ENVIRONMENTAL HEALTH & SAFETY

UNIVERSITY *of* WASHINGTON

COMPRESSED GAS CYLINDERS SAFETY GUIDELINES

SEPTEMBER 26, 2024

1. TABLE OF CONTENTS

2. INTRODUCTION

Compressed and liquefied gases are routinely used in laboratories, shops and various other operations at the University of Washington (UW). These guidelines provide information on their safe use and apply to all University personnel and students who handle or use compressed or liquefied gases or systems.

PURPOSE AND SCOPE

Compressed and liquefied gases have the potential for creating hazards in University work environments. UW promotes the safe use of gases by offering training and information on the proper storage, handling, use and disposal of compressed and liquefied gas cylinders. The information in these guidelines applies to all compressed and liquefied gases; however, specific information for select hazard classes is also provided.

Manage compressed and liquified gas hazards in the area where work is being conducted according to:

- **Laboratory settings:** UW Laboratory Safety Manual
- **Non-laboratory settings**: UW Chemical Hazard Communication Program Manual

Compressed and liquified gas/cryogen definitions used throughout these guidelines are available on the Compressed Gases and Cryogens page on the Environmental Health & Safety (EH&S) website.

3. REQUIRED PERSONAL PROTECTIVE EQUIPMENT (PPE)

Laboratories: Standard laboratory PPE, including safety eye wear and a lab coat, are required when using compressed gases. Gloves may also be required, depending on the chemical or physical hazards of the gas. Additionally, when moving or transporting a gas cylinder, hard close-toed shoes are required. Use the Lab PPE Hazard Assessment Guide to determine PPE requirements.

Shops and other non-laboratory areas: Safety glasses are required when working with compressed gas cylinders. Gloves may also be required, depending on the chemical or physical hazards of the gas. Additionally, when moving or transporting a gas cylinder, hard close-toed shoes are required. Use the **Shop Personal Protective Equipment (PPE) Hazard Assessment Guide** to determine PPE requirements.

PPE requirements for refrigerated liquefied gas/cryogen:

- Insulated leather gloves
- Protective eyewear and face shields
- Smock or lab coat.

Tailor PPE requirements to each hazard.

Back to top

4. PROCUREMENT

Procurement requirements apply to all gas cylinders and are stipulated in the Procurement section of the Compressed Gases and Cryogens webpage on the EH&S website.

Compressed gas cylinders must be purchased through the preferred supplier, Linde (formerly known as Praxair) because this supplier has a cylinder return authorization program. Refer to the instructions on the UW Procurement website.

Once the new gas cylinders are ordered, the requestor must add the cylinders to their MyChem inventory along with the safety data sheet (SDS) for the gas.

EH&S will review a control zone report to ensure the maximum allowable quantity (MAQ) for the control zone is not exceeded. If the maximum allowable quantity is exceeded, a separate hazardous materials permit must be obtained by the PI/Shop Manager/Responsible Person from the local fire department.

Proper storage and signage are critical for the safe use of compressed and liquefied gases.

5. SIGNAGE

Signage contains important hazard information regarding the gases stored and must be prominently posted in cylinder storage areas.

- A Caution Sign is required to be posted at entrances to laboratories, shops, and maker spaces where hazardous materials are used and/or stored.
- The Fire Code requires rooms or cabinets containing compressed gases to be conspicuously labeled "COMPRESSED GAS."

The Caution Sign generated in MyChem can be used to meet both of these requirements. Additional signage may be required based on the cylinder's contents and related hazards.

Caution Signs use a pictogram to indicate the presence of compressed gases and cryogens; it fulfills the requirements of the National Fire Protection Association (NFPA) 704 standard.

An acceptable method of signage is a Caution Sign displaying an NFPA diamond (shown at right), with a cylinder indicated in the "specific hazard" (white) section of the diamond. The red, blue, and yellow sections of the diamond indicate flammability, health, and reactivity hazards. Visit the Caution and Warning Signs page on the EH&S website for more information.

