



NORTHWESTERN
UNIVERSITY

Responsible University Official:

V.P. for Research

Responsible Office:

Office for Research Safety (ORS)

Origination Date: 07/12/2010

COMPRESSED OR LIQUEFIED GASES IN LABORATORIES AND LABORATORY SUPPORT FACILITIES

Policy Statement

All laboratories and laboratory support facility employees engaged in the use of compressed or liquefied gases shall adhere to the requirements stated in this Policy and all related safety programs of the Office for Research.

Reason for Policy/Purpose

The use of hazardous chemicals in the laboratory is regulated by the Occupational Safety and Health Administration (OSHA) Occupational exposure to hazardous chemicals in laboratories (29 CFR 1910.1450). Areas outside laboratories where compressed or liquefied gases are handled are regulated by the OSHA Hazard Communication Standard (29 CFR 1910.1200) and Compressed Gases (29 CFR 1910 Subpart H, M and Q). The storage of gases is also regulated by the currently adopted version of the International Fire Code, applicable standards of the Compressed Gas Association (CGA) and the National Fire Protection Association (NFPA). The University requires research laboratories using compressed or liquefied gases to maintain concentrations and/or quantities below the thresholds as promulgated by the Department of Homeland Security (DHS) Chemical Facilities Anti-Terrorism Standards (CFATS).

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Who Approved This Policy

Executive Vice President
Vice President for Research

Who Needs to Know This Policy

Northwestern University faculty, staff, postdocs, research associates, students, and visitors working in laboratories or laboratory support facilities using compressed or liquefied gases.

Website Address for This Policy

<http://www.research.northwestern.edu/ors/forms/policy-compressed-or-liquefied-gases-in-laboratories.pdf>

Contacts

If you have any questions on the Compressed or Liquefied Gases in Laboratories and Laboratory Support Facilities Policy, you may:

1. Call the Office for Research Safety at 847-491-5581, or
 2. Send an e-mail to ResearchSafety@northwestern.edu
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Definitions

Control area:	As defined by the International Building Code (IBC): “Spaces within a building where quantities of hazardous materials not exceeding the maximum allowable quantities per control area are stored, dispensed, used or handled.”
Emergency alarm system	A system to provide indication and warning of emergency situations involving hazardous material releases.
Maximum Allowable Quantity (MAQ)	MAQs are defined by the International Fire Code Table: 5003.1 and the National Fire Protection Association (NFPA) 55 Compressed Gases and Cryogenics Fluids Code. It is the maximum allowable gas volume or liquefied gas weight per hazard class and control area. A record of MAQs per control area is maintained by the Office for Research Safety. Further information is in the Guide to Compressed or Liquefied Gases in Laboratories .
Restricted Commodity	Gaseous chemicals above their threshold concentrations are classified as Chemicals of Interest per Department of Homeland Security Chemical

Facility Anti-Terrorism Standards (CFATS) and are Restricted Commodities at Northwestern University. The acquisition of Restricted Commodities requires the approval from the Office for Research Safety.

Policy

A sustainable safety culture in research is built on leadership engagement, hazard awareness, enhanced communication, and behavior changes. Everyone involved has a role in fostering and maintaining a safe environment and this policy assigns related responsibilities

Principal Investigator or Laboratory Supervisor Responsibility

The PI or laboratory supervisor shall ensure that the laboratory workers using compressed or liquefied gases are informed of the hazards of chemicals present in their work area.

Specifically, the PI or laboratory supervisor shall:

- Ensure that workers know and follow the guidelines for compressed and liquefied gases.
- Determine the required levels of protective apparel and equipment, and availability.
- Assure that the quantity of compressed and liquefied gases does not exceed Maximum Allowable Quantities or Restricted Commodity Thresholds of Consequence.
- Develop standard operating procedures and a hazard release risk assessment for high hazard gases
- Maintain an up-to-date inventory record.
- Properly classify and record the acquisition of Restricted Commodity within 30 days in the Northwestern Safety Information System (NSIS).
- Ensure that facilities and training for use of any material being ordered are adequate.

The PI or laboratory supervisor shall develop a written response protocol for activation of any emergency alarm system that is mutually agreed upon by the University Police Department (UPD), the Office of Risk Management (ORM), ORS and Facilities Management (FM) and disseminate the protocol to the designated responders. ORS shall work with the PI or laboratory supervisor to provide hazard awareness training to designated NU first responders.

The PI or laboratory supervisor shall also ensure that all laboratory workers using compressed or liquefied gases attend mandatory Laboratory Safety training in accordance with the ORS Training program. Training shall be conducted at the time of the laboratory worker's initial assignment to a work area where compressed or liquefied gases are present and prior to assignments involving new exposure situations.

