# University of Arizona

## Acetylene Standard Operating Procedure

*[This is a template. Fill in all necessary blanks and delete all highlighted areas when complete. Add any sections necessary for your laboratory. This will be appended to your Laboratory Chemical Hygiene Plan.]*

**Title:**  **Click here to enter the title of your SOP.**

**Approval Holder (AH):** Click here to enter text **Approval #:** Click here to enter text

**Approval Holder Phone Number(s):** Click here to enter text

**Approval Safety Coordinator (ASC):** Click here to enter text

**Approval Safety Coordinator Phone Number(s):** Click here to enter text

**Department:** Click here to enter text

1. **Purpose**

This standard operating procedure (SOP) is intended to provide guidance on how to safely store and use acetylene in Enter AH’s name’s laboratory. Laboratory personnel should review this SOP, as well as the appropriate Safety Data Sheet(s) (SDSs), before Describe the procedure or process this SOP will address. If you have questions concerning the requirements within this SOP, contact your Approval Holder (AH) or Approval Safety Coordinator (ASC).

1. **Scope**

*[Describe when this SOP applies and to whom this SOP applies.]*

1. **Hazard Description**

*[Describe the hazards presented by the procedure or process this SOP addresses. What makes it hazardous? Provide an example, if applicable.]*



Acetylene is a colorless, flammable gas with the formula C2H2. It typically has little to no odor, although commercial varieties may have a slight garlic odor to aid in detection. Acetylene is unstable and can undergo explosive decomposition at high pressures. Modern cylinders are typically filled with a porous material and a solvent such as acetone, but older cylinders may be filled with carcinogenic *N,N*-dimethylformamide and/or asbestos. Acetylene is incompatible with oxidizing materials and gases, such as oxygen gas. It may react with and create explosive compounds in the presence of copper, mercury, and silver. Symptoms of exposure include dizziness, headache, nausea, vomiting, fatigue, tachycardia, and tachypnoea.

1. **Process & Hazard Controls**

*[Describe the steps needed to set up and complete the procedure or process in safe manner following the* [*hierarchy of controls*](https://www.cdc.gov/niosh/topics/hierarchy/default.html)*. Use as much detail as is necessary to ensure all laboratory workers can complete the procedure or experiment safely.]*

* 1. **Elimination/Substitution**

*[Describe any eliminations of hazardous chemicals or processes; alternatively, any substitutions with less hazardous alternatives that could be used to accomplish the task.]*

* Propylene fuel gas can be readily substitute for acetylene in certain procedures, particularly for welding, brazing, heating or cutting. It is twenty times more stable and has a reduced chance of flashbacks, as it is far less volatile than acetylene. However, propylene is still a flammable gas requiring caution and safe practices for use.
  1. **Engineering Controls**

*[Describe any engineering controls (e.g. fume hoods, gas cabinets, local exhausts, blast shields, etc.) that are used to safely accomplish the task.]*

* Adequate ventilation is important to prevent accumulation of high concentrations of acetylene and to maintain air-oxygen levels at or above 19.5%. Fume hoods and local exhausts, such as snorkels, can be used to prevent “rich” air-gas mixtures from forming.
* Flashback arrestors should be placed on acetylene gas cylinders to prevent explosions from gas leaking back into the cylinder during use.
  1. **Work Practices**

*[Describe any work practices (e.g. staggering schedules, additional cleaning measures for particulates, etc.) that are used to safely accomplish the task.]*

* Use spark-proof tools and explosion-proof equipment.
* **Trans-filling and creating mixtures of acetylene is prohibited without consultation from RLSS.**
* Acetylene and oxygen cylinders may be used together on a cart for short-term or active use but must be separated for regular storage.
* Acetylene may be stored as a liquefied gas at pressures up to 200 psi but should never be used or stored in its pure form at pressures above 15 psig.
* Ensure internal valves are working properly by checking every 6 months or more often depending on if hoses are frequently removed from the torch.
* Avoid leaks and loose connections; use the bubble test (spraying soapy water) on regulatory and lines to ensure there are no leaks prior to use.
* Never rely on gas equipment such as torches or regulators to shut off the gas.
* Open the acetylene cylinder valve no more than one-half turn. In case of an emergency, this valve can be closed very quickly.
* Before starting any operation with the torch, make sure that all combustibles are away from the cutting area and that you have your fire extinguisher nearby.
* Never use copper lines, or materials containing copper, mercury, or silver, with acetylene gas.
  1. **Personal Protective Equipment**