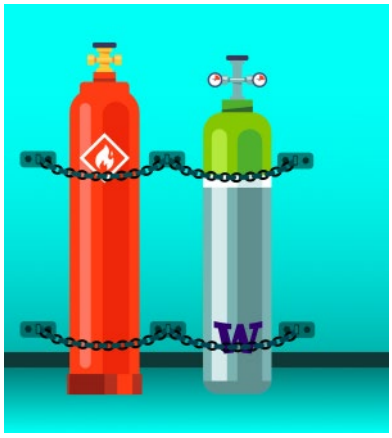
Back to top

6. STORAGE

Compressed gases and cryogenic liquids are stored in gas cylinders under high pressure, which can have several safety considerations to prevent injury and property damage. University units and departments with compressed gases and cryogens, including liquid nitrogen, are required to follow regulations for safe storage of gas cylinders and Dewars.

Securing cylinders

All gas cylinders must be firmly secured to a wall with **two chains or straps at 1/3 and 2/3 height** of the cylinder (shown at right) to prevent toppling due to seismic hazards.



Storage requirements

- The cylinder must be in **good condition**: Make sure it's not damaged and has no signs of corrosion. If a cylinder has damaged labels, dents, gouges, burn/heat marks, or shows signs of corrosion, do not accept it; return it to the supplier.
- Cylinders must have an **operable valve**. Make sure access to the cylinder valve is unobstructed at all times.
- **Cap cylinders** when not in use.
- Compressed gas cylinders should be stored in an organized, **ventilated and well-lit** place away from combustible materials.
- Store **incompatible gases** (e.g., flammables and oxidizers) **no less than 20 feet apart** or use non-combustible partitions extending no less than 18 inches above and to the sides of cylinders and containers.
    - One backup cylinder stored in the area with the one in use may also be considered "in use" and not subject to incompatibility storage requirements.
    - Also, consider compatibility with containers, tubing, and vessel materials.
- Do not remove or damage manufacturer applied **labels**, decals, or cylinder content information. If the label is missing or no longer legible, follow the instructions in the Labeling Requirements section of this document.
- Any storage area must be protected from excessive **heat, open flame, or ignition sources**.
- Storage outside should be **above grade** (i.e., above ground level), **dry,** and protected from weather conditions.
- Store cylinders so the oldest products get used first.
- Contact your compressed gas vendor for removal of unwanted or **empty cylinders**.

- Compressed gas containers, cylinders, and tanks must be stored in an **upright position** with two exceptions:
    - Containers designed for use in the horizontal position
    - Compressed gas containers with a water volume of less than five liters

A lecture gas cylinder is an example of a cylinder that may be stored horizontally.

QUANTITY AND VOLUME

The maximum allowed usage and storage of flammable or toxic compressed gases within a laboratory work area or control zone are defined by the International Building Code and shown in Table 1.

If there is more than one lab located within a control zone, all gas quantities within the zone are combined, which may affect the maximum allowable quantity limit within a zone.

If the maximum allowable quantity is exceeded, the PI/Shop Manager/Responsible Person must apply for a hazardous materials permit from the local fire department. Information on quantities and limits for maximum allowable quantities can be viewed in MyChem.

Review your Caution Sign: A rating from zero to four will appear on your Caution Sign if your inventory contains quantities that require a fire permit. You may have chemicals in your lab, shop or maker space, but show zeros on your NFPA diamond if the quantities do not meet or exceed the permit quantities.

*Table 1: Maximum Expanded Volume Quantity (ft^3) Limitations for Flammable or Toxic Compressed or Liquefied Gas Cylinders in Laboratories [(1)] **

	Ventilated Enclosure Sprinklered Room	Ventilated Enclosure Non-Sprinklered Room	Non-Ventilated Enclosure Sprinklered Room	Non-Ventilated Enclosure Non-Sprinklered Room
Highly Toxic [(2)]	40	20	No	No
Toxic / Corrosives [(2)] [(4)]	3240	1620	1620	810
Flammable [(3)]	4000	2000	2000	1000

Notes:

(1) Consult manufacturer or your safety office for expanded volume data for various sized cylinders.
(2) International Building Code (IBC) definition listed in Appendix A
(3) Appendix II: Any material with a "y" in the flammability column (for materials classified as both flammable and toxic, defer to the toxic limitations).
(4) All ammonia storage containers must be stored and used in a ventilated enclosure, per EH&S requirement.

* 2018 International Building Code

Annual review of compressed gas cylinder inventories must be conducted annually in MyChem by the Responsible Person or their designee. Contact EH&S at 206.543.7262 if you have cylinder use questions.

