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GUIDELINES FOR STORAGE AND USE OF HEALTH HAZARD (HH) 3 and 4 GAS

1. Definition of Health Hazard (HH) Gases

- 1.1. Gases defined in the guidelines are based on International Fire Code (IFC) and National Fire Protection Association (NFPA) standards
- 1.2. Health Hazard 3 (HH3) gas – material that, under emergency conditions and according to the guidelines, can cause serious or permanent injury
- 1.3. Health Hazard 4 (HH4) gas – material that, under emergency conditions and according to the guidelines, can be lethal

2. Notification of Environmental Health & Safety (EH&S) Prior to Obtaining HH3 and HH4 Gases

- 2.1. EH&S must be notified prior to obtaining HH3 and HH4 gases (regardless of quantity). EH&S can be notified via email (safety@ehs.pitt.edu) or phone 412-624-9505
- 2.2. Notification of EH&S regarding HH3 and HH4 gas must include the following:
 - 2.2.1. Type and concentration of compressed or liquefied gas
 - 2.2.2. Quantity (net weight) of compressed or liquefied gas
 - 2.2.3. Type / size of gas cylinder
 - 2.2.4. Storage and use location(s)
 - 2.2.5. Vendor source – including written acknowledgement / agreement confirmation that the vendor will accept the “used” cylinders for return
- 2.3. Quantities of gases may be subject to reporting requirements of the Department of Homeland Security Chemical Facility Anti-Terrorism Standard

3. Storage and Use of HH Gases

- 3.1. HH3 and HH4 gas cylinders must be secured at all times, and used in a cool, dry, well-ventilated, fire rated room isolated from work areas
- 3.2. Gas cabinets exhausted out of the work area or certified chemical fume hoods must be utilized for all storage and usage of HH3 and HH4 gases.
- 3.3. Quantities of agent in storage and usage must be limited to comply with IFC standards at all times; contact EH&S for specific guidance
- 3.4. Only compatible and approved regulators, valves, piping, and fittings must be used with all gas system installations (Consult your gas supplier for approved materials for each gas)
- 3.5. HH gas cylinders should be equipped with an automatic shut off valve in the event of gas detection at any of the monitoring points
- 3.6. HH gas cylinder set-up should be equipped with a manual shut-off valve when feasible
- 3.7. Entry doors to the laboratory or storage room in which HH gas is stored and/or used must be labeled with the gas by common name and room entry instructions for alarm or emergency conditions

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4. Gas Detection and Alarm Systems

- 4.1. Gas detection devices or systems are required in the gas cabinet or chemical fume hood and at all potential release points of the HH gas system (per manufacturer's recommendations); contact EH&S for specific guidance
- 4.2. An alarm system (local, audible, and visual) must be installed at locations inside and outside the laboratory or use site. If the alarm system is not feasible due to a set-up in the chemical fume hood, then ventilation flow rate alarms are required on the fume hood.
- 4.3. Emergency power must be provided for the gas cabinet exhaust, system shut offs, monitoring, alarms, and associated components

5. Certification and Testing Requirements

- 5.1. Upon installation of the gas cabinet and cylinder, the entire system must be certified as functional in writing by the installer and turned over to the Principal Investigator
- 5.2. Gas detection and alarm system must be serviced and maintained according to manufacturer's guidelines
- 5.3. EH&S recommends annual testing / calibration of the alarm system by a qualified vendor
- 5.4. Integrity of testing equipment must be tested and certified on an annual basis

6. Reserved

7. Appendix A – List of Health Hazard 3 and 4 Compressed and Liquefied Gases

Gas	CAS No.
Acetylene	74-86-2
Ammonia, anhydrous	7664-41-7
Arsenic Pentafluoride	7784-36-3
Arsine	7784-42-1
Boron Trichloride	10294-34-5
Boron Trifluoride	7637-07-2
Carbon Monoxide	630-08-0
Carbonyl Fluoride	353-50-4
Carbonyl Sulfide	463-58-1
Chlorine	7782-50-5
Chlorine Dioxide	10049-04-4
Chlorine Monoxide	7791-21-1
Chlorine Trifluoride	7790-91-2
Cyanogen	460-19-5
Cyanogen Chloride	506-77-4
Diazomethane	334-88-3
Diborane	19287-45-7
Dichlorosilane	4109-96-0
Ethane	74-84-0
Ethylene Oxide	75-21-8
Fluorine, compressed	7782-41-4
Germane	7782-65-2
Hexafluoroacetone	684-16-2

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Gas	CAS No.
Hydrogen	1333-74-0
Hydrogen Bromide	10035-10-6
Hydrogen Chloride, anhydrous	7647-01-0
Hydrogen Cyanide, anhydrous, stabilized	74-90-8
Hydrogen Fluoride, anhydrous	7664-39-3
Hydrogen Selenide	7783-07-5
Hydrogen Sulfide	7783-06-4
Methane	74-82-8
Methyl Mercaptan	74-93-1
Nitric Oxide	10102-43-9
Nitrogen Dioxide	10102-44-0
Nitrogen Trioxide	10544-73-7
Nitrosyl Chloride	2696-92-6
Oxygen Difluoride	7783-41-7
Ozone	10028-15-6
Pentaborane	19624-22-7
Phosgene	75-44-5
Phosphine	7803-51-2
Propane	74-98-6
Selenium Hexafluoride	7783-79-1
Silane	7803-62-5
Silicon Tetrafluoride	7783-61-1
Stibine	7803-52-3
Sulfur Tetrafluoride	7783-60-0
Sulfuryl Fluoride	2699-79-8
Tetrafluorohydrazine	10036-47-2
Tungsten Hexafluoride	7783-82-6