

Principal Investigator: _____

Date Approved: _____






This document covers basic chemical safety information for acutely toxic pyrophoric gases. The use of any acutely toxic pyrophoric gas is subject to pre-approval by the Principal Investigator (PI) and/or Supervisor. PI and/or Supervisor may use the sheet attached to this SOP to document any lab specific training for Acutely Toxic Pyrophoric Gases. **DO NOT USE ANY ACUTELY TOXIC PYROPHORIC GAS UNTIL YOU HAVE OBTAINED THE NECESSARY PRE-APPROVAL.**

Acutely Toxic Pyrophoric Gases

Pyrophoric gases are gases which spontaneously ignite when exposed to air. Acutely toxic pyrophoric gases produce toxic combustion byproducts when burned and include any gas with a median lethal concentration (LC₅₀) of 500 ppm or less.

Examples of acutely toxic pyrophoric gases include phosphine and diborane.



Personal Protective Equipment & Personnel Monitoring					
					
Lab Coat	Nomex Suit	Gloves		Eye Protection	Face Shield
Wear a flame-resistant lab coat whenever working with acutely toxic pyrophoric gases. Wear a Nomex suit and hood whenever changing out cylinders.		Wear fire gloves when changing out acutely toxic pyrophoric gas cylinders and for any operations where accidental release is a possibility.		ANSI Z87.1-compliant safety glasses or safety goggles and a face shield.	

Labeling & Storage

Acutely toxic pyrophoric gases must be stored in a toxic gas cabinet or exhausted enclosure away from combustible materials, oxidizing substances, and ignition sources. OSHA regulation 1910.253(b)(4)(iii) requires that combustible cylinders in storage be separated from oxidizing gas cylinders by a minimum distance of 20 feet or by a noncombustible barrier at least five feet high and with a fire resistance rating of least one-half hour.

Ensure compressed gas cylinders are in an upright position to prevent tipping and rolling. This can be achieved by using a strap or chain 1/3 from the top of the cylinder. Alternatively, use a cylindrical casing to secure the cylinder within the exhausted enclosure next to your experimental setup. Refer to American Society of Mechanical Engineers code for Process Piping, ASME B31.3, to select compliant piping.

WHAT NOT TO DO: Never store cylinders on transportation carts. Never store cylinders with regulators still attached, instead remove the regulator and replace with the safety cap. Never use a cylinder without a regulator. Never permit the gas to enter the regulator suddenly. Never try to stop a leak between a cylinder and regulator by tightening the union nut unless the cylinder valve has been closed first. Never strike an electric arc on the cylinder.

Cautions & Considerations

Use and store only in fully-sprinklered buildings.

Use only spark-proof tools and explosion-proof equipment.

Pyrophoric gases are transported with a vapor-tight cap over the threaded connector which must be removed in order to connect the regulator. If gas is trapped between the vapor-tight cap and main valve, it may ignite when the cap is removed. Extra care must be taken when removing this cap and fitting a regulator onto a pyrophoric gas cylinder, including the following procedure:

1. Operators should wear all appropriate PPE including fire gloves, Nomex suit or Firefighter turnout, face shield, earplugs, and safety glasses.
2. Operators should have a “buddy” equipped with the same PPE visually observing the operation and ready to assist if necessary.
3. Physically secure the cylinder away from other hazards.
4. Stand to the side of the cylinder valve outlet, then remove the plastic bag and the hold-down wire.
5. Confirm that the valve is closed tightly.
6. Position the cylinder to pull down with a wrench (a box wrench is preferred) when loosening the vapor-tight outlet cap.
 - a. Be aware that flames can come out of the leak-check hole in a Diameter Index Safety System (DISS) vapor-tight outlet cap.
7. Pull down slowly on the vapor-tight outlet cap and anticipate the possibility of a leak. Be ready to push up on the cap to reseal the system if a leak does occur.
8. Once the cap has been removed, visually check the valve outlet surface for damage or debris. Never look directly into the outlet. Instead, use a dental mirror for visual inspection.

Engineering Controls, Equipment & Materials

Fume Hood

If your protocol does not permit the dispensing of these materials into a fume hood, contact EHS to determine whether alternative engineering controls and/or additional respiratory protection is warranted.

Ordering & Disposal

As of July 1st 2022, Receiving & Stores will no longer coordinate the cylinder gas program for campus departments. Beginning on July 1, departments will enter requisitions for cylinder gases into [49er Mart](#) directly to the mandatory State Term Contract #1214A vendors, Airgas or ARC3 Gases, and deliveries/pickups will be made by the vendors directly to the department. Any order or service issues should be communicated directly to the vendor supplying the cylinder gas, or to the Purchasing Office who will assist the department with any issues encountered.

Burn Box

Consult with EHS to determine if a burn box is necessary for your operations.

First Aid & Emergencies

Releases

Immediately notify others in the area of the release and evacuate the location where the release occurred. If venting or leaking gas catches fire, **DO NOT** attempt to extinguish flames. Notify your supervisor and call 911 from any campus phone (or 704-687-2200 from a cell phone). Report any exposure to EHS at 704-687-1111. Remain on-site (at a safe distance) to provide detailed information to first responders.

Skin or Eye Contact

Without putting yourself at risk, move person into fresh air. Remove contaminated clothing and accessories; flush affected area with water for at least 15 minutes. Get medical attention immediately.

Inhalation

Without putting yourself at risk, move person into fresh air. Get medical attention immediately.

Name	Signature	Date