

## **Non-flammable Medical Gas Storage And Mechanical System Requirements**

If you intend to use and store non-flammable medical gas (includes compressed Oxygen, Helium, Nitrogen and other non-combustible gasses), certain requirements must be met according to NFPA 99, Standard for Health Care Facilities, 1999 Edition, which is referenced by NFPA 101, Life Safety Code (2000 Edition). NFPA 99 has two sets of requirements, based on the volume of gas to be stored. Where the stored volume is in the Bulk Oxygen range, another NFPA publication addresses the requirements. NFPA 99 clearly distinguishes between compressed Oxygen in cylinders and liquid Oxygen in containers (high or low pressure) in the pertinent chapters. The following guidelines are not intended to be all inclusive, but to serve as a general overview.

Outdoors storage shall be in an enclosure or within an enclosed space of noncombustible or limited-combustible construction with doors that can be secured against unauthorized entry. Where the storage of a volume less than a bulk system is outside in an enclosure (fence), the nearest window of the licensed facility must be not less than 25' away. Smoking, open flames, electrical heating elements and other sources of ignition shall be prohibited within 20 ft. of outside storage.

Oxidizing gases such as oxygen and nitrous oxide shall be separated from combustibles or incompatible materials by either :(1) a minimum distance of 5ft. if the storage location is protected by an automatic sprinkler system or (2) an enclosed cabinet of noncombustible construction having a minimum fire resistance rating of one half hour or an approved flammable liquid storage cabinet according to NFPA 99, Section 8-3.1.11.2 (c).

A precautionary sign, readable from a distance of 5 feet shall be conspicuously displayed on the door to the room or on the protective enclosure if outside. This sign shall include, as a minimum, the following wording. Note that both Oxygen and Nitrous Oxide are oxidizing gasses

### **CAUTION OXIDIZING GASES STORED WITHIN NO SMOKING**

The following applies for indoor storage of compressed Oxygen, whether stored or connected (total collective):

<3000 CF - dedicated space (non- or limited combustible), 5' on standard electrical devices, 72 sq. in. door vent(1), restraints. Where located on an *egress corridor*: no door vent, vent as for over 3000 SF (mech. or natural vent to outside), 1 hour rating of door, etc.

3000-20,000 CF - dedicated space w. 1 hr fire rating, 5' on standard electrical devices, 72 sq. in. natural vent or power vent to outside (no CFM given), restraints. If serving a piped system, overpressure devices vented to outside.

>20,000 - bulk rules apply.

Where liquid O<sub>2</sub> (cryogenic) containers are stored, *regardless of volume*, the provisions for over 3000 CF shall be observed, including mechanical ventilation in lieu of optional natural ventilation. (NFPA 99 Sec 8-3.1.11 modifies Sec 4-3.1.1.2(b)4). Note that all of the above numbers are based on Oxygen in gas form; an equivalent amount of Oxygen in liquid form would require 860 times more volume when off-gassed.

Mechanical systems (compressors, vac. pumps) on essential branch of electrical system. Alarms on Life Safety Branch. Med air intake NLT 10' from and building opening (such as a window or door) and potential noxious sources (exhaust fumes, exhaust vents, etc.), plus 20' above ground level.

For piped in medical gas: two master alarm locations: one in the area of person responsible for maintaining/operating the systems, and one in continuously attended area like a nurses station. Audible, plus non-cancellable visual.

Changeover is about to occur.

Reserve in use (and/or alternate pump)

Reserve down to one day.

Pressure 20% hi/low; vacuum below 12" or above 19" Hg.

Zone alarms as needed, audible plus non-cancel visual.

Med air: pressure, dew point, CO (local alarm only); add visual indicator of liquid hydrocarbon detection for extended head type.

Derangement alarm for med air and vac pump local panels.

Sequential alarms reinitiate audible signals

Pressure gauge by alarm switches, every case. Pressure Reducing Valves shall be duplexed for all systems.

Emergency Oxygen connection: where the cryogenic supply source is located OUTSIDE a served building, an emergency gaseous Oxygen connection shall be provided at a location away from the cryogenic supply. This shall be accessible, generally on the outside of the building near a street.

Piping shall be installed inside pipe or conduit for protection where passing through fire rated barriers. Protection shall be continuous to contain any leaked material where the piping passes through hazardous areas (mechanicals, laundries, etc.). No med gas passing through kitchens or electrical switchgear rooms. Supports:

0.25" - 5'	0.375" - 6'	0.50" - 6'
0.75" - 7'	1.00" - 8'	1.25" - 9'
	1.50" - 10'	

Pipe labels every 20' and at least one visible above ceiling of each room served.

Valves - main supply site (at least one accessible to shut down the whole system), downstream of each riser take-off, each zone box (or for a single outlet off a riser).

Non-hospital based systems:

Less than 2000 CF (or 5000 CF equivalent of cryogenic liquid.)

Regulators mounted directly on tanks

Ten use points or less, single treatment facility

Any deviation from above: hospital based regulations.

System testing - see NFPA 99 Section 4-3.4 et seq. Outlet verification testing to be done by other than the installing contractor.

**Liquid Oxygen:**

Much of the information on Transfilling of liquid Oxygen containers is contained in NFPA 99, but it comes directly from three Compressed Gas Association (CGA) pamphlets on the subject.

Transfilling: NFPA 99 Section 8-6.2.5.1(b) Transfer of gaseous oxygen from one cylinder to another shall be in accordance with CGA Pamphlet P-2.5, *Transfilling of High Pressure Gaseous Oxygen to Be Used for Respiration*. **Transfer of any gases from one cylinder to another in patient care areas of health care facilities shall be prohibited.**

See also:

NFPA 99 Section 8-6.2.5.2 **Transferring of Liquid Oxygen** Transferring of liquid oxygen from one container shall be accomplished at a location specifically designated for the transferring that is as follows:

- (a) Separated from any portion of a facility wherein patients are housed, examined, or treated by a separation of a fire barrier of 1-hour fire-resistive construction; and
- (b) The area is mechanically ventilated, is sprinkled, and has ceramic or concrete flooring; and
- (c) The area is posted with signs indicating that transferring is occurring, and that smoking in the immediate area is not permitted.®

CGA P-2.6:

Well ventilated location, posted NO SMOKING, location remote from patient care areas, equipment designed for transfilling, must not have combustible flooring, must have adequate ventilation.

5.1.1.2 The Facility must (a) provide for spill prevention; (b) provide containment or diversion to an area that provides sufficient vaporization capacity and ventilation to safely discharge the entire contents of any container(s) permitted in the area.

Boiling point: -297 F

Expansion: nominal 860:1

Critical temperature: -181.4F

Specific gravity: 1.14

Light blue fluid, low viscosity.