

HANDLING COMPRESSED GAS CYLINDERS IN THE LABORATORY

COURSE OUTLINE

- **Gas cylinders exist to "squeeze down" the space needed to store gases.**
 - This works more efficiently than other methods of storage.
 - But it creates a great deal of pressure.
 - That pressure can become dangerous.
- **A small gas leak can be very hazardous.**
 - High pressure pushes the gas great distances.
 - The gas can flow over bench tops, past electrical devices, etc.
 - If the gas is flammable, an explosion can occur.
- **There are four basic ways to store pressurized gases.**
 - "Standard compression" (substances "squeezed" but kept in gas form).
 - "Liquefied compression" (only works for gases that condense at ordinary temperatures or between 2,000 2,500 lbs. of pressure).
 - Dissolving the gas in a solvent (acetylene, unstable in pure form, is stored this way).
 - Creating a "cryogenic liquid" (for substances with boiling points below - 238 F).
- **It is important to know how the compressed gases we work with behave.**
 - We also need to be aware of the safety precautions that should be taken when handling them.
- **Personal protective equipment is often called for when handling cryogenics.**
 - They require goggles, a face shield and impervious gloves.
 - Their extremely low temperatures can cause severe burns.
 - Prolonged exposure can also cause frostbite.
- **Low temperatures can also have other hazardous effects:**
 - Valve washers can become brittle, break and cause leaks.
 - Steel may fail on impact.
- **Accidents with cryogenic liquids can be especially hazardous.**
 - Cryogenics produce huge volumes of gas when vaporized.
 - This could increase the chances of fire or explosion.

- **Some gases can push breathable air from a room.**
 - The rapid release of gas could also turn a cylinder into a "rocket".
- **Because of these hazards, correct cylinder storage is very important.**
 - Use cool, dry, well-ventilated spaces.
 - Secure cylinders upright.
 - Strap cylinders into place.
 - Keep safety caps on until connections are made.
 - Keep cylinders out of direct sunlight.
- **Certain gases should also be separated when stored.**
 - Keep flammables and oxidizers apart by at least 20 feet, or separated by a wall.
 - Many gases should also be kept away from electrical equipment and other sparking sources.
- **Smoking is never permitted in storage areas.**
- **Never tamper with a cylinder's identifying labels/stencils.**
 - They are the only reliable way to determine what gas is inside.
 - Never use cylinder paint colors as an indicator.
- **Some gases have relatively short "shelf lives".**
 - Corrosive gases should be stored for no more than 6 months.
 - Gases that may polymerize should also not be stored more than 6 months.
 - Ethylene oxide should never be stored more than 3 months (unless it is refrigerated).
- **Cylinders should be handled carefully when they are transported.**
 - Never drag a cylinder across the floor.
 - "Hand-rolling" is also a bad idea.
 - Handtrucks should always be used (4-wheeled trucks, if possible).
- **Safety caps should always be in place whenever you are transporting cylinders, even for small distances.**
 - The caps protect valves in case of falls or bumps.

- **If a cylinder does fall, don't try and catch it.**
 - More people are injured trying to catch cylinders than in any other type of cylinder-related accident.
 - Make sure you always wear safety shoes.
- **Use service elevators or "dumbwaiters" to move cylinders from floor to floor.**
 - Do not ride with the cylinder.
 - Walk up the stairs to meet the cylinder when it arrives.
 - Or have someone else in position to accept the cylinder.
- **Laboratories must be equipped with a secure method for keeping cylinders upright.**
 - A rack system is the best alternative.
 - Clamps are used to keep cylinders in place.
 - The clamps should be anchored to lab benches at two points.
 - "Chained" cylinders are not always safe.
 - Some states have more rigorous requirements for securing cylinders than others.
- **Even suspected gas leaks should be treated carefully.**
 - Immediately report the situation to your supervisor and the equipment supplier.
 - Remove the cylinder from service.
- **Cylinders with other problems should also be removed from service. This includes:**
 - Cylinders containing rust.
 - Corroded cylinders.
- **After a cylinder is properly secured in place, the safety cap can be removed.**
 - Never force a cap off with a screwdriver or bar.
- **To correctly hook up cylinders you must be familiar with the associated fittings and mechanisms. This includes:**
 - "Regulators" (reduce the "delivery pressure" of the gas to safe levels).
 - "CGA Fittings" (connect to the cylinder valve to allow gas to be withdrawn).

- **There are specific CGA's for specific gases.**
 - Some are larger than others.
 - Some have washers or notches.
 - Threads may be right or left-handed.
 - These differences protect against hooking cylinders into systems they don't belong to.
 - So never force a CGA onto a valve or use an adaptor.
- **Another important mechanism associated with gas cylinders is the "Pressure Release Device".**
 - They prevent rupture and violent pressure releases if a cylinder is exposed to extreme heat.
 - They allow for a controlled release of gases during a fire as well.
 - They can also be used with a "flame arrester" (this helps prevent "flashback").
 - But PRD's are not used with poisonous gases because of their hazardous properties.
- **Once cylinders are connected and systems are assembled, valves and fittings should be checked for leaks.**
 - Cover all surfaces with a diluted soap solution.
 - Bubbles will indicate leaks.
 - If leaks are evident tighten or correct cylinder fittings, if possible.
- **If leaks cannot be fixed:**
 - Alert employees in the area.
 - Use self-contained breathing apparatus (SCBA) in the area.
 - Get back-up personnel to assist you.
 - Evacuate the area if needed.
- **If a problem does occur, you should follow your facility's emergency plan.**
 - Safety Data Sheets should also be consulted for the gases involved.

*** * * SUMMARY * * ***

- **Know the properties/hazards of gases you work with.**
- **Know how to safely use, store and transport cylinders.**
- **Understand the ways in which regulators, CGA's and pressure release devices operate.**
- **Think ahead and prepare for using compressed gases.**