

Standard Operating Procedure

Compressed Gases

Section 1 – Lab-Specific Information

Department:	College of Engineering – Discovery Learning Labs
Date SOP was written:	10/29/2018
Date SOP was approved by PI/lab supervisor:	Click here to enter a date.
Principal Investigator:	Thomas Silman
Internal Lab Safety Coordinator/Lab Manager:	Thomas Silman
Lab Phone:	414-288-4602
Office Phone:	414-288-5423
Emergency Contact:	Thomas Silman 414-350-5432
Location(s) covered by this SOP:	<i>Engineering Hall – Discovery Learning Labs Complex</i>

Section 2 – Type of SOP:

Process Hazardous Chemical Hazardous Class

Section 3 – Physical / Chemical Properties and Uses

Physical / Chemical Properties:

CAS#: N/A

GHS Classification: Gases under pressure, compressed gas (depending on the type of compressed gas, other hazards such as toxicity and/or flammability often apply as well)

Molecular Formula: N/A

Form (physical state): Gas

Color: N/A

Boiling Point: N/A

Flash Point: N/A

Lower Explosive Limit: N/A

Upper Explosive Limit: N/A

Relative Vapor Density: N/A

Section 4 – Potential Hazards

Contains gas under pressure; may explode if heated. Protect from sunlight. Gases may displace oxygen and present an asphyxiation hazard. Many gases present other hazards; make sure that all the potential hazards are understood before handling any chemical.



Section 5 – Personal Protective Equipment (PPE)

Respirator Protection:

If compressed gases are being used outside of a chemical fume hood, respiratory protection may be required. If this activity is necessary, contact EH&S so a respiratory protection analysis can be performed. Respirators should be used under any of the following circumstances:

- As a last line of defense (i.e., after engineering and administrative controls have been exhausted).
- When Permissible Exposure Limit (PEL) has exceeded or when there is a possibility that PEL will be exceeded.
- Regulations require the use of a respirator or an employer requires the use of a respirator.
- There is potential for harmful exposure due to an atmospheric contaminant (in the absence of PEL)
- As PPE in the event of a chemical spill clean-up process
- Lab personnel intending to use/wear a respirator mask must be trained and fit-tested. This is a regulatory requirement. Contact EH&S 8-8411 regarding respirator clearance.

Hand Protection:

Gloves must be worn. Use proper glove removal technique to avoid any skin contact. Nitrile gloves are recommended for low volume applications. Wearing two pairs of nitrile gloves is recommended.

NOTE: Consult with your preferred glove manufacturer to ensure that the gloves you plan on using are compatible with the specific flammable or combustible liquids being used.

Eye Protection:

ANSI approved properly fitting safety glasses or chemical splash goggles are required.

Skin and Body Protection:

Laboratory coats may be worn and be appropriately sized for the individual and buttoned to their full length (flame resistant lab coats must be worn if handling flammable gases such as hydrogen). Laboratory coat sleeves must be of sufficient length to prevent skin exposure while wearing gloves. Personnel must also wear full length pants, or equivalent, and close-toed shoes. Full length pants and close-toed shoes must be worn at all times by all individuals that are occupying the laboratory area. The area of skin between the shoe and ankle must not be exposed.

Hygiene Measures:

Not applicable.

Section 6 – Engineering Controls

Use of compressed gases should be conducted in a properly functioning chemical fume hood whenever possible. The chemical fume hood must be approved and certified by EH&S and have a face velocity between 85 – 125 feet per minute. Contact EH&S for information regarding specific handling requirements when work with toxic, highly toxic, corrosive, and reactive gases. Generally, these of gases need to be stored and used with local exhaust ventilation (e.g., fume hood or gas cylinder cabinet).

Section 7 – First Aid Procedures

If inhaled:

Move into the fresh air immediately. Consult a physician. If not breathing give artificial respiration and seek immediate medical attention.

In case of skin contact:

Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash any contaminated clothing before reuse. Thoroughly clean shoes before reuse. Consult a physician.

In case of eye contact:

Check for and remove any contact lenses. Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Seek immediate medical attention.

If swallowed:

Do NOT induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person. Seek immediate medical attention.

