

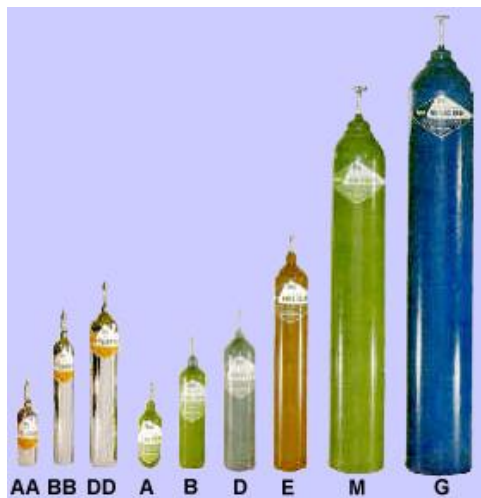


Storage and Handling of Medical Gases

Sanford Health
Safety Services

Storage and Handling of Medical Gases

- Medical Gases are stored in one of two ways:
 - Portable high-pressure cylinders
 - Large bulk reservoirs



Storage and Handling of Medical Gases

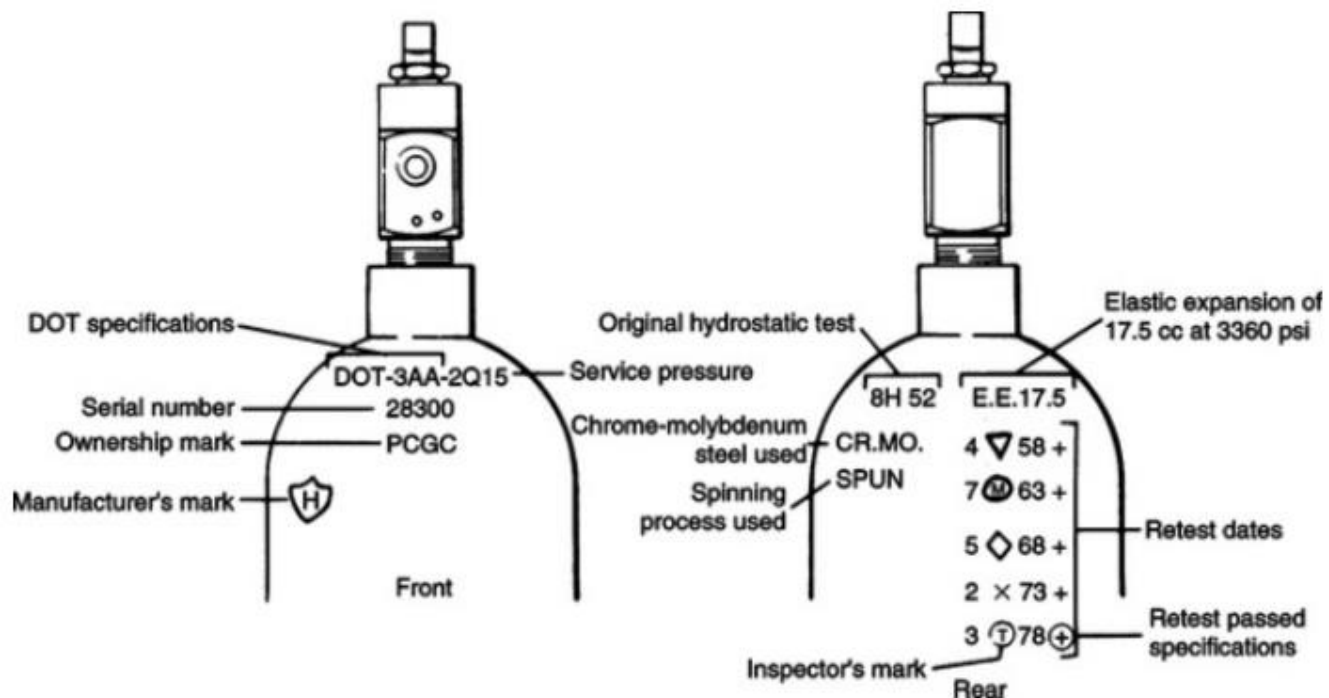
■ Gas Cylinders

- High pressure cylinders used to store and ship compressed or liquid medical gases
- Constructed from:
 - chrome molybdenum steel
 - High strength aluminum alloy
- Regulated by:
 - Department of Transportation (DOT)
 - Interstate Commerce Commission (ICC)

