

FIRE COMMISSIONER'S BULLETIN

**(Revised)
2008-06-26**

Bulletin #10

USE OF MEDICAL OXYGEN IN A DWELLING UNIT

PURPOSE

To outline the safety procedures involving the use of oxygen in the home or apartment.

To outline precautionary measures to take by occupants of home or apartments in which oxygen is used.

To enable the Fire Chief/Inspector and/or Hospital Staff to conduct an inspection prior to use of oxygen in a home or apartment.

PROCEDURE

The attached information may be given to any individual requesting information relative to fire safety requirements as pertaining to the use of oxygen in a dwelling unit.

The information in this Bulletin should be used by the fire chief or hospital staff to perform an inspection prior to the use of oxygen in a dwelling unit. Supervisory hospital staff may conduct this inspection where no Municipal Fire Department is established.

Where possible, a member of the fire department or hospital staff should visit the dwelling unit from time to time to ensure all is correct and safe.

DISTRIBUTION

A copy of the guideline has been forwarded to the Department of Health for distribution to all hospitals.

FIRE AND LIFE SAFETY STANDARDS PERTAINING TO OXYGEN CYLINDERS

The following Fire and Life Safety Standards apply to all persons who use oxygen (for medical reasons) in a dwelling unit.

1. In addition to an in-use quantity (oxygen cylinder in-use), please refer to Appendix A for maximum storage quantities and residential storage requirements. Appendix A is an excerpt from CSA Standard Z305.12-06 titled "Safe Storage, Handling, and Use of Portable Oxygen Systems in Residential Buildings and Health Care Facilities."
2. Smoking shall be prohibited in the room in which oxygen is being used. A "No Smoking - Oxygen In Use" sign must be prominently displayed.
3. Oxygen cylinders shall be located and secured in a manner that will prevent any damage or injury.
4. Never permit oil, grease or oil base products to come in contact with oxygen cylinders, regulators, gauges or fillings.

NOTE: Many normal household articles contain a grease or oil base. Care should be exercised in their use in proximity to oxygen equipment.

5. Except when demand type respirators are used, the oxygen tank valve should be closed when not in use.
6. Never drape an oxygen cylinder with any articles of clothing. Clothing may become saturated in oxygen and easily ignited.
7. One (1) 110 volt or battery operated Smoke Alarm shall be installed in patient's immediate sleeping area. If more than one smoke alarm is installed in the dwelling unit, they shall be interconnected.
8. One (1) 2½ lb. ABC dry chemical extinguisher shall be available near the room where oxygen is being used.
9. Please refer to Appendix A for additional storage quantities and storage requirements.
10. A family escape plan must be developed with emphasis on the safe evacuation of the patient.

11. If clothing becomes saturated with oxygen, change clothing (preferably) or move outside for one half hour and slap clothing to disperse the oxygen.

12. Conditions to avoid:

- (a) Heat - Do not place either the liquid oxygen base unit or portable unit near any source of heat.
- (b) Flame - Any flame producing items must be eliminated from the room where the oxygen system is used and stored.
- (c) Sparks - All electrical appliances should be kept at least five feet away from the units. It is also necessary to make sure that all electrical equipment is properly grounded.

13. EMERGENCY PROCEDURE

- (a) IF A LARGE STEADY VENTING OCCURS (DENSE WHITE VAPOUR PLUME) FROM THEIR CONTAINER, STAY OUT OF THE VAPOR PLUME, OPEN ALL WINDOWS IN THE ROOM. CLOSE THE DOOR TO THE ROOM AND IMMEDIATELY CALL YOUR AUTHORIZED SERVICE REPRESENTATIVE AND YOUR FIRE DEPARTMENT.
- (b) CAUTION SHOULD ALWAYS BE USED WHEN MOVING THE BASE UNIT. DO NOT TILT THE UNIT OR ALLOW THE UNIT TO FALL OVER. UNIT PROPERLY VENTILATES WHEN IN AN UPRIGHT POSITION.

