

GAS CYLINDER AWARENESS OUTLINE

OBJECTIVES:

The purpose of this awareness training is to help staff and students understand how compressed gas cylinders (CGC) work and how to handle them safely. The training should address the following objectives:

- Understand the inherent dangers of compressed gas cylinders
- Look to hazard labels, warning signs and MSDS for important information
- Selection of appropriate PPE when working with gas cylinders
- Know how to properly move, handle and store cylinders
- Know what to do in case the cylinder or delivery system develops a leak (e.g., troubleshooting and emergency procedures)
- Know what problems can occur when installing a cylinder in a gas delivery system (e.g., installing a regulator on a cylinder)
- Know how to check cylinders for potential problems

OUTLINE OF MAJOR AWARENESS POINTS:

Compressed gas cylinders are used in a variety of settings at UWM:

- Explain specific applications or see our web page for examples at UWM
- Know what hazards can exist with compressed gas cylinders:
- Gas cylinders may be under very high pressure (e.g., CO₂ and CO can be 1,000 psi; argon, helium, hydrogen, nitrogen, oxygen can be 2,600 psi)
- Specific hazards (health, fire, reactivity hazards)
- Physical hazards (very heavy, can tip easily, hazards of high pressure)
- You must be aware of the types of hazards that the various gases themselves have. Be sure to read:
 - Labels/warnings
 - MSDS

Special Hazards of Certain Compressed Gases:

- Toxic gases (e.g., carbon monoxide, hydrogen cyanide, nitric oxide, phosgene)
- Corrosive gases (e.g., ammonia, chlorine, nitrogen dioxide, nitric oxide, sulfur dioxide, etc.)
- Flammable gases (acetylene, ammonia, ethylene, etc.)
- Explosive (hydrogen, etc.)
- Oxidizers (e.g., fluorine, oxygen, etc.)
- Simple asphyxiants (e.g., carbon dioxide, helium, nitrogen, sulfur hexafluoride, etc.)

If There Is A Leak, We Can Find Ourselves With A Dangerous Situation, Since Gas Can Flow:

- Along work surfaces, over electrical devices or by a spark or flame. This is a problem if there is a flammability hazard or if the gas is an oxidizer (e.g., oxygen)
- If inhaled, the problem might be there could be displacement of oxygen if there is significant leak or if the leak is in a poorly ventilated area, or if the gas is a poison or irritant)

Some Gases Are Compressed Into A Liquid Form:

- CO₂, propane, etc.
- Can result in frost-bite

Some gases are dissolved in a solvent and then compressed:

- Acetylene is the only common substance stored this way.

Special Hazards Of Cryogenic Liquids:

- Direct contact can cause severe burns
- Low temperatures can make valve washers brittle and cause leaks
- PPE like goggles and gloves should be used at all times

Important Things To Know To Properly Store Compressed Gas Cylinders:

- Cool, dry, well ventilated space
- Secured so they can not fall over
- Provisions for securing a cylinder
- When or when not the valve cap must be on (e.g., whenever moving)
- When or when not the regulator must be on / off
- Storage of oxy/acetylene tanks, and appropriate separation distances

Important Things To Know To Properly Handle And Move Compressed Gas Cylinders:

- Use a cylinder cart
- Don't roll cylinders by hand, except for short distances, and how to properly do this
- Make sure the valve cap is on
- If a cylinder falls, don't attempt to catch it

Regulator and the Gas Delivery System:

- Regulators control the rate at which gas is delivered from the cylinder so the gas may be used safely
- Never discharge a gas without the use of a regulator
- There may have a washer between the tank and the regulator. System may leak if the washer is missing
- Use a correctly sized open end wrench or adjustable wrench to tighten fittings; never use a channel lock or pliers
- Describe proper sequence of turning gas on at main cylinder and pressurizing the system
- Do not look directly at the regulator or fittings when first pressurizing the system
- Do not over tighten fittings
- System must be depressurized before removing the regulator
- Check for leaks and how to correct
- Participants should demonstrate hands-on proficiency for both installing/removing a regulator and pressurizing the gas delivery system

Compressed Gas Association (CGA) fittings

- Specific CGA fittings for certain gases; likewise various regulators (i.e., many types of regulators)
- Never attempt to modify regulators, fittings or connectors

Pressure Relief Devices:

- Allow for the controlled release of gas when heated by fires or other emergency situations
- Keeps the cylinder from exploding
- Toxic / poisonous gases do not have pressure relief devices because of their own hazards

Flame Arrestors Prevent Flashback:

- Are necessary with flammable gases and oxy/acetylene setups
- Occurs when fire is accidentally drawn back into the cylinder
- Can cause explosions or other incidents

Checking For Leaks:

- Cover surfaces with a liquid soap solution
- If bubbles appear, there may be a leak
- Corrections may be as simple as tightening a valve with a wrench

If You Suspect a Cylinder Has a Leak, You Should Do Several Things:

- Alert coworkers
- If the gas is flammable, don't unplug equipment or turn off lights (since this can generate sparks)
- Notify your supervisor
- Evacuate the area if necessary
- Consult MSDS for additional information
- Follow emergency plan for your lab
- If necessary, call University Police (x9911) for assistance. Tell them what the problem is and what gas is involved.

Special Precautions for Oxygen Systems:

- Oxygen itself does not burn, but it greatly contributes to the flammability of other combustible materials
- Separation distances when tanks are in storage
- Never oil or grease fittings on oxygen systems.
- Seek other references for more precautions

Other Do's and Don'ts:

See UWM University Safety & Assurances web page for good examples.

Incidents We've had at UWM:

- Leaking gas delivery systems of toxic gases (e.g., nitric oxide in Chemistry) and how to deal with them
- Personnel unable to turn the gas off because they didn't use enough force to turn the main cylinder valve
- Personnel not knowing the proper emergency procedures in the event of a leak or problem
- Personnel not knowing the health and physical hazards of the gas
- Personnel stripping regulator or cylinder fittings because they didn't use a proper tool
- Cylinder wall brackets not properly secured to wall with proper anchors

SUMMARY:

- Be aware of the properties and hazards associated with the gases you use.
- Exercise caution during transport and storage of cylinders
- Check for leaks and other defects when hooking up a cylinder
- Read tags and labels
- Follow you lab's standard operating procedures and know emergency procedures for the chemical you use.
- Seek assistance if you have questions, if you require further training including hands-on, or whether you encounter any problems.

REFERENCES:

UWM University Safety & Assurances Gas Cylinder Safety web page:

http://www4.uwm.edu/usa/safety/laboratory_safety/gas_cylinders.cfm has very good information and should be reviewed before conducting this awareness training.

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