Storage and Handling of Medical Gases

■ Cylinder Markings

- Cylinders are marked with metal stamping on the shoulder



Storage and Handling of Medical Gases

■ Cylinder Color Coding

- Cylinders are color coded and labeled for identification of their contents
 - Code adopted by the Bureau of Standards of the U.S. Department of Commerce
- Note: Prior to initiating use of any gas, the contents of the cylinder must be verified by reading the label that is affixed to the tank

Storage and Handling of Medical Gases

■ Cylinder Color Coding

○ Oxygen	Green
○ Carbon Dioxide	Gray
○ Nitrous Oxide	Blue
○ Cyclopropane	Orange
○ Helium	Brown
○ Ethylene	Red
○ CO ₂ /O ₂	Gray/Green
○ Helium/O ₂	Brown/Green
○ Nitrogen	Black
○ Air	Yellow
○ Nitrogen/O ₂	Black/Green

Storage and Handling of Medical Gases

- Cylinder Color Coding

Oxygen



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- Cylinder Color Coding

Air



Storage and Handling of Medical Gases

- Cylinder Color Coding

Nitrous Oxide



Storage and Handling of Medical Gases



■ Cylinder Labeling

- Name and chemical symbol of the gas
- Purity of the gas
- Volume of the cylinder in liters at a temperature
- Specific hazards/precautions
- Instructions in case of exposure
- Name of manufacturer, packer, and shipper

DO NOT REMOVE THIS LABEL

OXYGEN COMPRESSED	
U.S.P.	
UN1072	

Oxygen produced by air liquefaction process

Warning:
High pressure oxidizing gas which vigorously accelerates combustion. Handle and store with care. Do not drop. Do not use or store near heat or flame. Keep free from oil or grease. Use only with equipment designed, cleaned and rated for use with medical high pressure cylinder oxygen systems. Open valve slowly. Close valve after each use and when empty. Uninterrupted use of high concentrations of oxygen over an extended period of time without monitoring its effects may be harmful. Do not attempt to use on patients who have stopped breathing, unless used in conjunction with resuscitative equipment.

WARNING: For emergency use only when administered by properly trained personnel for oxygen deficiency and resuscitation. For all other medical applications, **Rx only.**