HOME OXYGEN CONCENTRATORS:

There are no special requirements where an approved Home Oxygen Concentrator is used. These units do not use oxygen tanks. If conventional oxygen tanks are in use as a back-up, then the provisions of this bulletin must apply. Where the Home Oxygen Concentrator is used, a 110 volt or battery operated smoke alarm and a 2½ lb. ABC type fire extinguisher is required.

FIRE AND LIFE SAFETY STANDARDS FOR IN-HOME LIQUID OXYGEN SYSTEMS

1. Home Storage: Home Base Unit - 150 lbs. Full, 50 liters maximum with portable liquid oxygen unit. See Appendix A for additional storage quantities.
2. Liquid oxygen refill of patient home liquid oxygen base unit:
 - (a) Refill in properly vented stationary vehicle.
 - (b) For refill outside of vehicle: Liquid base unit placed in a 1 meter x 1 meter 8 centimeter deep aluminum tray.
 - (c) Refill done by personnel qualified in:
 - properties of oxygen
 - refill procedures
 - safety precautions for refill

Either:

 - Nurse
 - Respiratory Technician
 - Trained employee of gas manufacturer and/or distributor.
3. Filling of portable liquid units in the home:
 - (a) Patient and/or family member(s) thoroughly trained in the safety precautions and correct use of the equipment of either:
 - Nurse
 - Respiratory Technician
 - Trained employee of gas manufacturer and/or distributor.
 - (b) Safety precautions - Training checklist, completed and signed by trainer and trainee.
4. Portable units are not to be carried under clothing. Keep units exposed to outside air.
5. Smoking shall be prohibited in the room in which oxygen is being used. A "No Smoking - Oxygen in Use" sign must be prominently displayed.
6. One (1) 110 volt or battery operated Smoke Alarm shall be installed in patient's sleeping area. If more than one smoke alarm is installed in the dwelling unit, they shall be interconnected.

7. At least one (1) 2½ lb. dry chemical fire extinguisher shall be available near the room where oxygen is being used.

IN THE EVENT OF A FIRE, THE FOLLOWING ACTION SHOULD BE TAKEN

Actions numbered below as 1 through 4 taken simultaneously, the remainder being taken in the approximate order given.

- (1) If the patient's hair or clothing are burning, put out the fire.
- (2) Get the patient away from the equipment and to safety.
- (3) Turn off the oxygen flow at the head of the cylinder if it can be done without personal hazard.
- (4) Close all doors and windows in the room.
- (5) Notify other occupants of the building of the fire.
- (6) Call the fire department.
- (7) A. If the fire is small and quantities of smoke are not present, attempt to contain or put out the fire.
B. If the fire is large or if quantities of smoke are present, evacuate immediately and call the fire department to the scene of the fire.
- (8) Above all, remain calm.

SUPERVISION

Where oxygen is used through a constant flow mask, it may be necessary to continuously supervise the patient. In the event the patient falls asleep and the mask is dislodged from their face, the oxygen will flow freely and eventually fill the room.

A copy of this bulletin should be given to the supervisor of the dwelling unit, who should discuss its content with all members of the household, and put these instructions on the wall.

- APPENDIX A** - Excerpt from CSA Z305.12-06
Safe Storage, Handling, and Use of Portable Oxygen Systems
Residential Buildings and Health Care Facilities.
- APPENDIX B** - Safety precautions in the handling of liquid oxygen for portable
and base units.
- APPENDIX C** - Procedures and guidelines for the outfitting and operation of
vehicles used in the transportation transfilling of liquid oxygen to
be used for respiration.

APPENDIX A

EXCERPT FROM CSA Z305.12-06

SAFE STORAGE, HANDLING, AND USE OF PORTABLE OXYGEN SYSTEMS IN RESIDENTIAL BUILDINGS AND HEALTH CARE FACILITIES

7 Storage of oxygen systems

7.1.1 Regulations

The cylinder and/or cryogenic container shall be stored in accordance with applicable regulations and the manufacturer's recommendations.

7.1.2 Signage for oxygen storage

"OXYGEN" and "NO SMOKING" signs shall be prominently posted in all oxygen storage areas.