Back to top

7. USE

- Compressed gas cylinders must be handled with caution at all times.
- Assume all cylinders contain gas under pressure. Treat all gases as hazardous chemicals.
- Use cylinders in a well-ventilated area. If you need to use a gas cylinder in spaces with inadequate ventilation, call EH&S at 206.543.7388 to conduct a hazard assessment. Spaces with inadequate ventilation may need oxygen alarms or ventilation failure alarms.
- When turning off the cylinder, turn the gas supply off at the cylinder valve first, depressurize the system, and turn off the regulator.
- Do not use or allow contact with oil or grease on cylinders or their valves.
- Do not empty gas cylinders to a pressure lower than 25 psi (172 kPa). At lower pressures, suction and backflow can cause contamination of residual contents with air if the valve is open.
- Do not use Teflon® tape on cylinder or tube fitting connections, which have metal-to-metal face seals or gasket seals.

8. TRANSPORT

Compressed gas cylinders and Dewars are particularly vulnerable to damage during transport. Refer to the Gas and Cryogen Transport Focus Sheet for best practices for safely transporting on campus, shipping off campus, and coordinating deliveries.

When in motion, secure the container to a cart, hand truck or other transport device designed for the movement of compressed gas containers, cylinders or tanks. Make sure caps are in place during transport.

Compressed gases must be handled and transported by properly trained people. Refer to the Training section for specific requirements.

9. TRAINING

Gas cylinders are used in various areas within the University, including shops and laboratories. EH&S recommends compressed gas safety training is completed by individuals working with compressed gases prior to handling cylinders.

EH&S offers two online training courses: Compressed Gas Safety for Laboratory Environments and Compressed Gas Safety (for non-researchers).

Online Liquid Nitrogen Safety training course is required for University personnel working with or around liquid nitrogen. This training provides awareness of the hazards associated with liquid nitrogen and provides best practices for using, moving, and storing liquid nitrogen.

The Responsible Person must provide site-specific hazard communication and safety information to anyone working with or near gas cylinders.

Completion of the relevant online training course, following the guidance in this document, and site-specific training will help ensure that gas cylinders are used safely.

As with any chemical, read the safety data sheet before you begin using the gas.

10. GAS PIPING SYSTEM REQUIREMENTS

The use of manifolds, piping, valves, and/or regulators must follow these guidelines.

- Where compressed gas cylinders are connected to a manifold, the manifold and its related equipment, such as regulators, must be of proper design for the product(s) they are to contain at the appropriate temperatures, pressures and flows.
- Use only approved valves, regulators, manifolds, piping, and other associated equipment in any system that requires compressed gas.
    - Be sure pressure gauges on regulators are correct for the pressure of the gas cylinder used.
    - Gas threads, configurations and valve outlets are different for each class of gas to prevent mixing of incompatible gases. Lecture bottles are an exception.
- Lecture bottles use universal threads and valves, some of which are interchangeable. Label all associated equipment with the gas name, to prevent unintentional mixing of incompatible materials.
- Compressed Gas Association Pamphlet V-1: "Standard for Compressed Gas Cylinder Valves," lists the appropriate valve for each gas. Manufacturers and distributors should also be able to identify the valves and associated equipment required for each gas.

GENERAL REQUIREMENTS

Piping can suffer pressure changes depending on the ambient temperature resulting in an over-pressurization, which requires a pressure relief device.

Pipes must be labeled in accordance with ASME A13.1 to include the content name and the direction of flow not less than every 20 feet, and at each valve, change of direction, and where it penetrates a wall or floor/ceiling assembly.

Piping systems should include zone shut-off valves, point-of-use valves, regulators and pressure relief valves to venting lines between regulators and shut-off valves.

Do **not** use copper fittings and tubing on acetylene tanks.

GUIDELINES FOR PERMANENT PIPING SYSTEMS

- Many gas systems require a permit from the city or county prior to installation.
- The systems must be installed by qualified personnel.
- Piping must be of durable and heat resistant materials compatible with the material. This may include steel, copper and stainless steel tubing/pipe.

- Fuel gas Grade T flexible gas tubing with appropriate hose clamps must be used for all petroleum-based products.