Laboratory Worker Responsibility

- Conduct all work with compressed or liquefied gases in accordance with standard operating procedures.
- Notify the PI/Supervisor and ORS of any accidents, incidents involving material releases, and adverse health, safety and environmental conditions.
- Complete all assigned safety training certificates

Office for Research Safety Responsibilities

The University's Chemical Hygiene Officer (CHO) is a designated ORS staff member. The CHO or other designated ORS personnel shall:

- Monitor the maintenance of the chemical inventory program
- Review and approve purchase requests for Restricted Commodity
- Maintain a list of MAQs for each control zone
- Develop and offer safety training modules
- Assess the use of personal protective equipment
- Provide guidance in environmental detection
- Provide guidance and act as a resource to departmental safety committees and personnel
- Assist in the development of specific standard operating and emergency response procedures
- Review laboratory designs according to the Program on Safety Review of New and Renovated Facilities and Equipment
- On a monthly basis report the Chemicals of Interest inventory to UPD

Facilities Management Responsibility

The designated FM project manager shall follow the Program on Safety Review of New and Renovated Facilities and Equipment and assist in developing a mutually agreed upon emergency response plan. The periodic maintenance of required gas detection and emergency alarm systems that are designed and installed through FM shall be completed through FM Operations.

FM shall also maintain a record of control area boundaries.

University Police Responsibility

UPD staffs a central station 24/7 and follows the mutually agreed upon response protocol in case of an alarm activation of a required emergency alarm system.

Office of Risk Management Responsibilities

ORM staff review laboratory designs in accordance with the Program on Safety Review of New and Renovated Facilities and Equipment, and assist in the development of emergency response procedures.

Forms/Instructions

Specific instructions and procedures can be found in the [Guide to Compressed or Liquefied Gases in Laboratories](#)

Appendices

Appendix 1 – Restricted Commodities

Gaseous Chemicals	CAS#	Concentration of Consequence in %	Quantity Threshold of Consequence in pounds
Arsine	7784-42-1	>0.6	15
Boron trichloride	10294-34-5	> 84.7	45
Boron trifluoride	7637-07-2	>26.87	45
Bromine chloride	13863-41-7	>9.67	45
Carbonyl fluoride	353-50-4	>12	45
Carbonyl sulfide	463-58-1	>56.67	500
Chlorine	7782-50-5	>9.77	500
Chlorine dioxide	10049-04-4	ACG	any amount
Chlorine pentafluoride	13637-63-3	> 4.07	15
Chlorine trifluoride	7790-91-2	>9.97	45
Cyanogen	460-19-5	> 11.67	45
Cyanogen chloride	506-77-4	>2.67	15
Diborane	19287-45-7	>2.67	15
Dichlorosilane	4109-96-0	>10.47	45
Dinitrogen tetroxide	10544-72-6		15
Fluorine	7782-41-4	>6.71	15
Germane	7782-65-2	>20.73	45
Germanium tetrafluoride	7783-58-6	>2.11	15
Hexafluoroacetone	684-16-2	>15.67	45
Hydrogen bromide (anhydrous)	10035-10-6	>95.33	500
Hydrogen chloride (anhydrous)	7647-01-0	ACG	500
Hydrogen cyanide	74-90-8	>4.67	15
Hydrogen fluoride (anhydrous)	7664-39-3	>42.53	45
Hydrogen iodide, (anhydrous)	10034-85-2	>95.33	500
Hydrogen selenide	7783-07-5	>0.07	15
Hydrogen sulfide	7783-06-4	>23.73	45
Methylchlorosilane	993-00-0	>20	45
Methyl mercaptan	74-93-1	>45	500
Nitric Oxide	10102-43-9	>3.83	15
Nitrogen trioxide	10544-73-7	>3.83	15
Nitrosyl chloride	2696-92-6	>1.17	15
Oxygen difluoride	7783-41-7	>0.09	15

Perchloryl fluoride	7616-94-6	>25.67	45
Phosgene	75-44-5	>0.17	15
Phosphine	7803-51-2	>0.67	15
Selenium hexafluoride	7783-79-1	>1.67	15
Silicon tetrafluoride	7783-61-1	>15	45
Stibine	7803-52-3	> 0.67	15
Sulfur dioxide (anhydrous)	7446-09-5	>84	500
Sulfur tetrafluoride	7783-60-0	> 1.33	15
Tellurium hexafluoride	7783-80-4	> 0.83	15
Trifluoroacetyl chloride	354-32-5	>6.93	45
Trifluorochloroethylene	79-38-9	> 66.67	500

ACG= Any commercial grade

Quantities in each building must be managed below the Threshold of Consequence or MAQ, whichever threshold is lower.

Related Information

Table of Acronyms

CFATS	Chemical Facilities Anti-Terrorism Standards
CGA	Compressed Gas Association
CHO	Chemical Hygiene Officer
DHS	Department of Homeland Security
IFC	International Fire Code
MAQ	Maximum Allowable Quantity
NFPA	National Fire Protection Association
NSIS	Northwestern Safety Information System
ORS	Northwestern University Office for Research Safety
OSHA	Occupational Safety and Health Administration

History/Revision Dates

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