MEDICAL GAS SAFETY AND MANAGEMENT

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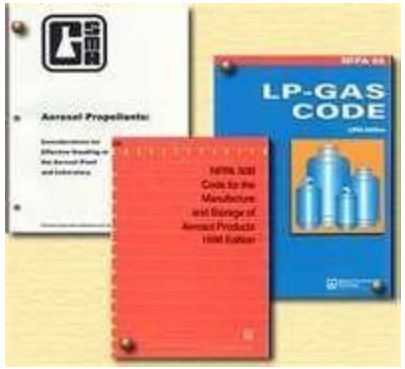
Regulations

- Regulations for use, storage and handling will be according to the authority having jurisdiction, or AHJ
- In the absence of codes, the following may provide guidance:
  - Compressed Gas Association
  - National Fire Protection Association (NFPA)
  - Safety Data Sheet (formerly Material Safety Data Sheet)



Gas Properties

Gases can be:

- Flammable
- Non-flammable
- Oxidizers
- Corrosive
- Asphyxiants
- Poison
- Inert
- Or a mixture

Ignition Temperature

- Ignition temperature: Unique to various solids, vapors and gases, the requisite heat from an open flame source required to ignite materials

- Autoignition temperature: The temperature required to ignite materials absent an open flame source

Gas Containers

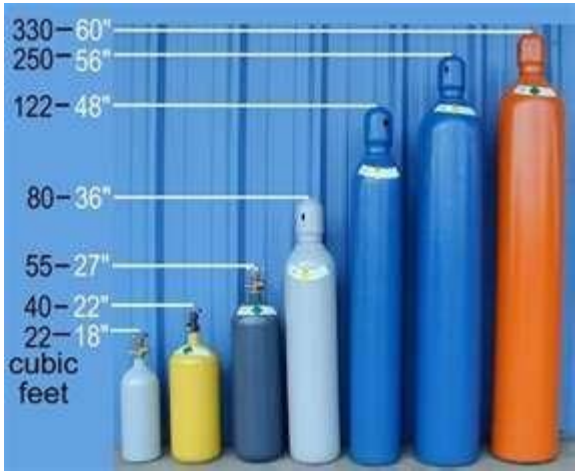
- Lecture Bottles
- Cylinders
- Tank Trucks

Gas Containers

- Railroad Tank Cars
- Portable Tanks
- Fixed Storage
- Pipelines

Cylinders

•Construction Must be compatible with the material contained



• Markings
Labeling required to identify the gas in storage and during shipment

Storage Pressure

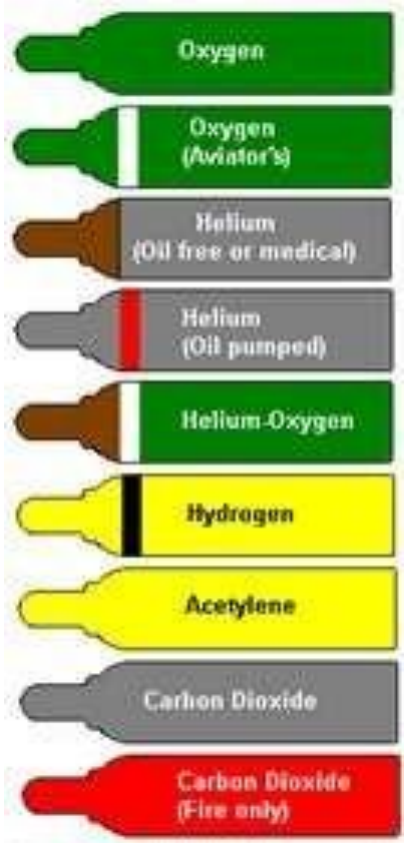
Types	Storage Pressure (PSI)	Ignition Temperature
•Methane	up to 6000psi	999 °F
•Ethane	544	959 °F
•Propane	109.7	871 °F
•Butane	31	761 °F
•Nitrogen	2,000/below 200 as cryogen	Inert
•Oxygen	2,000/below 200 as cryogen	Inert
•Arsine	219.7	(*see note)

*Note: Arsine has no given Ignition Temperature but decomposes into arsenic and hydrogen between 446 °F to 464 °F

Color Codes

- Cylinder shells can also be color coded to better identify the contents permitted into the specific type of cylinder

- This eliminates cross-contamination by introducing non-compatible gases into non-specification cylinders



