

Principal Investigator: _____

Date Approved: _____

This document covers basic chemical safety information for flammable gases and supplements the laboratory Chemical Hygiene Plan as appropriate. The use of any flammable gas is subject to pre-approval by the Principal Investigator (PI) and/or the designated Laboratory Responsible Safety Person. DO NOT USE ANY FLAMMABLE GAS UNTIL YOU HAVE OBTAINED THE NECESSARY PRE-APPROVAL.

Flammable Gases

Flammable gases are gases which are ignitable at a concentration in air of $\leq 13\%$ (v/v), or have a flammable range in air of at least 12 percentage points regardless of the lower flammable limit, at 20 °C and 1 atm.

Examples of flammable gases include hydrogen and methane.



Personal Protective Equipment & Personnel Monitoring



Lab Coat

Flame-resistant lab coat.



Gloves

For proper glove selection, review the chemical safety data sheet and consult glove manufacturer recommendations with your PI or supervisor.



Eye Protection

ANSI Z87.1-compliant safety glasses or safety goggles.

Labeling & Storage

It is prudent to provide local exhaust ventilation for large cylinders containing flammable gases (e.g., a toxic gas cabinet or snorkel). All flammable gases must be stored away from combustible materials, oxidizing substances, and ignition sources. Some installations may require monitoring and additional fire protection measures.

Store flammable gases away from combustible materials, oxidizing substances, and ignition sources. NFPA 55 requires that flammable 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 at least one-half hour. Section 2703.9.8 of the IFC requires the barrier to be at not less than 18 inches above and to the sides of the stored material.

Compressed gas cylinders in storage should be chained to a stable structure such as a wall with no more than three cylinders of equal size secured with a single chain, 1/3 from the top of the cylinder. Compressed gas cylinders in use with a regulator attached should be secured individually so that no slippage or sliding occurs that could damage or alter the regulator. Alternatively, use a cylindrical casing to secure the cylinder to the floor 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: Do not use table/bench clamps for securing cylinders. Never store cylinders on transportation carts. Remove regulators from cylinders when not in use 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.

Engineering Controls, Equipment & Materials

Fume Hood

If your protocol does not permit the handling of these materials in a fume hood, contact the Department of Environmental Health, Safety and Sustainability (EHSS) to determine whether alternative engineering controls are warranted.

Housekeeping

Waste

If the vendor does not have a method to return/refill a cylinder, refer to the laboratory *Chemical Hygiene Plan* (Section 6.7) for information on proper chemical waste disposal procedures.

First Aid & Emergencies

Release

Immediately notify others in the area of the release and evacuate the location where the release occurred. Notify your PI/Responsible Safety Person and call Vanderbilt University Public Safety (VUPS) at 615-421-1911 or use the VandySafe app on your smart phone. Report any exposure through Risk and Insurance Management's Origami portal and mark that it occurred in research when prompted. Both VUPS and the Origami system will notify EHSS of the incident. Remain on site at a safe distance to provide detailed information to first responders.

Skin or Eye Contact

Remove contaminated clothing and accessories; flush affected area with water. If symptoms persist, get medical attention.

Inhalation

Move person into fresh air. If symptoms persist, get medical attention.