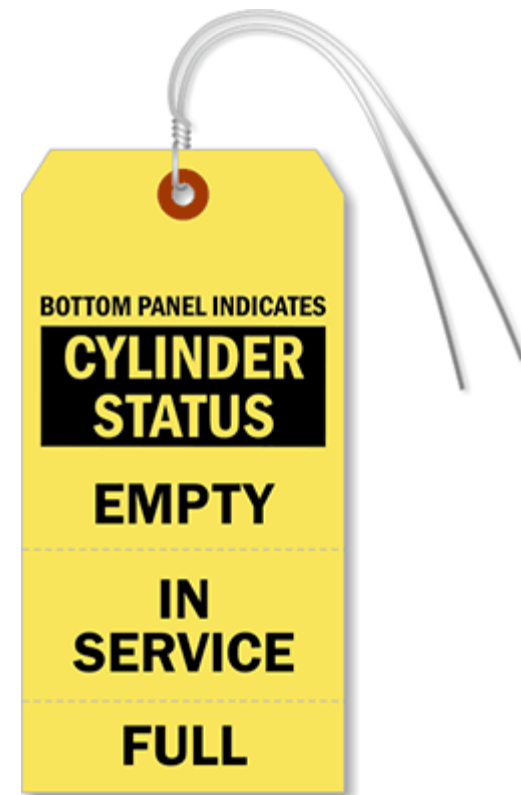
Filled by

Cylinder Distributor
Distributor Address
Distributor Phone Number

DO NOT REMOVE THIS LABEL

Storage and Handling of Medical Gases

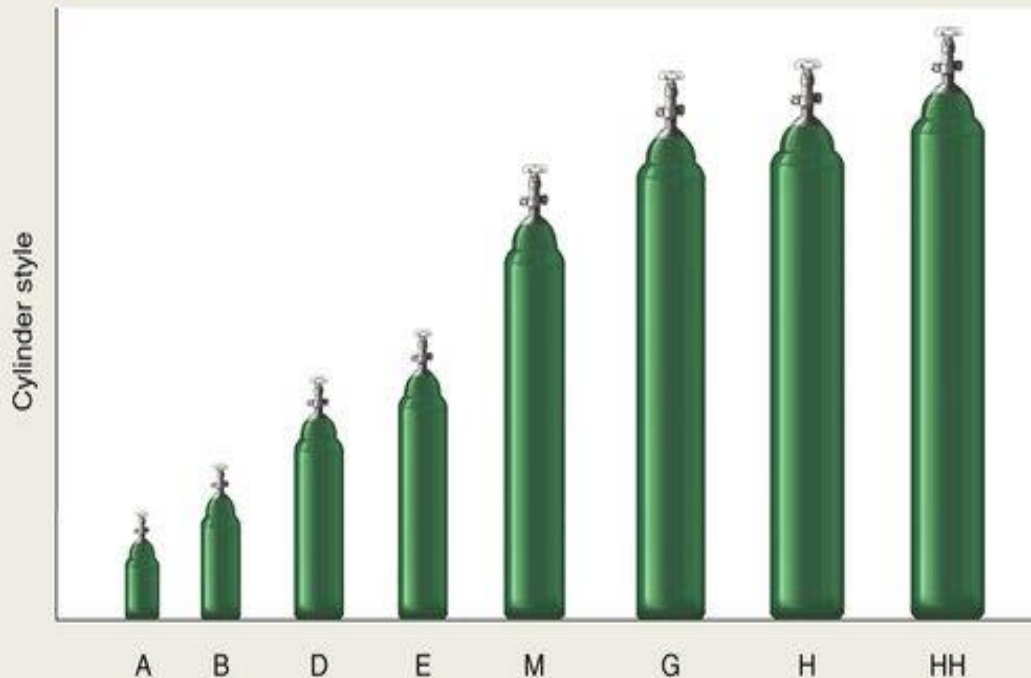
- Cylinder Labeling



Storage and Handling of Medical Gases

■ Cylinder Sizes

- Sizes E and H most common in medical facilities



Cylinder	Dimensions (in)	Weight of Empty Cylinder (lb)
A	3.0 × 10	2.75
B	3.5 × 17	8
D	4.25 × 20	12
E	4.25 × 29.5	21
M	7.12 × 46	74
G	8.5 × 55	130
H	9.0 × 55	130
HH	9.25 × 59	136

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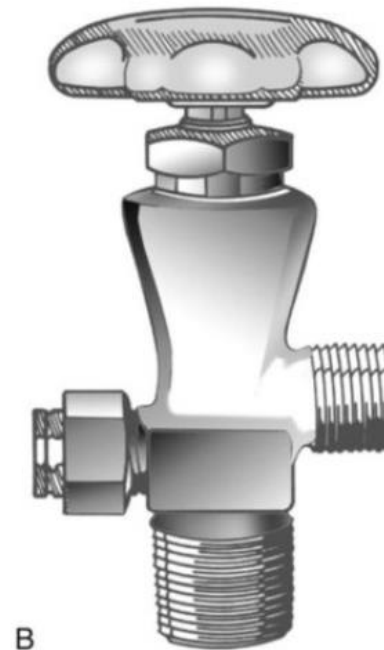
○ Valves and Connections

- Small cylinders have a post valve for yoke connectors
- Large cylinders (F – K) have a threaded valve outlet

Post valve



Threaded valve



Storage and Handling of Medical Gases

■ Cylinder Safety Relief Valves

- To prevent rupture due to high pressures, gas cylinders are equipped with high-pressure relief valves
 - Frangible
 - Ruptures at a specific pressure
 - Fusible plug
 - Melts at a specific temperature
 - Spring-loaded
 - Opens at a set high pressure

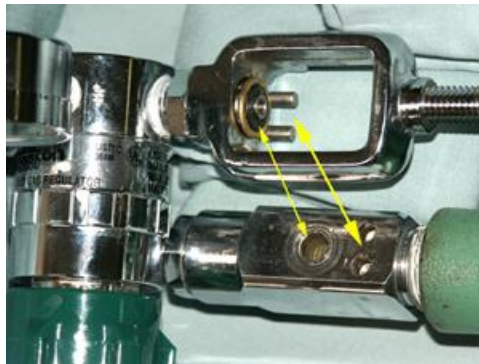
Storage and Handling of Medical Gases

■ Cylinder Valve Safety Systems

- Outlet connections of cylinder valves have safety systems to prevent the interchange of regulating equipment between gases that are not compatible
 - American Standard Safety System (ASSS) - threads
 - Pin Index Safety System (PISS) – pins
 - Diameter Index Safety System (DISS) - fitting