Medical Gas Color Codes

Gas	U.S. Color Code	ISO Color Code
Carbon Dioxide	Grey	Grey
He-O_2	Brown & Green	Brown & White
Instrument Air	Red (USA Only)	
Medical Air	Yellow	Black & White
Nitrogen	Black	Black
Nitrous Oxide	Blue	Blue
O_2-He	Green & Brown	White & Brown
Oxygen	Green	White
Vacuum (Suction)	White	Yellow
WAGD (Evac)	Purple	Purple

Labels

FTSC Code

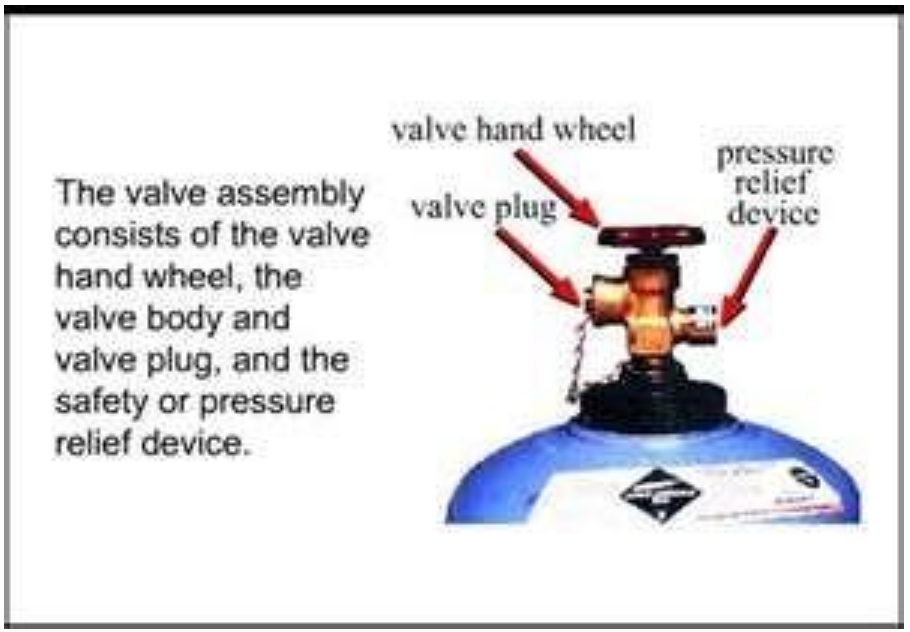
Standard numerical code for a gas indicating:

- Flammability
- Toxicity
- State of the gas
- Corrosiveness

CGA V-7 pamphlet provides more in-depth information

Pressure Relief Valve (PRV)

- May be activated by pressure, temperature or spring to permit container contents to escape, thereby averting a container rupture
- The PRV is in the product line



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Cylinder Hazards

- Material Hazards
- Flammability
- Spontaneously flammable (arsine, silane and phosphine)
- Corrosivity
- Reactivity
- Poison
- Carcinogenic

- Container Behavior
- Frostbite
- Rupture
- Rocketing
- Boiling liquid expanding vapor explosion (BLEVE)

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Oxygen

- Not flammable
- Sensitizes flammable and combustible materials requiring less input heat for ignition
- In some cases, materials impregnated with oxygen can be ignited with static electricity

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TYPES OF TERMINAL GAS OUTLETS

Outlets can be installed as flush fitting units, surface-fitting units on booms or pendants, suspended on a hose and gang mounted.

