

Perchloric Acid Hood Policy

Science & Engineering Building

I. INTRODUCTION:

The Science & Engineering Building (SEB) has two fume hoods dedicated to Perchloric Acid use. These reside in SEB-3111 and SEB-4120. Even though use of these hoods by SEB researchers and laboratory personnel should be uncomplicated, improper use of this building infrastructure by untrained persons must be prevented by careful control. This policy document will delineate:

- A) Perchloric Acid Hood Construction
- B) How to Request Use and Start-up
- C) Risk Managements and Safety (RMS) Guidelines for Use

II. DEFINITIONS:

CROSS FLOW SCRUBBER:

A piece of equipment which directs the perchloric acid fume hood exhaust horizontally over media which increases surface area and is continuously flushed with water often containing a PH buffer. This effectively removes all inorganic compounds, and maintains emissions to specific ppm levels, eliminating concentrations of perchloric acid crystals from developing within the system.



WASH DOWN SYSTEM: A water irrigation system local to the hood designed to wash the hood interior exhaust baffle and ventilation piping.

PERCHLORIC ACID: A clear colorless liquid, HClO_4 , explosively unstable under some conditions, that is a powerful oxidant used as a catalyst and in explosives.

III. POLICY

A) CONSTRUCTION:

The SEB perchloric acid hoods, ductwork, and exhaust fans are constructed of acid resistant, non-reactive materials which are impervious to perchloric acid. The exhaust fan is acid and spark resistant. All joints are sealed with gaskets and sealants that are acid resistant and non-reactive with perchloric acid. All internal hood ducting, duct work, and fan systems are equipped with a water wash down system. Duct work provides an appropriate drainage slope back into the hood. The hood work surface is watertight with a 1/2 inch dished front and Sides. An integral trough at the rear is provided in the hood to collect wash-down water. The hood baffle is removable for inspection and cleaning and the hood surface has an all-welded construction with rounded corners to facilitate cleaning. The perchloric acid hood exhaust system is not manifold or joined to non-perchloric acid exhaust ventilation systems but is on its own an isolated system with a roof mounted crossflow scrubber.

B) REQUESTING USE AND START-UP:

The SEB perchloric acid hoods and crossflow scrubbing systems have been deemed programmatic and are therefore under the purview of SEB and not Facilities for its operation and maintenance. Given the intermittent nature of perchloric acid use in SEB labs and the systems complexity, these systems are turned off when not required. This saves us considerable money reducing wear and tear and conserving waste water, approximately ~1000 Gallons/8Hrs.

SEB therefore has the following requirements for operation:

- 1) Given the roof top location and sophistication of the crossflow scrubber, the unit can only be operated by SEB staff.
- 2) The use of perchloric acid hoods must be scheduled at least 24 hours in advance through the SEB Admin office with a clear start time and end time. Scheduled operation times may span several days if needed.
- 3) Lead lab personnel will be required to demonstrate a general understanding of the system as a whole, how to confirm hood face velocity, and show they have opened a dialogue with RMS in the safe handling and storage of perchloric acid before a hood can be placed into operation.

Lab personnel may contact Eric Knight at 895-2020 or the SEB admin office at 774-4732 to request perchloric acid hood start-up.

C) RMS Guidelines for Use:

http://rms.unlv.edu/environmental-and-lab/lab/Perchloric_Acid_Safety.pdf

Perchloric Acid Safe Use and Storage

Use of Perchloric Acid

1. Always wear goggles, neoprene or rubber gloves and lab coats when pouring or handling perchloric acid (less than 70 %).
2. Working with solutions of 70% or more requires a face shield, heavy duty gloves, and lab coat. Special handling procedures are identified below.
3. Perchloric acid work must be with standard analytical procedures from well recognized sources unless specifically approved by the department head.
4. A current MSDS should be kept in the laboratory. Lab personnel working with perchloric acid should read the MSDS prior to commencing work.
5. Clean up spills immediately. Neutralize the liquid with sodium carbonate, clean the area with wet rags or spill pillows. Materials should be kept wet and sealed in a plastic bag. Do not allow materials to dry. Contact RMS immediately for pickup of materials or if you need assistance with cleanup.
6. A preventive maintenance program must be in effect for perchloric acid hoods and other hoods where hazardous materials are used.
7. Never heat perchloric acid in a hood unless the hood has been designed for use with perchloric acid and has a functioning wash-down system. Flush the system for at least 20 minutes at the end of each work session.

Storage and Waste Disposal

1. The maximum quantity within the lab is 450 grams (1 pound). It should be inspected monthly and if discolored should be disposed of immediately.
2. The storage of anhydrous perchloric acid is not allowed at UNLV. Storage for a short time, even less than 10 days poses a severe risk of explosion.
3. Perchloric acid should be stored separately from many other compounds including acetic acid, acetic anhydride, alcohols, aniline, bismuth and bismuth alloys, combustible materials, dehydrating agents, ethyl benzene, hydriotic acid, hydrochloric acid, grease, iodides, ketones, other organic materials, oxidizers and pyridine.
4. Perchloric acid should be stored in its original container with label intact and be placed in a ceramic or plastic container large enough to contain the entire contents. Never store it in a wooden cabinet or shelves lined with paper.
5. Waste should be collected in the original container if possible and not mixed.
6. Anhydrous perchloric acid may not be used or stored at UNLV. Anhydrous perchloric acid reacts violently with many organic materials posing a serious explosion hazard.

7. Opened bottles should not be stored longer than one year from the date opened. Unopened containers may be stored for a maximum of two years from the date received. If an "old" bottle of perchloric acid is discovered in the lab, do not open or move the bottle. Immediately call RMS for pickup.

Bulletin

Subject: Perchloric Acid Caution

Over the last few years there have been several incidents involving the use or storage of perchloric acid in laboratories, some involving severe injury and even death. Some were explosions in fume hoods, many the results of poor cleaning/rinsing of hoods after perchloric acid use. Some involved improper storage and use of the acid near organic material such as wood, organic solvents, or other compounds containing organic chemicals. In one accident, a maintenance worker was killed when he used a chisel on an area where perchlorates had formed from previous perchloric acid use.

UNLV Risk Management and Safety Department (RMS) has noticed a wide range of users and differing practices regarding the use or storage of perchloric acid. The biggest problem appears to be storage of perchloric acid with other chemicals. It is also felt that the storage of perchloric acid in locations that do not have a perchloric acid washdown hood, indicate the potential that perchloric acid may be used in a hood, not approved for perchloric acid use.

In order to promote safe use and storage of perchloric acid, the following rules surrounding the use and storage of perchloric acid are being distributed in hope that users on campus will practice safe use and storage.

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Last Amended: 06/17/11

Authority: SEB Assistant Director