

## Chemical Safety – Special Hazards

Safe Work Procedure (SWP – 001)

### Perchloric Acid

Last revised: January 23, 2026

#### REVISION HISTORY

	<i>Revision Date</i>	<i>Author</i>	<i>Position</i>
1.	23-June-2014	Troy Hasanen	OHSE Consultant
2.	16-Apr-2019	Troy Hasanen	OHSE Consultant
3.	22-May-2025	Paraskevi Lagaditis	OHSE Consultant
4.	23-Jan-2026	Paraskevi Lagaditis	OHSE Consultant

#### DOCUMENT APPROVAL

*Approved by:* Laboratory Safety Committee

Chris Papadopoulos \_\_\_\_\_  
*Chair, Laboratory Safety Committee*

May 22, 2025 \_\_\_\_\_  
*Date Approved*

*\*This revision replaces all previous versions of this document. If a copy is printed, it is the users' responsibility to verify the copy is the most current version of the document.*

## PURPOSE

To provide guidance and instruction on the safe use of perchloric acid in laboratories and to ensure regulatory compliance with WorkSafeBC. In addition to this general Safe Work Procedure (SWP), each lab must develop a lab-specific safe work procedure unique to the experiments and activities being performed. The Lab SWP must be reviewed by OHSE (see Procedures, #7).

## SCOPE

This SWP applies to the use of perchloric acid in concentrations of 3.3M (20% v/v) or less. The use of perchloric acid in higher concentrations, or in applications involving digestions or heating, is not permitted since the university does not have a dedicated perchloric acid fume hood with wash-down capabilities.

## TRAINING

The following training is required to be completed prior to working with perchloric acid:

- [WHMIS](#)
- [Lab Safety for Lab Workers](#)
- Lab SWP with documented signoff by the individual and their supervisor.

Refresher training in the General and Lab SWP must be provided when:

- there has been an extended timeframe of inactivity, or
- there has been an incident or injury, or
- 2 years has elapsed since the original training.

## REGULATION AND POLICY

The University of Victoria will follow WorkSafeBC Occupational Health and Safety Regulation, specifically sections 30.8 (5,b); 30.10 (2, b) and 30.21 and the University of Victoria Occupational Health, Safety & Environment Department.

## RESPONSIBILITY

It is the responsibility of personnel undertaking activities with special hazards to complete all required training and adhere to the safe work procedures, including any additional lab or job-specific procedures.

It is the PI's or supervisor's responsibility to ensure that individuals working with special hazards have been trained prior to commencing work and have demonstrated competency in safely performing all duties associated with the special hazard in accordance with the safety work procedures.

Only individuals with skill and experience in handling extremely hazardous materials should perform handling and disposal.

## MATERIALS

Acid waste container dedicated to perchloric acid to ensure no incompatible materials are mixed in by other lab users. Dedicated lab bench area clearly delineated and labelled for perchloric acid use only. Storage and working containers must be in glass or Teflon.

Spill X-A or sodium bicarbonate ( $\text{NaHCO}_3$ ) are commonly used acid neutralizers. When sodium bicarbonate is used to neutralize acids, carbon dioxide gas is released which is a non-toxic, non-flammable gas. Spill X-A is a proprietary product comprised of mainly (60-100%) magnesium oxide (MgO) blended with other chemical additives. Spill X-A has a reddish colour and minimal gas release is produced.

## HAZARD

Perchloric acid is a very strong oxidizing agent and strong acid. Even dilute solutions can, over time, reduce certain plastics to dust. Perchloric acid can form explosive mixtures with organic materials such as wood, paper, cardboard and many organic solvents. Clothing and rubber materials can become highly flammable if contaminated with perchloric acid. Perchloric acid vapours can condense to form perchlorate crystals, which are highly explosive and sensitive to physical shock. To reduce potential for vapours, no use of perchloric acid above room temperature is permitted. The perchloric acid SDS must be reviewed for hazards and compatibilities prior to any use.

The University of Victoria only permits research laboratories to use perchloric acid in concentrations of 3.3M (20% v/v) or less in a fume hood or bench top. Perchloric acid concentrations  $>3.3\text{M}$  ( $>20\%$  v/v) can only be handled or diluted in a dedicated fume hood with wash down capabilities – no such fume hood exists anymore on campus. Any researcher that purchases or is found by OHSE during inspections storing perchloric acid with concentrations  $>3.3\text{M}$  ( $>20\%$  v/v) will be required to dispose of the entire bottle/container as hazardous waste. Current perchloric acid usage on campus is for electrochemistry experiments and biochemical histone work. It is permissible to use unheated  $\leq 20\%$  v/v perchloric acid in general laboratories where a Lab SWP has been approved by OHSE. The SDS lists perchloric acid as safe to use with no engineering controls (fume hood) at room temperature due to its very low vapour pressure.

