shall be
  - a) supported on raised concrete or other noncombustible platforms, and
  - b) located in an enclosure fenced in conformance with Article 3.3.2.6.

*Comment: There are no separation requirements from the building or building openings for the storage of oxygen cylinders. There are separation requirements for storage of other compressed gases. DO NOT store oxygen with any other compressed gas. While separation from the building is not required, the storage area should have a clear space of 6 meters to provide space to permit cylinder carts to move in and out of the storage area.*

### **3.3.2.6. Fencing**

- 1) An outdoor storage area shall be surrounded by a firmly anchored fence that is
  - a) substantially constructed to discourage climbing and unauthorized entry,
  - b) not less than 1.8 m high, and
  - c) provided with gates that shall be locked when the storage area is not staffed.

### **3.3.2.7. Maintenance**

- 1) Any access route, gateway or clear space required in this Section shall be
  - b) kept free of obstructions and piles of snow.

*Comment: Location of the outdoor storage requires careful consideration. While not required a roof is recommended to shelter the storage area. The location selected must permit clear Fire Dept. fire truck access to within 60 meters travelling distance from fire truck location to storage site. The location must not be beneath electrical power lines. The storage area should be close to delivery truck access and staff access. Staff may have to access the storage area at any time so a location close to a building door should be selected. A good location is near the shipping dock as delivery trucks are close, staff generally has good access to the loading area and the loading area normally has good Fire Dept. access. Each site will differ so this location may not work for all sites.*