



**AL-Ayen University**  
**College of Health and Medical Technology**  
**Department of Anesthesia**



# Piped Medical Gas

**Lecture (3) theoretical**  
**Basics of Anesthetic Equipment (1)**  
**2nd Stage**  
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## ❖ Piped oxygen gas:

A central supply of oxygen is organized in two ways. In smaller hospitals **cylinder manifolds** might be used, where multiple oxygen cylinders are connected together. In a larger hospital a vacuum insulated evaporation set-up is used to store **liquid oxygen**, though a cylinder manifold system is retained as back up.

## ❖ Piped oxygen gas is divided into:

1-Cylinder manifolds

2-Vacuum insulated evaporator (VIE)

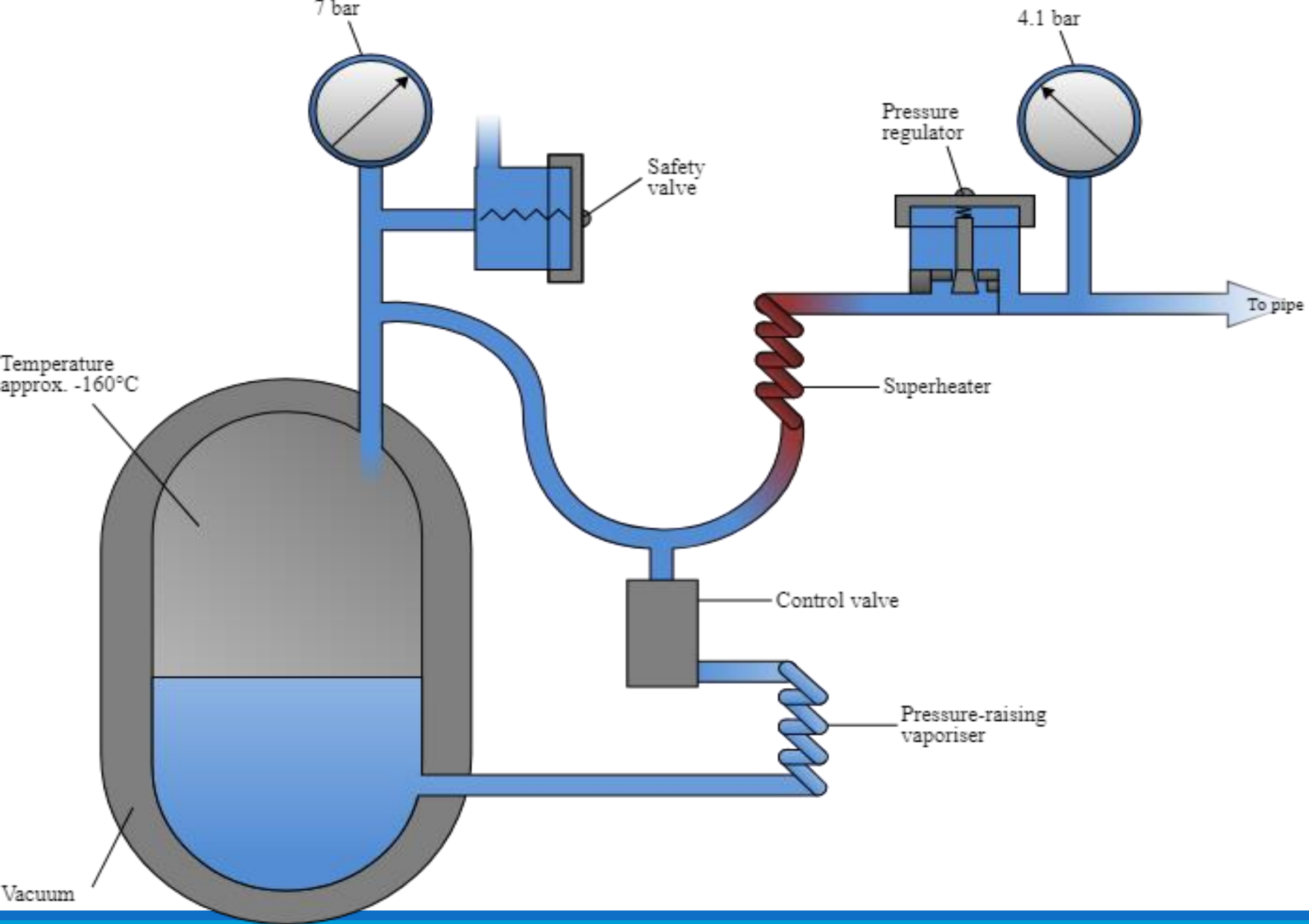
## 1-Cylinder manifolds



## 2-Vacuum insulated evaporator (VIE)

**Vacuum  
Insulated  
Evaporator  
used in  
Hospitals**

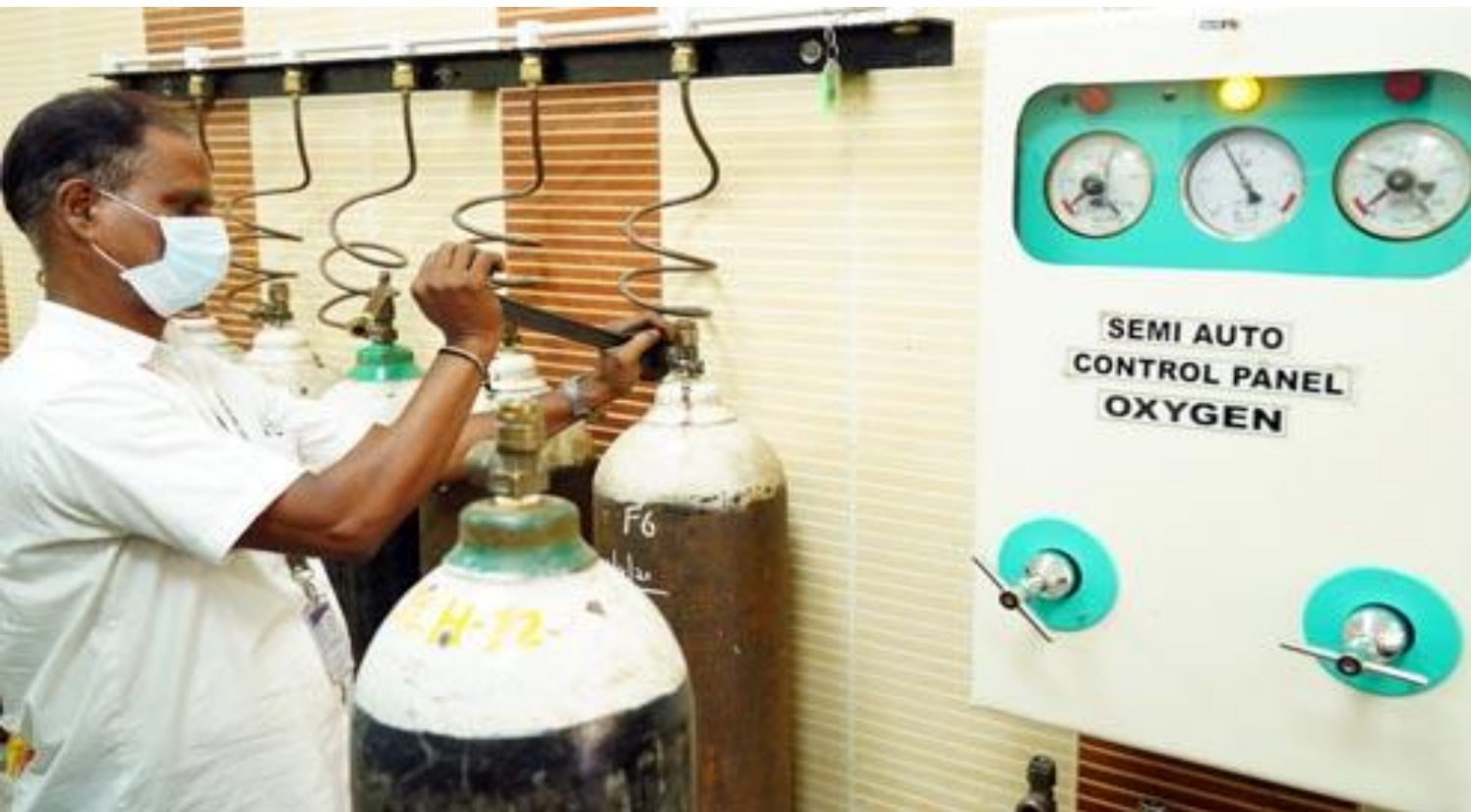




## ❖ Advantages of the central medical gas delivery system:

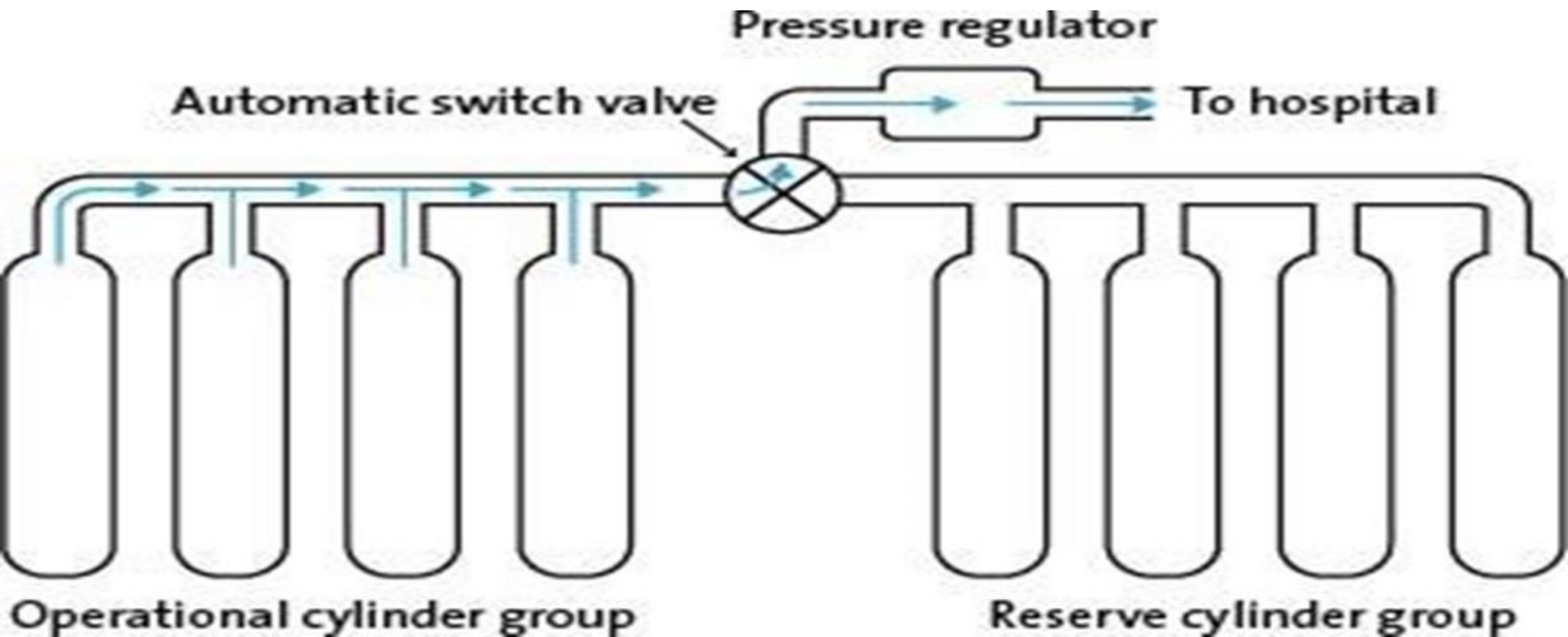
FOR PATIENTS:

- 1-No distressing sign of oxygen cylinder at bed side.
- 2-Elimination of noise produced by their movement.
- 3-Protection of sterile areas from contamination caused by use and movement of the cylinder.
- 4-Uninterrupted and clean gas supply at desired locations



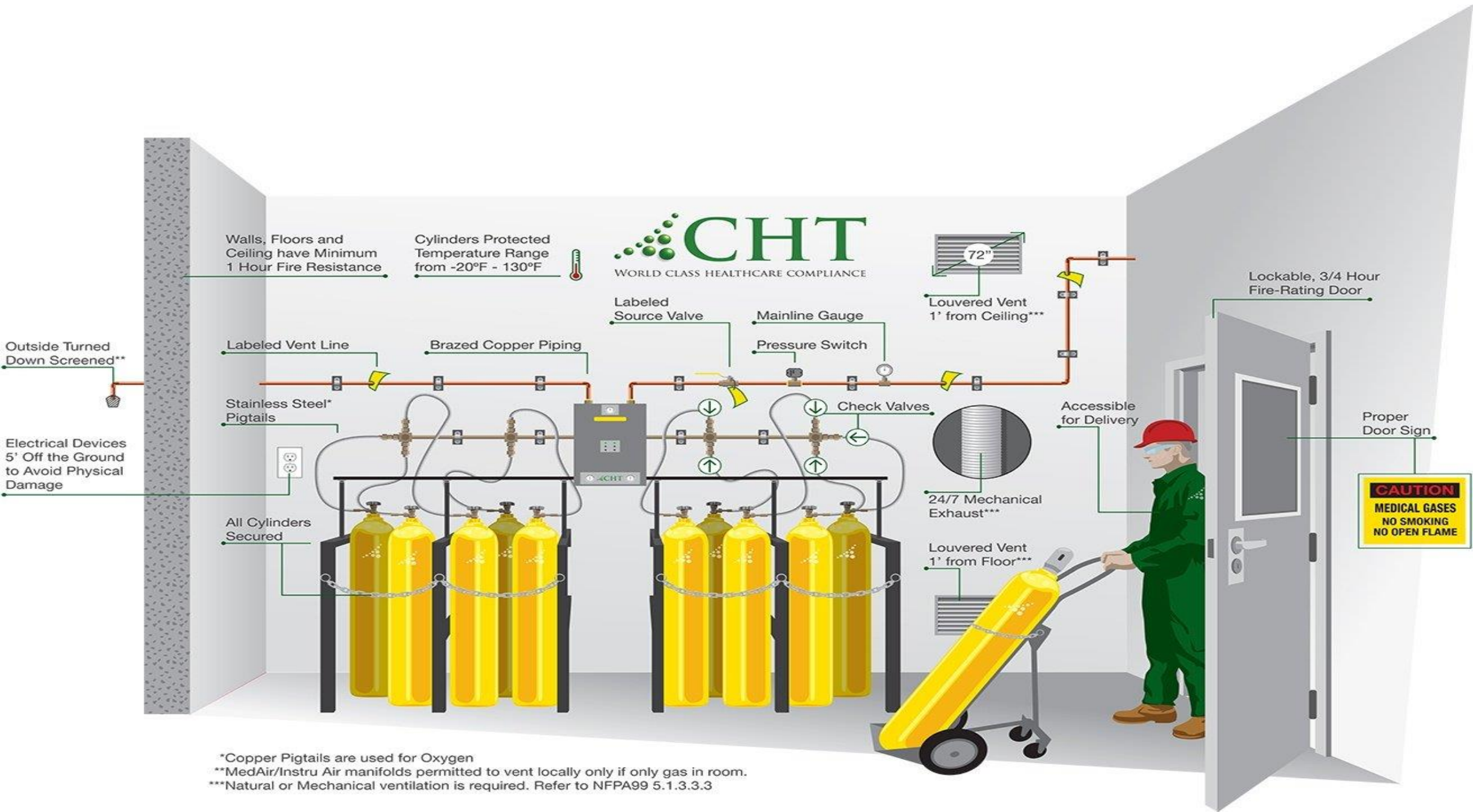
## ❖ 1- Oxygen Manifold:

It is the central supply room consists of a cylinder manifold and a control panel. The manifold may be as small as two banks of 2 cylinders each or as large as two banks of 20 cylinders each. The control panel consists of primary and secondary pressure regulators to ensure delivery of gas to the pipeline at required pressure. Manifolds are used to supply piped nitrous oxide and Entonox, and they may also be used as a primary oxygen supply in small hospitals, or as a backup supply for larger hospitals.