Medical Hanger

Hanging From Ceiling Type Outlet

Ceiling column & pendent

Bedhead Unit

Embedded Type Outlet

Wall Mounted Type Outlet

Plug

Trolley Stand

Presented by :AIMAN NASEEM


215 191 145
Pmax 40bar
215 191 144
Pmax 40bar
215 191 142
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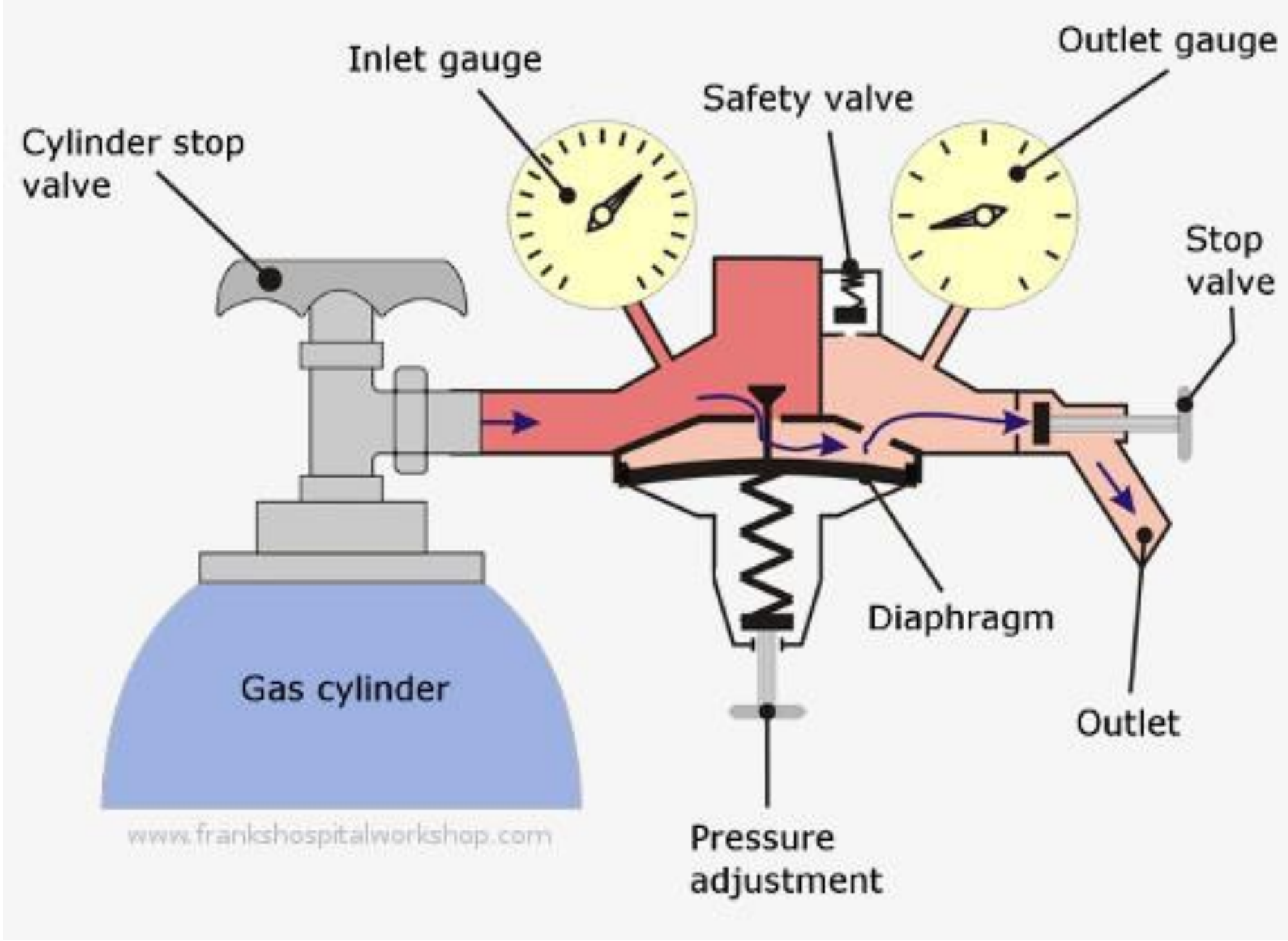
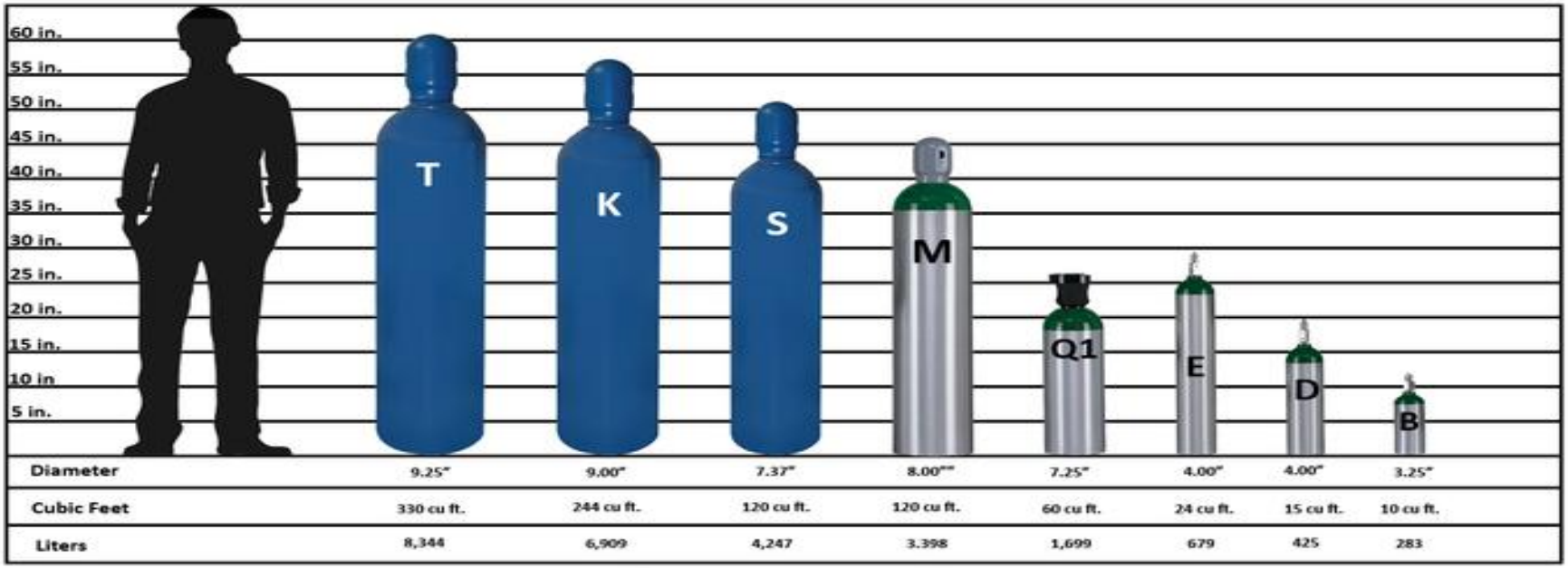
215 191 140
Pmax 40bar