ASSS



PISS



DISS

Storage and Handling of Medical Gases

■ Safety Rules for Cylinder Use

- Moving Cylinders



Storage and Handling of Medical Gases

■ Safety Rules for Cylinder Use

- Moving Cylinders
 - Most accidents or injuries involving cylinders happen while moving or handling the gas cylinders
 - Always leave protective valve caps in place when moving a cylinder
 - Do not lift a cylinder by its cap
 - Do not drop a cylinder, strike two cylinders against one another, or strike other surfaces
 - Do not drag, slide, or roll cylinders; use a cart
 - Use a cart whenever loading or unloading cylinders



Storage and Handling of Medical Gases

■ Safety Rules for Cylinder Use

- Storing Cylinders
 - Comply with local and state regulations for cylinder storage as well as with those established by the National Fire Protection Association
 - Post name of the gases stored
 - Keep full and empty cylinders separate. Place the full cylinders in a convenient spot to minimize handling of cylinders
 - Keep storage areas dry, cool, and well ventilated. Storage rooms should be fire-resistant



Storage and Handling of Medical Gases

■ Safety Rules for Cylinder Use

○ Storing Cylinders

- Do not store cylinders close to flammable substances such as gasoline, grease, or petroleum products
- Protect cylinders from damage. Keep cylinder valve caps on at all times when not in use.
- May be stored in the open; however, shading may be necessary
- Protect cylinders from potential tampering by untrained, unauthorized individuals

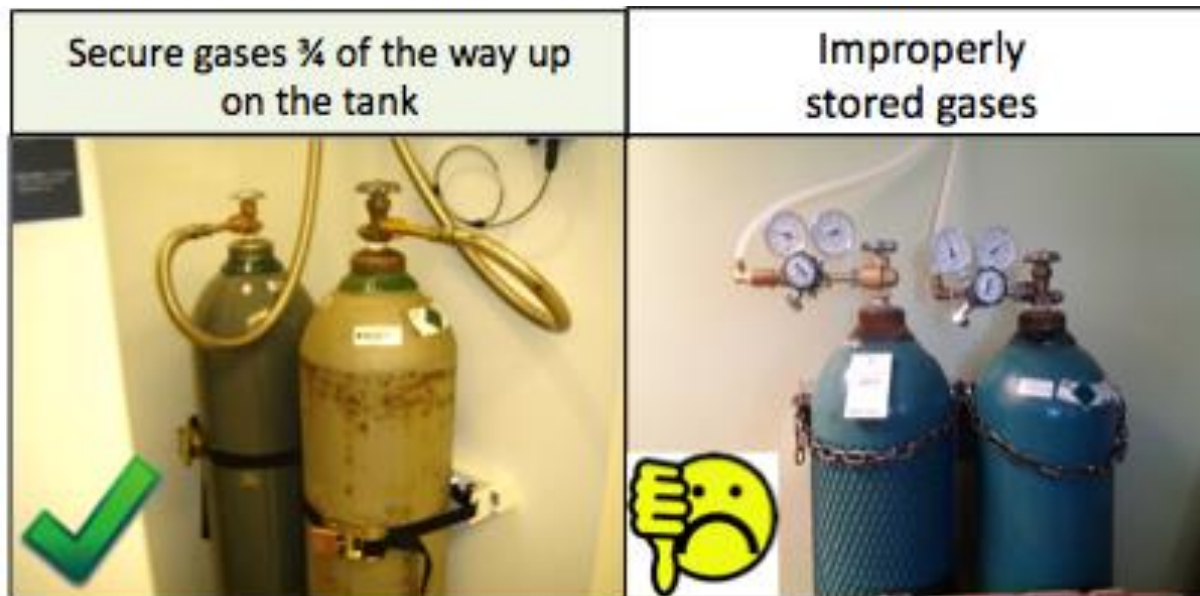


Storage and Handling of Medical Gases

■ Safety Rules for Cylinder Use

○ Storing Cylinders

- Compressed gas cylinders must be stored upright and properly secured with a chain, a strap, or a cable, above the midpoint but below the shoulder of the cylinder, to a stationary building support or to a proper cylinder cart to prevent it from tipping or falling.