MINIMUM GUIDELINES FOR TEMPORARY PIPING SYSTEMS

Temporary gas piping systems may be used for short term experimental process development, but it must meet the following conditions:

- Piping/tubing runs should be as short as possible.
- Piping should be visible (i.e., not hidden within walls).
- It must be appropriately labeled with the material and direction (tape may be used if writing is legible).
- Piping may not serve other rooms; only local use only.
- Piping material must be compatible with gas; appropriate plastic and soft copper tubing may be acceptable depending on the gas.
- Regulators must step down pressure significantly for piping system.
- Tubing/piping may not be charged (pressurized) when unattended.
- Only experienced personnel should operate the system.
- The high pressure in cylinders (4.4 to 6,000 psig) makes the gas cylinder a potential rocket with enough energy to punch through walls.
- Flammability is a concern especially with the gases acetylene, hydrogen, and propane.

Contact EH&S at 206.543.7262 with gas piping questions.

11. LABELING REQUIREMENTS

Cylinders stored and used at a University location must be clearly labeled according to U.S. Department of Transportation (DOT) and Occupational Safety and Health Administration (OSHA) regulations.

A Name of Product, B Material identification number, C Hazard diamond, D Hazards and precautions, E Contact information

- The labeling must list contents, concentrations, hazard classifications, safety precautions, and the manufacturer or supplier.
- Do not remove or damage manufacturer applied labels, decals or cylinder content information.
- Be sure to contact the manufacturer if you are unsure of a cylinder's contents.

Clearly label all gas lines leading from gas cylinders. This is especially important if the cylinder cannot be seen from the application point. Markings used for piping systems must include the content's name and hazard information and indicate direction of flow. Orient labels in a manner that can be easily read from a point of normal approach. Markings are required at each valve, at wall or ceiling penetrations, at each change of direction and at a minimum every 20 feet throughout the piping run.

Additional labeling requirements include:

- Use only the vendor label for positive identification of contents of the cylinder. Be aware that color coding may be inconsistent from vendor to vendor.
- Mixed gases must be clearly labeled with the contents of the cylinder.
- Empty cylinders must be labeled with the word "empty."
- Know the contents of each cylinder you are using.
- Preferred labeling includes the identity of the material, statement of hazard, and the associated signal word/primary hazard (listed on the safety data sheet).
- Only the gas supplier is allowed to mix gases in a cylinder for labs. Special consideration is given to Diving Gas Mixing allowed by following the guidelines in the CGA Diving Pamphlet
- Do not use cylinders for any other purpose than holding the contents as received.
- Leaking, defective, fire burned, or corroded containers must not be shipped without prior approval of the supplier.

When labeling is missing from the cylinder, use the sources listed below to get the information, which may involve getting new labels or swapping out the cylinders.

- Air Products;
- Matheson and other gas company catalogs;
- The Compressed Gas Association Pamphlet C-7: "Precautionary Labeling and Marking of Compressed Gas Cylinders;" and
- The manufacturer or distributor of the gas. If the label is no longer legible, contact the vendor for pickup, or contact EH&S at 206.543.7262 with cylinder labeling questions.

Back to top

12. SPECIFIC HAZARD CLASSES

This section provides additional guidance to be used in conjunction with the general use requirements in this document.

CORROSIVE GASES

Examples include chlorine, hydrogen chloride, fluorine, hydrogen fluoride, and hydrogen sulfide.

- Remove regulators after use and flush with dry air or nitrogen.

- Metals become brittle when used in corrosive gas service, check equipment and lines frequently for leaks.
- Use a diaphragm gauge with corrosive gases that would destroy a steel or bronze gauge. Check with the gas supplier for recommended equipment.

CRYOGENIC LIQUIDS

Cryogenic liquids and their boil-off gases rapidly freeze human tissue and cause embrittlement of many common materials. All cryogenic liquids produce large volumes of gas when they vaporize and may create oxygen-deficient conditions.

Examples of common cryogenic liquids include liquid nitrogen, oxygen, hydrogen, helium, and liquid neon. The following information applies to the use and handling ofcryogenics:

- Use appropriate personal protective equipment, including insulated gloves, lab coat, and eye protection (goggles and a face shield) and wear closed-toe shoes during any transfer of cryogenic liquid.
- In the event of skin contact with a cryogenic liquid, do not rub skin; place the affected part of the body in a warm water bath (not to exceed 40°C (105°F)). If a burn is significant, seek medical attention.
- Use only equipment, valves, and containers designed for the intended product, service pressure and temperature.
- Inspect containers for loss of insulating vacuum. If the outside jacket on a container is cold or has frost spots, some vacuum has been lost. Empty the contents into another cryogenic container and remove the damaged unit from service. Repairs should be made by the manufacturer or an authorized company.
- Transfer operations involving open cryogenic containers, such as Dewars, must be conducted slowly to minimize boiling and splashing of the cryogenic fluid.
- Ice or other foreign matter should not be allowed to accumulate beneath the vaporizer or the tank. Excessive ice buildup could result in the discharge of excessively cold gas or structural damage to the cryogenic container or surroundings.
- All cryogenic systems, including piping, must be equipped with pressure relief devices to prevent excessive pressure build-up. Pressure relief must be directed to a safe location. Do not tamper with pressure relief valves or the settings for the valves.
- Hot air, steam or hot water should be used to thaw frozen equipment with one exception: **Do not** use water to thaw liquid helium equipment.
- For vehicle transportation, cryogenic liquid containers must only be transported in a University vehicle's truck bed. Do not transport cryogenic liquid containers inside a vehicle.

FLAMMABLE GASES

Some common examples of flammable gases include acetylene, hydrogen, methane, propane, carbon monoxide, and isobutane.

- Flammable gases, except for protected fuel gases, must not be used near ignition sources. Ignition sources include open flames and sparks, sources of heat, oxidizing agents and ungrounded or non-intrinsically safe electrical or electronic equipment.
- Store and use flammable gas cylinders inadequately ventilated areas.
- Portable fire extinguishers must be available for fire emergencies. The fire extinguisher must be compatible with the apparatus and the materials in use. Contact EH&S to verify an appropriate fire extinguisher is available and appropriate for a specific gas.
- Do **not** use flames for detecting leaks. A compatible leak detection solution must be used for leak detection.
- Use spark-proof tools when working with or on a compressed gas cylinder system containing flammable gases. Refer to the Grounding and Bonding Focus Sheet on the EH&S website for more information.
- Post signs reading "No Open Flames" on access doors to areas that use or store flammable gases.
- Manifold systems must be designed and constructed by competent personnel who are familiar with the requirements for piping of flammable gases. Consultation with the gas supplier before installation of manifolds is recommended.
- Do **not** store flammable gases next to an exit or near oxygen cylinders.

FUEL GASES

Fuel gases often use a combination of flammable and oxidizing gases. Use of fuel gases must comply with,

- OSHA 29 CFR1910.253--Oxygen-Fuel Gas Welding and Cutting
- OSHA 29 CFR1910.102--Acetylene
- OSHA 29 CFR1910.103--Hydrogen
- Compressed Gas Association Pamphlet G-1: "Acetylene"
- Compressed Gas Association Pamphlet SB-8: "Use of Oxy-fuel Gas Welding and Cutting Apparatus"
- NFPA Standard 51: "Standard for the Design and Installation of Oxygen-Fuel Gas Systems for Welding, Cutting and Allied Processes"

HIGH PRESSURE GASES

High pressure gases can be rated up to 3,000 pounds per square inch (psi). Typical uses for high pressure gases include:

- Inert welding gas mixtures
- Cryogenics
- Breathing gas cylinders (SCUBA and SCBA)
- Non-toxic gas distribution
- Medical gas distribution
- Emergency oxygen services

In addition to any gas-specific hazards, high pressure gases must carry a caution label.

OXIDIZING GASES

Oxidizing gases are non-flammable, but in the presence of an ignition source and fuel can support and vigorously accelerate combustion. They include:

- Oxygen
- Chlorine
- Fluorine
- Nitrous oxide

Do not use oil in any apparatus where oxygen will be used. Gauges and regulators for oxygen must bear the warning "OXYGEN - USE NO OIL."

Oxidizers react explosively with flammable gases; they must be stored separately.

TOXIC AND HIGHLY TOXIC GASES

Common toxic or highly toxic gases are listed in MyChem. Access the safety data sheet for these classes of chemicals by conducting a search for the chemical in MyChem. Contact EH&S for any questions concerning potentially toxic gases.

Store highly toxic gases in exhausted enclosures such as a gas cabinet. A chemical fume hood may be acceptable for lecture cylinders and other small bottles. Contact EH&S for more information.