7.1.3 Maximum storage quantities for gaseous and liquid oxygen

Maximum storage quantities for gaseous and liquid oxygen are shown in Tables 3 and 4, respectively. Tables 3 and 4 exclude in-use quantities, e.g., patients who are currently using oxygen.

7.1.4 Storage locations

7.1.4.2 Residential buildings

Oxygen storage shall be permitted in the following locations in residential buildings:

- (a) the oxygen user's bedroom;
- (b) common areas; and
- (c) storage rooms.

The maximum oxygen quantities specified in Tables 3 and 4 for common areas in residential buildings shall not require enclosure of the common areas by a fire separation with a minimum 0.75 h fire-resistance rating if the common areas are located within a dwelling unit. However, local codes, regulations, or bylaws can require dwelling units in a multi-unit residential building to be separated from the remainder of the building by fire separations with a fire-resistance rating.

In multi-unit residential buildings, common areas for oxygen storage can be located outside of a dwelling unit. In such areas, the maximum oxygen quantities specified in Tables 3 and 4 shall apply only if those areas are enclosed by a fire separation with a minimum 0.75 h fire-resistance rating and are well ventilated. If this fire separation is not provided, oxygen storage shall be restricted to the user's dwelling unit or appropriately designed storage rooms. However, as an alternative to providing a rated

fire separation, sprinkler protection throughout the floor area in accordance with NFPA 13 may be provided.

Oxygen storage rooms (see Tables 3 and 4) can be constructed in a dwelling unit or elsewhere in a residential building. These rooms shall be enclosed by a rated fire separation in accordance with local codes or regulations. If local codes or regulations do not address the issue of storage rooms, a fire separation with a minimum 1 h fire-resistance rating should be provided. Storage rooms should be ventilated using at least six air changes per hour or as necessary to prevent the formation of an oxygen-enriched atmosphere in accordance with local codes or regulations. Storage rooms shall be kept dry and their temperature shall not exceed 50 C (125 F). Below-grade storage room locations should be avoided.

Stored oxygen and cryogenic containers shall have sufficient ventilation to prevent the formation of an oxygen-enriched atmosphere. Oxygen cylinders and cryogenic containers shall not be stored in unvented enclosed spaces (e.g., closets or clothes chests) or in the presence of ignition sources.

Notes:

(1) Oxygen storage in a residential building should be limited to quantities necessary for therapeutic needs.

7.1.5 Separation from combustibles

Oxygen cylinders and cryogenic containers shall not be stored with readily ignitable substances such as gasoline or waste, or with combustibles in bulk, including oil. Cylinders containing flammable gases shall not be stored with cylinders containing liquefied or gaseous oxygen or other gases that support combustion.

7.1.6 External corrosion

Corrosion can damage containers and cause valve protection caps to stick. Accordingly, cylinders and cryogenic containers shall not be exposed to continuous dampness and shall not be stored near salt or other corrosive chemicals or fumes. Cylinders and cryogenic containers shall be protected from corrosive atmospheres.

7.1.7 Mechanical damage

Cylinders and cryogenic containers shall be protected from any object that could produce a harmful cut or other abrasion in the surface of the metal. Cylinders and cryogenic containers shall not be stored near elevators, gangways, and unprotected platform edges or in locations where heavy moving objects could strike or fall on them. Dropping or physically abusing containers or their attachments shall be avoided.

7.1.8 Grouping of cylinders

Gases of different types stored at the same location shall comply with local codes. In the absence of applicable local codes or regulations, gases should be grouped in accordance with NRCC *National Fire Code of Canada* requirements. Full and empty containers should be stored separately, with the storage layout planned so that old stock containers can be removed first to reduce handling of other containers.

7.1.9 Storage and use of cylinders

All compressed gas cylinders in service or storage shall be stored upright and secured in such a way that they will not be knocked over. Gas cylinders with a water volume up to 5.0 L may be stored horizontally. Cylinders or equipment for handling oxygen shall be stored in a clean, ventilated area free of grease, oil, or other contaminants.

