

## **MAJOR PROGRAM POINTS**

# **"HANDLING COMPRESSED GAS CYLINDERS IN THE LABORATORY"**

**Part of the "LABORATORY SAFETY SERIES"**

**Quality Safety and Health Products, for Today...and Tomorrow**

# Outline of Major Points Covered in the "Handling Compressed Gas Cylinders in the Laboratory" Course

The following outline summarizes the major points of information presented in the course on "Handling Compressed Gas Cylinders in the Laboratory". The outline can be used to survey the course before taking it on a computer, as well as to review the course when a computer is not available.

- **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.**
  - Material 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.**