

# VETERINARY HYPERBARIC MEDICINE

## MEDICAL GAS SOLUTIONS

### HYPERBARIC CHAMBER OXYGEN SUPPLY

Oxygen systems are comprised of the source equipment and distribution system. The source equipment consists of all items required to store and regulate the oxygen. The distribution system includes the piping, valves and alarms between the supply and the point of use.

Class C (Animal, no human occupancy<sup>1</sup>) hyperbaric chambers are typically compressed with 100% oxygen which supports the patient's respiratory requirements and displaces carbon dioxide in the enclosed chamber environment. The volume of oxygen required for hyperbaric treatments dictates installation of a liquid oxygen supply. The configuration of the oxygen supply equipment and storage capacity affects location and construction requirements. Where applicable, in the absence of NFPA<sup>2</sup> 99; 2012, Chapter 14 code requirements for Class C chambers, Sechrist recommends using code requirements for Class B chambers.

### OXYGEN INSTALLATION LOCATIONS & LIMITATIONS

General considerations for locating the oxygen supply

- Storage capacity of oxygen equipment
  - Bulk Storage (>20,000 ft<sup>3</sup>)
  - Non-bulk Storage (>3,000 & <20,000 ft<sup>3</sup>)
- Vendor delivery access
  - Accommodate delivery vehicle
  - Access to oxygen storage enclosure – interior or exterior locations
- Aesthetics (zoning requirements)

### BULK OXYGEN SYSTEM

NFPA-55 Defines a bulk oxygen system as an assembly of equipment that has a total storage capacity of more than 20,000 standard cubic feet<sup>3</sup>, mandates minimum distances of separation from hazards and prohibits locating indoors.



FIGURE 1: 3,000 LITER LIQUID O<sub>2</sub> & HIGH PRESSURE RESERVE

<sup>1</sup> NFPA-99, 2012 Edition

<sup>2</sup> National Fire Protection Association

<sup>3</sup> 20,000ft<sup>3</sup> = 174 gallons or 658 liters liquid oxygen



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### NON-BULK OXYGEN SYSTEM

Liquid oxygen source equipment most often utilized for storage systems not exceeding 20,000 ft<sup>3</sup> is configured with liquid oxygen VGL vessels often referred to as Dewar vessels. As with bulk oxygen vessels, VGL vessels are supplied in various capacities and care must be taken to ensure the combined storage capacity, including reserve vessels or cylinders, is appropriate for the storage location.

VGL systems with a storage capacity of <20,000 ft<sup>3</sup> may be installed in or out of doors. If installed out of doors, the installation must be secured and protected from weather with a protective cover.

If installed indoors, the installation must comply with the local building code, NFPA-55 requirements for ventilation and a minimum of 1-hour fire rated enclosure. The location must provide for sufficient space to store, access and safely move VGLs, reserve and stored cylinders.

Customized mobile and modular oxygen supply source equipment designs are additional options to support specialized practices.

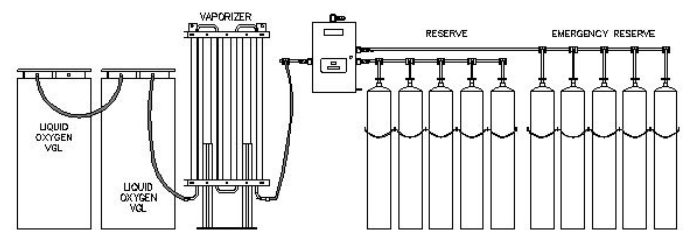


FIGURE 2: LIQUID O<sub>2</sub> VGLs WITH HIGH PRESSURE RESERVES

### MEDICAL AIR SUPPLY FOR HYPERBARIC CHAMBERS

Medical air is utilized in some veterinary practice treatment protocols for normobaric treatment procedures.

### MEDICAL AIR INSTALL LOCATIONS & LIMITATIONS

Medical air source equipment is generally configured as two banks of high pressure cylinders controlled with an automatic switching manifold. Medical air manifolds are most commonly installed at an indoor location. The storage location must be constructed in conformity with local code.

Depending upon the volume of medical air utilized, the hyperbaric chamber may be serviced by a single high pressure cylinder secured at the foot of the chamber and controlled by a single stage regulator rather than the manifold system.