7.1.10 Storage of cryogenic containers

Cryogenic containers, except those designed for use in a horizontal position, shall be stored upright to prevent their tipping over and releasing liquid oxygen.

7.1.11 Outdoor storage

Cryogenic containers may be stored outdoors and shall comply with local codes or regulations. Compliance measures usually include a non-combustible canopy and an enclosure that is used solely for such storage and is surrounded by a firmly anchored fence.

Note:

See Clause 7.1.6 for external corrosion requirements.

7.1.12 Interference with egress

Cryogenic containers and cylinders shall not be located in such a way that they impede egress to corridors, doorways, exits, or stairways, or in areas normally used or intended for the safe exit of people. Containers and cylinders in public areas should be protected against tampering.

7.1.13 Enclosed areas

Cryogenic containers shall not be stored in enclosed unvented areas such as closets or clothes chests. Air shall be allowed to circulate around the containers at all times.

Table 1
Properties of gaseous oxygen

Chemical Formula	O ₂
Molecular weight (one mole)	31.9988 mg
Purity	99.0% minimum (USP)
Color	None
Odor	None
Life-support capability	Life supporting
Physical state in the compressed gas cylinder	Gaseous
Usual method of manufacture	Separation from air
Normal cylinder-filling limit	13 790-15 169 kPa (2000-2200 psig) pressure at 21 °C (70 °F)
Combustion characteristics	Non-flammable; oxidizer (supports combustion)
Volume in 1 ft ³ at normal atmospheric pressure and 21 °C (70 °F)	28.64 L

Table 2
Properties of liquid oxygen

Chemical formula	O ₂
Purity	99.0% minimum (USP)
Color	Pale blue
Odor	None
Life-support capability	Life supporting
Physical state in the cryogenic container*	Gas over liquid
Usual method of manufacture	Separation from air (air liquefaction process)
Normal vapour pressure	Generally between 138 and 345 kPa (20 and 50 psig)
Combustion characteristics	Non-flammable; oxidizer (accelerates combustion)
Number of litres in 1 kg at normal atmospheric pressure and 21 °C (70 °F)	754 gaseous litres
Expansion ratio	860:1 (gaseous:liquid)

**During non-usage, pressure will increase very slowly, after which the cryogenic container will vent gas.*

Table 3
Maximum storage quantities for gaseous oxygen (gaseous litres)*
 (See Clauses 7.1.3, and 7.1.4.2.)

Facility category	Storage room**	Supervised / monitored area	Common area	Patient/resident room or user bedroom	Corridor
Hospitals (acute and chronic)	Unlimited	8000	1500	8000	0
Other health care facilities	Unlimited	8000	700	8000	0
Residential buildings	Unlimited	-----	700	8000	0

*Storage quantities exclude in-use quantities, e.g., patients who are currently using oxygen.

**See local codes, regulations, or bylaws for design requirements for oxygen storage rooms. Where there are no applicable local codes, regulations, or bylaws, the NRCC's National Fire Code of Canada should be used.

Table 4
Maximum storage quantities for liquid oxygen (liquid litres)*
 (See Clauses 7.1.3, and 7.1.4.2.)

Facility category	Storage room**	Supervised / monitored area	Common area	Patient/resident room or user bedroom	Corridor
Hospitals (acute and chronic)	Unlimited	150	50	50	0
Other health care facilities	Unlimited	150	50	50	0
Residential buildings	Unlimited	-----	50	50	0

*Storage quantities exclude in-use quantities, e.g., patients who are currently using oxygen.

**See local codes, regulations, or bylaws for design requirements for oxygen storage rooms. Where there are no applicable local codes, regulations, or bylaws, the NRCC's National Fire Code of Canada should be used.

APPENDIX B

SAFETY PRECAUTIONS FOR DEALERS IN THE HANDLING OF LIQUID OXYGEN FOR PORTABLE AND BASE UNITS.

Oxygen is colorless, odorless and tasteless. It is non flammable but vigorously accelerates combustion. Some materials that will burn in air, burn vigorously in oxygen.