Storage and Handling of Medical Gases

■ Safety Rules for Cylinder Use

- Withdrawing Cylinder Contents
 - Only to be handled by experienced, trained individuals
 - User must verify cylinder contents before use
 - Leave protective cap in place until ready to use
 - Make sure cylinder is supported and protected from falling
 - Always “crack” the cylinder prior to attaching a regulator
 - Use appropriate regulator or reducing valve

Storage and Handling of Medical Gases

■ Safety Rules for Cylinder Use

- Withdrawing Cylinder Contents
 - Do not force any threaded connections. Verify that the threads are designed for the same gas in accordance with the American Standard Safety System
 - Open valves slowly. Never use a hammer or wrench to force a valve open
 - Keep all connections tight to prevent leakage
 - Before removing a regulator, turn off the valve and bleed the pressure
 - Never use a flame to detect leaks with flammable gases
 - Do not store flammable gases with oxygen. Keep all flammable anesthetic gases stored in a separate area

OXYGEN STORAGE

Policy link: [Medical Gas-high pressure cylinders](#)



Cylinders must always be supported in an upright rack/bin or with a tie down strap or chain

DO NOT CO-MINGLE full tanks with any other tanks!

During transport always secure oxygen to prevent movement while in motion

Know tank levels: Full >2200 PSI, Partial 500-2200 PSI, Empty <500 PSI

Do NOT stock more than 12 full or partial tanks in one area at one time

Keep 6 feet away from sparks, electrical appliances, or combustible materials (cautery laser)

TJC SAFETY TIP



[Oxygen tank utilization guide link](#)

Storage and Handling of Medical Gases

Joint Commission Talking Points regarding Portable Oxygen Tanks

Definitions: Oxygen E cylinders are classified as

- Full (>2000 PSI – green zone on gauge)
- Partial (500-2000 PSI)
- Empty (<500 PSI – red zone on gauge).



Use of cylinder: Prior to patient use, always run flow through the valve or open tubing connection to clear any dust or debris.

In-use: Cylinders in 2-wheel carts, bed cages, and bed holders are always considered partial cylinders in use. Staff is expected to monitor PSI, remove them from service when <500 PSI remains in the tank, and return to an empty rack. NEVER leave a cylinder in a bed cage free standing.



Emergency: For emergency situations, staff should always obtain the oxygen cylinder from their crash cart. This cylinder is checked daily to document that there is at least 1000 PSI in the cylinder.



Storage and Handling of Medical Gases

- Bulk Gas Systems

- Used to supply large amounts of medical gas to a hospital or other institution

- Bulk Liquid Oxygen

- Cylinder Manifold Systems

- Bulk Air Supply Systems

Storage and Handling of Medical Gases

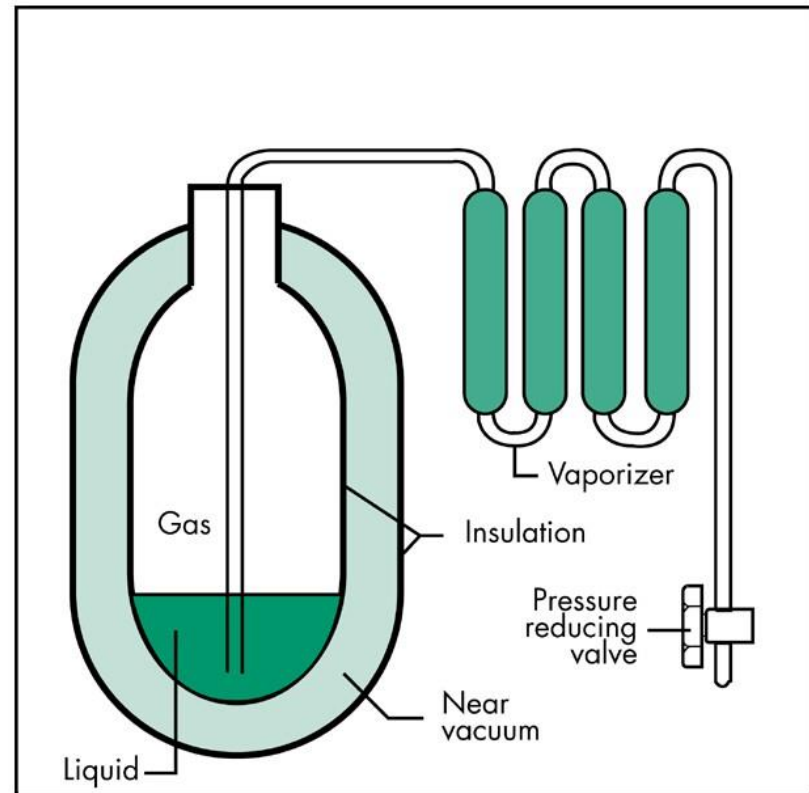
- Bulk Liquid Oxygen



Storage and Handling of Medical Gases

■ Bulk Liquid Oxygen

- NFPA defines a bulk oxygen system as more than 20,000 cubic ft. of oxygen (at atmospheric temperature and pressure)
- Major components
 - Insulated reservoir
 - -183° Celsius
 - Vaporizer/tubing
 - Warms liquid O₂
 - Pressure reducing valve
 - 50 psi for hospitals
 - Pressure release valve