Section 8 – Special Handling and Storage Requirements

- Compressed gas cylinders should be stored in a secure, well ventilated location, and in an upright position at all times. All compressed gas cylinders should be handled as if full and should never be completely emptied.
- Cylinders that are not in use (meaning that the regulator is not attached) must be secured and the safety cap must be on the cylinder and are permitted to be chained together.
- Cylinders that are in use, meaning there is a regulator attached, must be individually secured by a chain or strap.
- Cylinder valves and regulators must be protected from impact or damage.
- A designated storage area must be established for compressed gases and inventoried periodically.
- Toxic, highly toxic, corrosive, and reactive gases should be stored in a gas cylinder cabinet.
- Avoid contact with skin, eyes, and inhalation.
- Keep away from sources of ignition if the gas is flammable.
- Follow laboratory supervisor's instructions for PPE, which may differ depending on the type and/or quantity of compressed gas being used.
- Use in the smallest practical quantities for the experiment being performed.

- Work must be conducted in a chemical fume hood if air concentrations above 10% of the LEL could be created, if the chemical is irritating to the eyes or respiratory system, and/or is toxic by inhalation.
- Gas cylinder connections and fittings must be inspected frequently for deterioration and must never be used without a regulator.
- Never use a leaking, corroded, or damaged cylinder and never refill compressed gas cylinders.
- When stopping a leak between cylinder and regulator, always close the valve before tightening the union nut.
- The regulator should be replaced with a safety cap when the cylinder is not in use.
- The safety cap must be in place when a gas cylinder is moved.
- For large gas cylinders (>27 inches), an approved gas cylinder cart should be used. The cylinder must be strapped to the cart and the protective cap must be in place before moving the cylinder. A cylinder should never be moved or transported without the protective cap.
- If a gas type or gas specie is noted to be outside of normal inventories or “strange”, a search for SDS and inventory list shall be made.
- A few compressed gas cylinders have a shelf-life and can become more hazardous as time goes on. It is extremely important that these chemicals are identified and managed properly. If any time-sensitive gases are found to be past the manufacturer’s expiration date, they must be submitted to EH&S for hazardous waste disposal immediately. The following is a list of time-sensitive compressed gases:
 - Hydrogen fluoride, anhydrous
 - Hydrogen bromide, anhydrous
 - Hydrogen sulfide, anhydrous
 - Hydrogen cyanide, anhydrous
 - Hydrogen chloride, anhydrous

Section 9 – Spill and Accident Procedures

Chemical Spill Dial 8-911

Immediately evacuate area and ensure others are aware of the spill. If there is an imminent threat of a fire, pull the nearest fire alarm station to evacuate the building and **dial 8-911**.

Chemical Spill on Body or Clothes:

Remove clothing and rinse body thoroughly in emergency shower for at least 15 minutes. Seek medical attention; **dial 8-911**.

Chemical Splash into Eyes:

Immediately rinse eyes and inner surface of eyelid with water from the emergency eyewash station for 15 minutes by forcibly holding the eye open. Seek medical attention; **dial 8-911**.

Section 10 – Medical Emergency

Life Threatening Emergency, After Hours, Weekends And Holidays:

Dial 8-1911

Non-Life Threatening Emergency:

Immediately report injury to supervisor and complete the First Report of Injury.

http://www.marquette.edu/riskunit/riskmanagement/documents/Employee_First_Report_of_Incident.pdf

Section 11 – Waste Disposal Procedures

Label Waste:

Make sure the waste container(s) is properly labeled; label should indicate all of the contents of the container. EH&S provides hazardous waste labels free of charge, contact dennis.daye@marquette.edu to obtain labels.

Store Waste:

Store hazardous waste in closed containers, and in a designated area (flammable cabinet is recommended).

Dispose of Waste:

Before submitting compressed gas waste to EH&S, ensure that the cylinder cannot be returned to the manufacturer or distributor. Many gas vendors charge demurrage for gas storage. Most lecture bottles cannot be returned to the manufacturer and must be treated as waste. Contact dennis.daye@marquette.edu or visit the EH&S webpage for questions.

http://www.marquette.edu/riskunit/environmental/documents/waste_disposal_form.pdf

Section 12 – Safety Data Sheet (SDS)

A current copy of the SDS for the specific compressed gas being used must be made available to all personnel working in the laboratory at all times. To obtain a copy of the SDS, refer to Marquette's MSDS library http://www.marquette.edu/riskunit/environmental/documents/msds_library.pdf or contact the chemical manufacturer. Many manufacturers' SDSs can be found online on websites such as Sigma-Aldrich (<http://www.sigmaaldrich.com/united-states.html>) or Siri MSDS Index (<http://hazard.com/msds/>).

Section 13 – Protocol/Procedure

Not applicable at this time.

NOTE: Any deviation from this SOP requires approval from PI.

Section 14 – Documentation of Training (signature of all users is required)

- Prior to conducting any work with compressed gases, designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
- The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and a copy of the SDS provided by the manufacturer.
- The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training within the last one year.

I have read and understand the content of this SOP:		
Name	Signature	Date
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