- DO** - Read and understand all instructions and safety information before filling or using any oxygen container or system. Only trained and qualified personnel should perform transfilling operations.
- DO** - Fill, store and use liquid oxygen containers only in a well ventilated area.
- DO** - Clean connections with a clean white lint-free cloth to remove any foreign material such as dust, oil, dirt and moisture.
- DO** - Keep all electrical equipment a minimum of 20 feet from any portion of the oxygen system when transfilling into a container.
- DO** - Always operate oxygen valves slowly.
- DO** - Always close the Flow Selector Valve or Flowmeter when not in use.
- DO NOT** - Store liquid oxygen containers in a small enclosure such as a closet or a parked vehicle with windows closed unless adequate permanent vents are provided.
- DO NOT** - Permit oil, grease or other hydrocarbon base material or any readily flammable materials to come in contact with any portion of an oxygen system.
- DO NOT** - Lubricate any connections with oil or grease. Most oils and greases react violently with oxygen and explosions can result.
- DO NOT** - Handle oxygen connections with oily or greasy hands or gloves.
- DO NOT** - Tamper with a pressure relief valve.

- DO NOT** - Transfill liquid oxygen over asphalt or any surface which is hydrocarbon base.
- DO NOT** - Drop liquid oxygen containers or place them in a location where they can fall over.
- DO NOT** - Store liquid oxygen containers near sources of heat (radiators, portable heaters, etc.)
- DO NOT** - Touch any frosted fittings or place any part of the body in the cold vapour cryogenic burns similar to thermal burns or frost bite can result.

- NOTE** - It is the responsibility of the dealer to comply with all Federal, Provincial Laws and Regulations in addition to recognized Industry Standards.

APPENDIX C

PROCEDURES AND GUIDELINES TO FOLLOW FOR THE OUTFITTING AND VEHICLES USED IN THE TRANSPORTATION AND TRANSFILLING OF LIQUID OXYGEN TO BE USED FOR RESTORATION

1. Transportation and Transfilling compartments must be separated from the driving compartment by a bulkhead to prevent buildup of an oxygen-enriched atmosphere in the driver's compartment. Fixed windows are permitted.
2. Multiple vents shall be provided in the cargo compartment. At a minimum there shall be one vent in the forward portion of each side of the cargo compartment and one in the rear. Vents should be of the fixed open type. All side and rear vents shall be at or near the floor line. At a minimum the total natural ventilation shall provide 1 sq. ft. per 300 sq. ft. of compartment ceiling area.
3. No combustible materials shall be used in the finishing of the cargo compartment, e.g. paneling, plywood, carpeting, etc.
4. Any vessels permanently installed in the vehicle will have all safety and vessel vent discharge lines piped outside the vehicle. These vents must be designed so that they are not likely to discharge onto oil or asphalt surfaces or other combustible materials, or onto the vehicle's exhaust system. If they discharge upward they should have weather protection. Vessels not permanently installed in the vehicle shall be suitably restrained during transit to prevent them from moving or tipping over.
5. All fittings and piping shall be installed with materials compatible for the service pressures and temperatures involved and acceptable for oxygen service.
6. No vessel shall be filled without an adequately trained person in attendance.
7. No vessel may be filled while the vehicle is in motion or while the vehicle's engine is running.
8. Where any vessel is filled inside the cargo compartment, all cargo compartment doors shall be open and vent gas shall be directed outside. Where a vessel is filled outside the vehicle, it shall be positioned to avoid vented liquid or gas coming into contact with asphalt or other combustible materials.

9. Notices prohibiting smoking and open flames must be clearly posted at appropriate locations in the compartment and on the outside of the vehicle.
10. After filling, all transfer lines shall be properly drained. The oxygen vapors shall be allowed to disperse before the vehicle's engine is started.
11. Vehicles and containers must be marked, placarded and labeled in accordance with the regulations of Transport Canada and all other Federal, Provincial and Municipal regulations.
12. An approved ULC type portable dry chemical fire extinguisher be installed on each vehicle and in an accessible location for the driver operator.

Revision 2008-06-26 Supercedes 2000-02-01