Storage and Handling of Medical Gases

- **Bulk Liquid Oxygen**
 - NFPA requires hospitals to maintain a backup gas supply to equal the average daily gas usage of the facility
 - **Second, smaller liquid stand tank**
 - **Cylinder gas manifold (smaller facilities)**
 - Contingency plan for system failure is imperative



Storage and Handling of Medical Gases

■ Cylinder Manifold System

- Gas cylinders banked together in series
 - Two sides – primary bank and a reserve bank
 - Control valve switches over to the reserve bank when pressure decreases to a set level
 - Equipped with low pressure alarms
 - Empty cylinders are replaced and become the reserve bank



Storage and Handling of Medical Gases

■ Bulk Air Supply Systems

- Most systems use two compressors that work independently, or in tandem if need arises
- Each must have the capacity to supply 100% of average peak demand
- Dryer removes humidity from air entering piping system
- Reducing valve reduces pressure to 50 psi or the desired working pressure

Storage and Handling of Medical Gases

■ Station Outlets

○ Hospital Piping System

- Zone shutoff valves located behind removable panel
- Life Safety Code states that zone valves shall be readily operable from a standing position in the corridor on the same floor they serve.
 - Readily- without hesitation, delay, or difficulty.
- Therefore nothing should be placed or stored in front of zone shutoff panels



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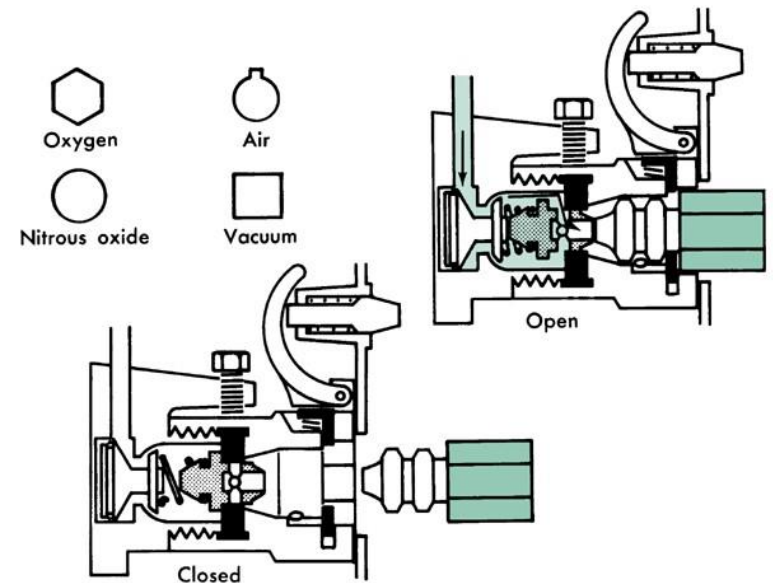
■ Station Outlets

- High-pressure, bulk oxygen supply is reduced to a 50 psi working pressure in the patient's room where it can be used to operate respiratory equipment
- Station outlets provide connections for gas-delivery devices such as flowmeters and mechanical ventilators
- These outlets contain check valves that open when a delivery device's (flowmeter) adaptor is inserted into it



Storage and Handling of Medical Gases

- Station Outlets
 - Safety Systems
 - Quick connect adaptors
 - Inserting the appropriate adaptor into the outlet pushes a plunger backward allowing gas to flow into the equipment, eg., flowmeter, mechanical ventilator, etc.



(Courtesy Nellcor Puritan Bennett, Pleasanton, Calif.)
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Storage and Handling of Medical Gases

Summary

- Medical gas can be stored in portable high pressure cylinders or large bulk reservoirs
- Gas cylinders are color coded to the type of gas they contain
- There are many different sizes of gas cylinders with the “E” size being the most common in medical facilities
- There are cylinder valve safety systems in place to prevent the interchange of equipment between gases that are not compatible
- Cylinders need to have proper labeling and user must verify cylinder contents before use
- Care should be taken when moving cylinders, always use a cart, never carry
- Area in front of zone shutoff valves is to be free of clutter and/or equipment that would prevent the valves from being readily operable.

IMPORTANT

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By clicking 'Mark Complete' you are verifying that you have read the material.