- A respirator may be necessary when working with toxic and highly toxic gases.
- A volume restriction orifice installed downstream of the regulator is required for all toxic and highly toxic gases. Specify pressure and flow requirements when ordering compressed gas so that the vendor provides the proper restriction orifice.
- ALL toxic and highly toxic gases should be purchased through the University's approved vendor (currently Praxair), unless they do not offer the material. Ordering information is provided on the UW Procurement webpage.
- Special Fire Department permits and engineering controls such as a gas storage cabinet may be required to use toxic or corrosive gases. Prior to ordering these gases, contact EH&S at 206.543.7262 for an assessment and to ensure proper safeguards are met.

- Extra precautions must also be documented in your standard operation procedures (SOPs) for toxic chemicals.

Back to top

13. DISPOSAL

The disposal requirements apply to all gas cylinders and are stipulated in the Disposal section of the Compressed Gases and Cryogens webpage on the EH&S website.

14. LEAKS AND EMERGENCIES

PRE-PLANNING

Despite adherence to cylinder safety practices, incidents involving gases may occur. The amount of damage sustained by personnel and property is greatly influenced by the quality of the emergency plan.

Users of compressed gas cylinders must be familiar with procedures for responding in an emergency. Standard operating procedures (SOPs) for using compressed gases must include possible incident scenarios with appropriate responses and must consider the following factors:

a. The nature of the operation (e.g., experimental design, equipment used and type of injury that could occur)
b. The potential location of a release or spill (e.g., outdoors versus indoors, in a laboratory, corridor or storage area, on a table, in a hood, or on the floor)
c. The quantities of material that might be released and the type of containment (e.g., compressed gas tank size, manifold systems, etc.)
d. The chemical and physical properties of the compressed gas (e.g., its physical state, vapor pressure and air or water reactivity)
e. The hazardous properties of the compressed gas (e.g., its toxicity, corrosivity and flammability)
f. The availability and locations of emergency supplies and equipment

The SOP includes an emergency response plan that identifies building evacuation routes, emergency telephone numbers, chemical containment procedures, fire extinguisher usage, etc.

SMALL LEAK RESPONSE

Occasionally, a gas cylinder or one of its component parts may develop a leak. Most of these leaks occur at the top of the cylinder, in areas such as the valve threads, pressure safety device, valve stem, or the valve outlet. To correct minor leaks:

a. For non-toxic gases, verify suspected leaks using a gas detector or soapy water solution (do not use soapy water for leak testing of oxygen cylinders). A flame must not be used for

detection. If the leak cannot be stopped by tightening a valve gland or packing nut, notify the vendor (if the cylinder is rented).

b. **Do not** try to fix a leak on a toxic or highly toxic gas cylinder; instead initiate emergency procedures.

c. For flammable (non-toxic), inert or oxidizing gases (non-toxic), move the cylinder to an isolated, well-ventilated area (within or next to a fume hood), away from combustible materials. **Post signs** that describe the hazard.

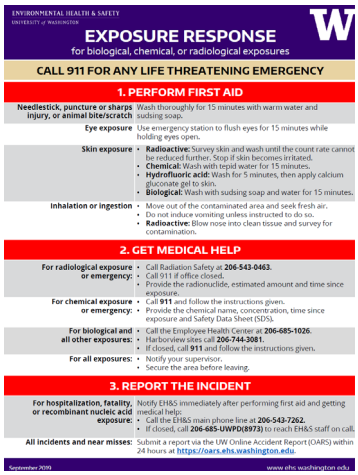
d. For corrosive and toxic gas leaks, immediately contact EH&S for remediation or cylinder removal. **Do not** remove a leaking toxic gas cylinder from a ventilated cabinet.

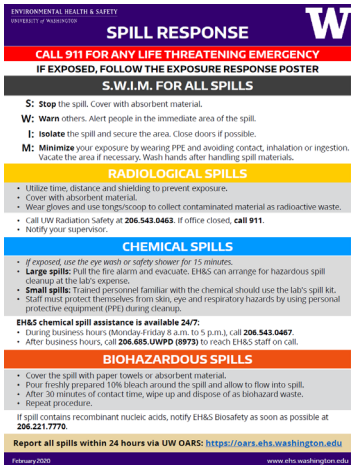
EMERGENCY RESPONSE

In the event of a large gas release or other incident, activate the following emergency procedures:

- Evacuate the area, securing entrances and aiding others on the way out.
- Activate building and area fire alarms (or chemical safety alarms if applicable).
- Call 9-1-1.
- Report the incident to a supervisor.
- Follow the EH&S exposure response procedures if potentially exposed to hazardous materials.
- Provide emergency response officials with details of the problem upon their arrival.
- Complete an incident report using the Online Accident Reporting System (OARS).

