

**Standard Operating Procedure for Using Perchloric Acid**

Print a copy and keep with your Safety Data Sheets and training documents.

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| Department |  |
| Principal Investigator (PI) |  |
| PI Phone Number |  |
| Lab Manager |  |
| Lab Manager Phone Number |  |
| Emergency Contact |  |
| Emergency Contact Phone Number |  |

1. **Purpose**

The purpose of this document is to provide the information necessary to safely use perchloric acid in the \_\_\_\_\_\_\_\_\_\_\_ laboratory and to comply with requirements of OSHA Standard 29 CFR 1910 Subpart Z.

1. **Hazard Identification:**
* *Strong oxidizing agent* -- Perchloric acid is a colorless liquid often used as strong Brønsted-Lowry acid, being comparable in strength to sulfuric acid. It is a powerful oxidizer, but its aqueous solutions up to 72% are remarkably inert, only showing strong acid properties and no other oxidizing properties at room temperature.
* *Highly reactive—*
	+ Upon heating, aqueous solutions below 72% do become very strongly oxidizing and can react violently or explode if not handled carefully.
	+ At concentration above 85% (anhydrous), perchloric acid is very unstable and can explode upon contact with organic material.
	+ Many heavy metal perchlorates and organic perchlorate salts are extremely sensitive explosives.
	+ Mixtures of perchlorates with many oxidizable substances are explosive.
	+ Perchloric acid fumes can accumulate on ductwork and equipment. This residue is unstable and extremely dangerous. Great care must be taken to ensure that all perchloric acid fumes are trapped/not allowed to escape into fume hood ductwork.
1. **Engineering & Administrative Controls**

Perchloric acid must only be handled/used within the chemical fume hood, which is designed to pull air and fumes up and away from the user (Engineering Control).

**NOTE: If there is any risk of perchloric acid fumes escaping the experimental apparatus, then a specially designed and dedicated perchloric acid fume hood must be used that is designed to “wash down” the hood and ductwork (Engineering Control).**

All lab personnel who use perchloric acid must be trained on the hazards of perchloric acid, including being familiar with this SOP (Administrative Control).

The door to the \_\_\_\_\_\_\_\_\_\_ lab is posted with signage indicating the presence and hazards associated with perchloric acid (Administrative Control).

1. **Personal Protective Equipment (PPE)**
* *Hand Protection*: Neoprene gloves are acceptable for incidental exposure. Viton gloves are preferable if the loss of manual dexterity they cause is acceptable.
* *Eye Protection*: Safety glasses or splash goggles must be worn when handling perchloric acid.
* *Skin and Body Protection*: A lab coat must be worn when handling perchloric acid.
* *Respiratory Protection*: Perchloric acid must only be used in the chemical fume hood. Do not open, pour, etc. perchloric acid anywhere other than the chemical fume hood.
1. **Standard Operating Procedures for Perchloric Acid Handling and Storage:**

Perchloric acid can be only used in areas properly equipped with a certified eye wash/safety shower that can be reached within ten seconds. It is essential that all strong corrosives be stored separately from other laboratory chemicals with which they may react. For oxidizing acids such as perchloric acid, this includes all organic material. Ensure secondary containment and segregation of incompatible chemicals. Also, follow any substance-specific storage guidance provided in Safety Data Sheet (SDS) documentation.

The corrosive properties of perchloric acid and its ability to produce fires or explosions by combination with combustible materials make the following considerations mandatory in the selection of a storage site:

* A relatively cool, dry environment free from extremes of temperature--humidity should be maintained.
* Store in a material that is acid-resistant; this facilitates flushing and other cleanup procedures in the event of leaks or spills.
* Store on low shelves or in acid/base storage cabinets.
* **Segregate perchloric acid from organic acids, and flammable and combustible liquids. This is crucial to avoid fires/explosions!**
* Segregate all acids from active metals such as sodium, potassium, magnesium, etc.
* Use bottle carriers for transporting materials when possible.
* When mixing acids and water, always add acid to water. To prevent surface boiling/spattering, **NEVER add water to acid!**
* Store mineral acids together, separate from oxidizing agents and organic materials.
* Store acetic acid and other organic acids with the combustible organic liquids.
	1. As they deem necessary, the PI/supervisor should insert here any information about whether a special use-area is designated for this material/process.
	2. Add appropriate lab-specific information here describing how this material(s) is generally used. E.g., name of protocol, typical frequency done, quantities used, temperature and any additional safety measures, etc.
1. **Chemical Decontamination & Disposal**

Using proper personal protective equipment as outlined above, decontaminate equipment and bench tops using soap and water and properly dispose of all chemical and contaminated disposables as hazardous waste following the guidelines below.

All chemical waste must be disposed of in accordance with Federal and State regulations and UNM's Chemical Hygiene Plan. Perchloric acid and perchloric acid-containing wastes should be collected in suitable containers and properly labeled as soon as waste is added to the containers. Perchloric acid waste should be labeled as such:

**HAZARDOUS WASTE**

**Perchloric Acid waste**

**Toxic, Corrosive & Reactive**

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Call EHS at 277-2753 to schedule a pickup of waste perchloric acid and/or other waste chemicals.

1. **Spill Procedures:**

For small/minor spills (<1L), use the materials in the spill kit to clean up the spill. Minimum PPE for cleaning up a perchloric acid spill is safety glasses/goggles, gloves and lab coat. The spill clean-up materials must be double-bagged, tightly closed, labeled and picked up by EH&S for disposal.

Spills in excess of 1L of perchloric acid should not be cleaned up by lab personnel. In the event of a large/major spill of perchloric acid, evacuate the area and call:

* Campus Police -- 911 on a landline or 505-277-2241 on a mobile phone, and
* Environmental Health & Safety (EH&S) – 505-277-2753 during business hours, or
* EH&S Duty Officer Pager -- 505-951-0194 (enter your phone number after the message)
1. **First Aid Procedures**

In the event of a perchloric acid exposure, seek immediate medical attention.

* Skin Contact and Eye Contact should be washed immediately in safety shower or eyewash respectively for 15 minutes.
* If the exposure is severe, seek medical attention at the emergency room. If heading to UNMH, a non-injured person should contact the UNMH charge nurse in advance at 505-604-9349 with information on the chemical and nature of exposure.
* UNM employees should contact Employee Occupational Health Services (EOHS) at 505-272-8034.
* UNM students should contact Student Health Services at 505-277-7810.
* If the exposure occurs after hours, employees and students should seek medical treatment at a hospital emergency room.
* The supervisor of the injured person and EH&S must be notified as soon as possible after the exposure.
* The notice of Accident, Incident, or Spill form should be filled out on the EH&S website.

1. **Other Emergencies**

**Fire or Medical Emergency -- Dial 911**

**Life-Threatening Emergency, After Hours, Weekends and Holidays** – **Dial 911**

**Non-Life Threatening Emergency** – Call EH&S at 505-277-2753 to seek assistance and report the incident.

**Training Requirements**

All lab personnel who use perchloric acid must review the lab specific perchloric acid SOP before beginning work.

**Principal Investigator SOP Approval**

By signing and dating here, the Principal Investigator certifies that this Standard Operating Procedure (SOP) for Using Perchloric Acid is accurate and provides information sufficient to safely use perchloric acid in the \_\_\_\_\_\_\_\_\_\_\_ laboratory.

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Signature Printed Name/Title Date

I have read and understand the content of this SOP:

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| **Name** | **Signature** | **Date** |
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