*[Describe the personal protective equipment needed to adequately protect laboratory workers when performing the process or procedure addressed by this SOP. Ensure to specify any personal protective equipment beyond the minimum (i.e. safety glasses, lab coat, gloves, long pants and closed-toed shoes).]*

* **Hand and Arm Protection:** flammable resistant or insulated neoprene are appropriate for work with acetylene.
* **Body Protection:** 100% cotton required; it is recommended to wear a flame-resistant laboratory coat or other flame-resistant body protection.
* **Face and eye Protection:** Safety glasses are minimal standard; use face shield or additional face and eye protection as required for the task.
* Avoid wearing all synthetic fabrics during acetylene use; these will melt into skin and may result in severe burns, infection, and even death.
  1. **Transportation and Storage**

*[Describe how to safely transport and/or store (e.g. ventilated cabinet, flammable cabinet, under inert blanket, etc.) the hazardous chemical(s) or processes.]*

* Store acetylene away from combustible materials, oxidizing substances, and ignition sources.
* Flammable cylinders in storage be separated from oxidizing gas cylinders (such as oxygen gas) 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.
  + Compressed air is not considered to be an oxidizing gas and can be stored near acetylene, but this practice is strongly discouraged as it will still increase/sustain flames.
* Acetylene cylinders should be double chained to a stable structure such as a wall with no more than three cylinders of equal size secured with a single set of chains.
  + The first chain should be 1/3 from the bottom of the cylinder and the second chain should be 1/3 from the top of the cylinder. Alternatively, use a cylindrical casing to secure the cylinder to the floor next to your experimental setup.
* 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 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.

1. **Spills, Cleanup & Disposal**

*[Describe how to safely end the procedure or process, clean up the process or spills, and/or dispose of any waste generated.]*

If an acetylene leak is detected, evacuate the laboratory and call 911. Do not generate any sparks and avoid and potential sources of ignition.

Spill response should always follow the [University Chemical Hygiene Plan](https://rgw.arizona.edu/sites/default/files/cs-univeristy_chemical_hygiene_plan.pdf) Section 8.2.

**Exposure Response**

|  |  |  |  |
| --- | --- | --- | --- |
| **Inhalation** | **Ingestion** | **Skin Contact** | **Eye Contact** |
| If it is safe to do so, remove victim to fresh air, and place them in a comfortable position to wait for medical attention. Administer oxygen or artificial respiration if breathing is difficult. Seek immediate medical treatment. | Swallowing is not a  likely route of  exposure. Seek  medical treatment.  Do not induce  vomiting. | If it is safe to do  so, remove victim to an uncontaminated area,  and place them in a comfortable position to  wait for medical attention. Immediately remove  contaminated clothes and shoes. Cleanse the  affected skin areas thoroughly with soap under  running water for 15 minutes. Seek medical  treatment | Gas: Not applicable.  Liquid: Rinse the  affected eye  thoroughly for 10  minutes under running  water. Seek immediate  medical treatment. |

1. **Enter Additional Section Title**

*[Add as many sections as necessary to adequately describe how to safely perform the procedure or process addressed by this SOP.]*

**References:**

* Princeton EHS: <https://ehs.princeton.edu/chemical-specific-protocols/acetylene>
* Airgas SDS: [https://beta.lakeland.edu/AboutUs/MSDS/PDFs/377/Acetylene%20[001001]%20(Airgas)%204-26-15.pdf](https://beta.lakeland.edu/AboutUs/MSDS/PDFs/377/Acetylene%20%5b001001%5d%20(Airgas)%204-26-15.pdf)
* <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/337503/Acetylene_Toxicological_Overview_phe_v1.pdf>