Inlet gauge
Outlet gauge
Safety valve
Cylinder stop valve
Stop valve
Diaphragm
Gas cylinder
Outlet
www.frankshospitalworkshop.com
Pressure adjustment


Airgas
NO PARKING

Medical Cylinder Sizes



	T	K	S	M	Q1	E	D	B
Diameter	9.25"	9.00"	7.37"	8.00""	7.25"	4.00"	4.00"	3.25"
Cubic Feet	330 cu ft.	244 cu ft.	120 cu ft.	120 cu ft.	60 cu ft.	24 cu ft.	15 cu ft.	10 cu ft.
Liters	8,344	6,909	4,247	3.398	1,699	679	425	283

General Welding Supply Corp.

GWSCO.COM
(516)334-8200

Cylinder size	C	D	E	F	G	J
Dimensions (mm)	356×89	457×102	788×102	865×140	1248×40	1450×29
Capacities (L)						
Oxygen	170	340	680	1360	3400	6800
Nitrous oxide	450	900	1800	3600	9000	-
Entonox	-	500	-	2000	5000	-
Air	-	-	-	-	3200	6400
Carbon dioxide	450	1800	1800		-	-

Safe Handling & Storage

- Determine safe handling and storage needs based on your industry and the gases with which you work
- Create or follow check lists to best ensure a continuous safety program

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Proper Handling

- Use proper hand trucks - do not roll the cylinder on its side
- Provide a forklift cylinder change-out area which maximizes safety for the operator and other staff
- Provide:
  - Ventilation
  - Fire extinguisher
  - PPE

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Handling

- Take time to plan what you are going to do with a cylinder and how you are going to do it
- **Always** decide on the side of personal safety

This realistic accident scenario explains why safety shoes shall be worn at cylinder handling.

This accident situation demonstrates, that it is wise to use gloves at cylinder handling

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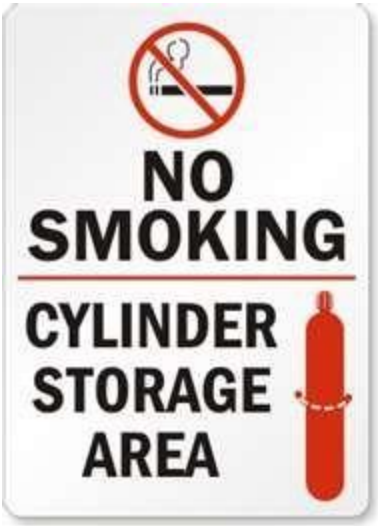
Storage

- Proper ventilation
- Out of the weather
- Not subject to temperature extremes
- Segregate gas types to eliminate fire or chemical reaction hazards
- Use good house keeping practices
- Post signage



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Emergency Response Methods

- An extraction hood used for daily operations may be used to vent escaping gas from a cylinder up through a filter
- Hoods and vents may also be equipped with a "scrubber" to neutralize various gases
- Some poison gases may be "scrubbed" this way

Response

- Do you have a trained team?
- Or will you call specialty responders?
- Will special response equipment be needed?
- Special precautions are required for spontaneously combustible gases such as silane

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Response

- Determine if you will handle an event alone or with off-site help
- Pre-plan potential zones of harm should your facility have a release
- Practice safety and be safe in handling, use, storage and response to gas incidents

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THANK YOU