# Manifold Room:

It is preferable that this room is located on the ground floor and should have easy access to delivery vehicles. It should be well ventilated and lit. For ease of handling of cylinders, the floor level should be at a height of one meter from the ground level.





## How it works :

- The manifold usually connects two groups of high-capacity cylinders (size J ). Each cylinder is connected to the manifold and then to the pipeline. Pressure regulators reduce the pressure to that of a standard pipeline.
- All the cylinders in a group are used together until their pressure falls below a certain level, at which point an automatic valve switches to draw gas from the other group of cylinders.
- At this point an alarm indicates the need to change the cylinders in the empty group.

A cylinder manifold is typically designed with each cylinder group able to supply a typical day's demand

- The pressure of oxygen in the cylinders is 137 bar and a pressure reducing valve drops this to the 4 bar value of the piped supply

## ❖ 2- Vacuum insulated evaporator (VIE)

- Vacuum insulated evaporator: For larger hospitals with a high usage of oxygen, oxygen cylinders are inadequate, and instead oxygen is stored as a liquid at high pressure and a low temperature, about 700 kPa (7 bar) at a temperature between –150 and –180°C.
- It is held in a thermally insulated vessel which is essentially a very large vacuum flask known as a vacuum insulated evaporator (VIE)
- The VIE has an inner shell of stainless steel and an outer of carbon steel.
- The liquid state delivers a large amount of gas per unit volume: one litre of liquid oxygen gives 860 litres of gaseous oxygen.
- An electrical warmer is needed to bring the oxygen up to room temperature. To ensure demand is met
- secondary VIE is installed in larger acute hospitals, connected via piping to ensure continuous supply.

## ➤ **Advantages:**

- 1-Storing liquid oxygen is highly efficient in terms of space. It expands to 860 times its volume
- 2-Compared with a cylinder , liquid oxygen is stored at a much lower pressure (700 instead of 13 700 kPa).
- 3-Oxygen is therefore cheaper both to deliver and to store as a liquid.

## ➤ **Disadvantages:**

- 1-Initial equipment costs are much higher than a cylinder manifold.
- 2-A backup cylinder manifold and/or second VIE is required in case of interruption to the oxygen supply.
- 3-If demand is not fairly continuous a significant amount of oxygen will be unused and vented.

## ➤ **Safety:**

1. The VIE must be kept outside the building because of the fire risk.

## ❖ Piped Oxygen Gas in Hospital:

Fully automatic oxygen control panel

The panel shall be Fully Automatic and shall switch over from “Bank in Use” to Reserve Bank without fluctuation in delivery line pressure and without the need of external electrical power. The control panel incorporates three coloured LED

✓ LED Green for Bank in use

✓ Amber for Bank ready

✓ Red for Bank empty.



## Alarm System:

Two kinds of alarm are usually incorporated in system in the centralized medical gas system. One monitor the pressure it becomes red when pressure is low. The other alarm is remote signal lamp. It is preferably both visual and audible



THANKS FOR  
FOLLOWING ME

A large neon sign is mounted on the roof of a building. The sign consists of two lines of text: "THANKS FOR" on the top line and "FOLLOWING ME" on the bottom line. The letters are a bright orange color and are illuminated from within, giving them a glowing appearance. The sign is supported by a dark metal framework. The background is a clear, dark blue sky, suggesting it is either dusk or dawn. The building's facade is visible in the lower portion of the image, showing some architectural details like windows and a balcony.