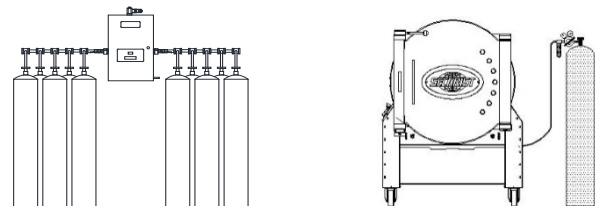


FIGURE 3: MEDICAL AIR-MANIFOLD & SINGLE CYLINDER EXAMPLES





## SIZING THE MEDICAL GAS SUPPLY EQUIPMENT

Multiple considerations are involved in correctly sizing the storage and selection of supporting equipment, i.e., manifolds, vaporizers piping. Primary considerations include:

- Hyperbaric equipment demand specifications
- Patient utilization (number of treatments)
- Duration of treatments
- Frequency of gas deliveries
- Physical plant & location
- Zoning restriction
- Aesthetics

## ADVANTAGES & DISADVANTAGES

### BULK VS. VGL OXYGEN SUPPLY EQUIPMENT

- Bulk supplies must be installed at an outside location
- VGL system, if under 20,000 ft<sup>3</sup> may be installed at an indoor location
- Bulk must be located with minimum separations from hazards
- VGL systems <20,000 ft<sup>3</sup> are not subject to minimum separations
- Bulk pricing of molecules is more economical than VGL molecules (think discounts based on volume)
- Bulk systems require fewer deliveries of molecules
- Bulk systems may be leased or purchased
- VGL systems are generally purchased
  - VGL vessels are leased from oxygen vendor
  - VGL system manifold, headers, vaporizers, etc. are purchased.
- VGL systems require additional labor to manage supply
- Initial expense for installation for a leased bulk system is potentially less than for a VGL system.

## EQUIPMENT & INSTALLATION COST ESTIMATES

A significant number of variables will have direct bearing on the final cost for acquisition and installation of either a bulk or VGL oxygen supply system.

Fred Evans Medical Gas Consulting assists clients in identifying and estimating costs of individualized medical gas solutions. In addition to acquisition, installation and certification of the primary and reserve oxygen supply, associated equipment and distribution system, budgeting considerations should include design, permitting, site development, electric power, tax, shipping, etc. Medical gas source equipment options include:

- Bulk, micro-bulk or VGL primary oxygen supply system with reserve
- Mobile or Modular VGL primary supply system with reserve
- Distribution system components for either bulk or VGL systems
- Medical air manifold & cylinder securement if installed with the oxygen distribution system

- For single cylinder medical air applications; medical air regulator, particulate filter and supply line with DISS fittings

## OPTIONAL CUSTOM HYPERBARIC HEADWALL

Fred Evans Medical Gas Consulting offers a custom hyperbaric headwall that has incorporated all utilities and connections required for the Sechrist hyperbaric chamber and attending veterinary staff. The headwall is offered in configurations to support either a single or double chamber installation and is available in a wide range of color selections to accent the veterinary office color pallet.

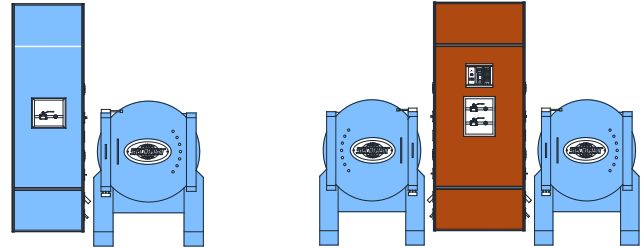


FIGURE 4: OPTIONAL SINGLE AND DOUBLE CHAMBER HEADWALL

## FRED EVANS MEDICAL GAS CONSULTING, LLC.

Fred Evans Medical Gas Consulting, LLC., with over 45 years of experience, is the industry leader in providing consulting, design, installation, certification and maintenance services related to medical gas supply and distribution systems. FEMGC is additionally known and recommended for demonstrating excellence in economical and code compliant design and installation of hyperbaric oxygen supply and distribution systems.

All installations are accomplished with qualified and credentialed ASSE Medical Gas System Installers in accordance with applicable NFPA 55 and 99, latest edition standards. Testing for certification is performed in accordance with applicable provisions of NFPA-99, 2012 Edition.

### FRED EVANS MEDICAL GAS CONSULTING SERVICES

- Design, Provide, Install & Certify
  - Medical gas system source equipment
    - Cryogenic systems
    - Gas systems
    - Vacuum systems
  - Medical gas distribution systems
    - Hospitals; Acute Care & Rehabilitation
    - Veterinary Clinics; small and large animal
    - Surgery Centers
    - Medical Clinics
    - Dental Clinics
    - Skilled Nursing and Long Term Care Facilities
  - Mobile and modular supply systems for specialized applications and medical practices
- Independent third party systems certifications
- Evaluation of systems
- Annual systems inspections
- Systems maintenance & repair
- Negotiation of gas supplier agreements