Download and Spill Response and Exposure Response Posters from the EH&S website and post them in a visible location.





In the event of a fire, immediately call 9-1-1.

A small, isolated fire within the space may be extinguished using the appropriate portable fire extinguisher, if personnel are confident that they can safely extinguish the fire.

For large or rapidly spreading fires, the following procedures should be followed:

- Evacuate the building, shutting doors and aiding others on the way out.
- Activate building and area alarms.
- Call 9-1-1 to report the fire.
- Provide fire or police officials with the details of the problem upon their arrival.
- Complete an incident report using the Online Accident Report System (OARS).

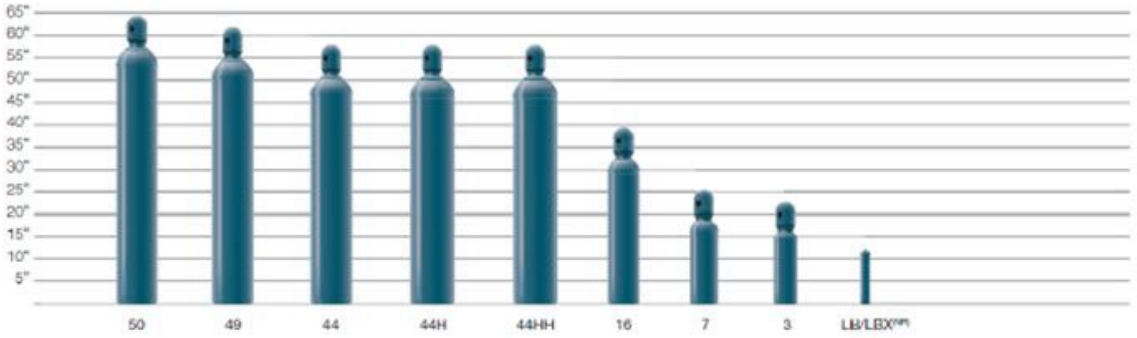
15. EH&S COMPRESSED GAS CYLINDER CONTACTS

- Building and Fire Safety Contact (206) 685-0341 / ehsdept@uw.edu
- Environmental Health & Safety Contact (206) 543-7262 / ehsdept@uw.edu
- Hazardous Materials Contact (206) 685-2849 / hazmat@uw.edu
- Laboratory Safety Contact (206) 685-3993 / labcheck@uw.edu
- MyChem Contact (206) 616-4046 / mychem@uw.edu
- Spill Advice Contact (206) 543-0467 / chmwaste@uw.edu

Back to top

APPENDIX 1: CYLINDER TYPES

Cylinder code (AirLiquide/Praxair)	Service pressure (psig)	Approx. capacity (ft^3)	Outer diameter (inches)	Height (inches)	Internal water volume (L / ft^3)
50	2900	335	9	58.2	50 / 1.8
49/T(UT)	2400	277	9.25	55	49 / 1.7
44/4K	2265	232	9	51	44 / 1.6
44H/3K	3500	338	10	51	42 / 1.5
44HH/6K	6000	433	10	51	40 / 1.4
16/Q(UG)	2015	76	7	2.5	16 / 0.56
7/G	2015	33	6.25	32.18.55	7 / 0.25
3/L4	2015	14	4.25	16.75	3 / 0.11
LB	1800	2	2	12	0.4 / 0.015



Cylinder Comparison Chart

Matheson Tri-Gas	Nominal Dimensions (inches)	Material of Construction	Air Products	Air Liquide	BOC	Praxair	Scott
1L/QK	10x55	C	A	49	300	UCT	K
1A/QA	9X51	C	B	44	200	K	A
1R/QX	8X48	A	B (AL)	30AL	150A	AS	AL
2/GA	9X26	C	C	16	80	Q	B
2R/GX	7X33	A	C(AL)	22AL	80A	AQ	BL
3/UA	6X19	C	D-1	7	30	G	C
3R/UX	7X16	A	D-1(AL)	7AL	30A	AG	CL
4/JA	4X13	C	D	3	12	F	D
LB	2X12	C	LB	LB	LB	LB	LB

Back to top