## PROCEDURES

### 1. Handling

- a. Ensure all perchloric acid purchases and work activities are with concentrations of 3.3M or 20% v/v or less.
- b. Do not perform any perchloric acid digestions and experiments involving heating or exothermic reaction. These activities would produce vapours requiring a dedicated perchloric acid fume hood with wash down capabilities.
- c. Dedicate areas with no combustible material when handling perchloric acid (3.3 M or 20% v/v/ or less).

- d. Use a secondary glass or Teflon container/tray to handle perchloric acid to contain any spills and ensure combustibles are separated

## 2. Storage

- a. Store perchloric acid separately from other chemicals and never store with known incompatible materials.
  - i. Do not store with organic acids
- b. Do not store more than 2 L of 20% v/v perchloric acid in a laboratory.
- c. Store perchloric acid in the original container or a clear glass or Teflon bottle utilizing a non-metallic cap with Teflon seal.
  - i. Avoid tinted or opaque containers to aid with inspecting discolouration
- d. Store containers of perchloric acid using secondary containment glass or ceramic trays in an acid storage cabinet.
- e. Store perchloric acid in such a manner that, in the event of breakage, the spilled acid will not contact flammable materials, wood or similar combustible materials.
- f. Inspect perchloric acid at least monthly
  - i. Dispose immediately any discoloured perchloric acid
- g. If crystals have formed around the bottom of the bottle or around the threads of the cap, there is a potential explosion hazard. Do NOT move the bottle. Evacuate the lab posting a 'Do Not Enter' sign then immediately contact OHSE for assistance.

## 3. Spills

- a. Follow OHSE's general spill response instructions.
- b. Specific steps for perchloric acid spills:
  - i. Don personal protective equipment nitrile gloves, safety glasses, lab coat and closed toe shoes.
  - ii. Neutralize with as Spill X-A or sodium bicarbonate
  - iii. Slowly apply acid neutralizer from the outside of the spill inward.
  - iv. Use pH paper to ensure all of the acid is neutralized.
  - v. Scoop the absorbed neutralized material into an appropriately sized plastic (polyethylene or polypropylene) container.
  - vi. Wipe up any residue with a moist spill pad or paper towel.
  - vii. Dispose spill pad or paper towel as hazardous waste with contaminated solid waste
  - viii. Wash all tools and equipment that may be contaminated with perchloric acid to remove any traces of perchloric acid contamination.

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- ix. Collect and label all materials used in the clean-up for disposal through the hazardous waste system indicating the material is “Neutralized perchloric acid spill absorbent and debris”.
  - x. Adhere a green hazardous waste pick up sticker and submit a request for hazardous waste pick up.
  - xi. Complete a [Department Incident & Investigation Report](#) to document and review the spill incident.

#### 4. Decontamination

- a. Rinse materials (e.g. disposable pipette tips, reusable beakers, etc.) that have been in contact with perchloric acid solutions with 10x volume of water
- b. Keep all washings to dispose via hazardous waste
- c. Test final rinse of materials for possible perchloric acid contamination via methylene blue indicator
  - a. Prepare a 0.4% solution of methylene blue in water
  - b. Take 25 mL of final rinse and add a few drops of the methylene blue solution
  - c. If a violet precipitate appears, rinse materials with copious amounts of water again
  - d. Retest with the methylene blue solution until no change in blue colour.

#### 5. Emergencies and First Aid

- a. Call 911 to summon an ambulance if there is a medical emergency.
- b. Call Campus Security at 250-721-7599 for first aid.
- c. If material has contacted the eyes, use emergency eyewash and flush for at least 15-20 minutes.
- d. For skin contact, flush affected area with running water for at least 15-20 minutes.

#### 6. Waste Disposal

- a. For perchloric acid waste solutions:
  - i. Do not mix solutions of perchloric acid with waste materials, including other acids.
  - ii. Use a clear glass bottle or Teflon bottle with a non-metallic cap with Teflon seals for perchloric acid waste solutions (less than 20% v/v or 3.3 M).
  - iii. Dispose as single type hazardous waste.
  - iv. Adhere a green hazardous waste pick up sticker on all perchloric acid waste bottles.
- b. Dispose all decontaminated solid waste materials as hazardous waste with toxic solid & contaminated debris pail

## 7. Lab SWP

In addition to this general SWP, each lab that is using perchloric acid (3.3M (20% v/v) or less) requires a Lab SWP that includes specific procedures for:

- a. Storage in clear glass containers utilizing non-metallic caps with Teflon seals
- b. Secondary spill containment using trays of glass or ceramic
- c. How to decontaminate any surfaces or reusable lab ware
- d. How to dispose of any consumables by decontaminating with minimum 10x volume of water
- e. The clear delineation of lab bench workspace with a sign stating “Perchloric acid use, No flammable or combustible materials”
- f. Spill containment and response.

## REFERENCES

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