



Potentially Explosive Chemicals Disposal



It is the responsibility of **Principal Investigators (PI)** to ensure waste has been properly classified or assessed, and lab personnel follow the proper procedure.

Purpose

This procedure ensures that potentially explosive chemicals are properly assessed and safely disposed in compliance with all applicable legislation.

Scope

Waste Application & Regulations

This procedure applies to the disposal of chemicals that are considered potentially explosive, from research facilities and laboratories at UBC Point Grey campus and off-campus.

Explosive chemicals are classified according to the BC Environmental Management Act, 2003 and Hazardous Waste Regulation, 2009, as well as the current Transportation of Dangerous Goods (TDG) Regulations. Disposal of explosive waste in the sewer or landfill is prohibited by the Metro Vancouver Sewer Use Bylaw 299, 2007 Consolidated.

Certain chemicals which are **not stored properly, not inspected regularly, and/or past expiration date** may become unstable and potentially explosive over time, under mechanical shock or slightly elevated temperature/pressure – thus too hazardous and unsafe to handle for disposal. This degradation is due to contamination with air, water, other material or when the chemical dries out. Such chemicals are often disposed of as Organic Peroxides (TDG class 5.2), Flammable Solids (TDG class 4.1), or Substances Liable to Spontaneous Combustion (TDG class 4.2). Common examples include:

- Peroxide forming chemicals (e.g. acetaldehyde, diethyl ether, tetrahydrofuran, 2-butanol)
- Picric acid
- Perchloric acid, Perchlorates
- Nitrocellulose, Nitroglycerin

Does Not Apply

This disposal procedure does NOT apply to the following wastes that the Environmental Services Facility (ESF) **does not** accept or handle:

- Explosive chemicals TDG class 1 – generally not used at UBC
- Unknown or unidentified – solid or liquid chemicals

Risk Assessment Required

A case-by-case risk assessment and proper classification of potentially explosive/reactive chemicals before disposal are essential in ensuring worker safety and reducing disposal costs.

NOTE: ESF reserves the right to refuse pick-up of any chemicals that are unsafe to handle and transport.



Background

Explosive compounds are part of the broader hazard class of reactive chemicals. Reactive chemicals are substances which can, in contact with air, water or other common substances, vigorously or violently give off heat, energy or toxic gases or vapors. Such chemicals include: explosives, strong oxidizing agents (chlorates, perchlorates, nitrates), water reactive (potassium or sodium metal), air reactive (pyrophoric – white phosphorus, metal powders), and special organic compounds (peroxide forming chemicals).

Commercial chemicals with explosive properties can be identified by the manufacturer's container label and Safety Data Sheet (SDS). Section 2 (Hazard Identification) of the SDS lists physical hazard statements that will indicate whether a chemical is reactive or potentially explosive. Look for GHS hazard codes H200-H280, with phrases like "unstable explosive" (H200), "heating may cause a fire or explosion" (H241), etc.

These chemical nomenclature "red flags" may also alert you if a potentially explosive functional group is present: Azide, Azo, Fulminate, Nitrate, Nitro, Perchloric/Perchlorate, Peroxide, Picric/Picryl.

Procedure



Contact our **ESF Technicians** for pre-approval of potentially explosive chemical waste.



General Disposal (for any potentially explosive compounds):

- ✓ Avoid prolonged storage due to degradation and potential for shock sensitive explosions.
- ✓ Review Safety Data Sheets (SDS) for old chemicals and/or if chemicals look degraded.
 - Check if hazard statements include "fire or explosion" or any possible degradation products
 - Ascertain if the physical appearance matches the SDS description
- ✓ Dispose as chemical waste via the Hazardous Waste Inventory System (HWIS), ONLY if safe and acceptable for pick-up by ESF.
- ✓ If you find a reactive or explosive-chemical container that is damaged, bulging, past-expiration, leaking, shows solid crystals around the cap or inside the inside the bottle, or is otherwise compromised in any way, **DO NOT disturb or handle the container**.
- ✓ Identify the storage shelf or area with clear signage – e.g. "POTENTIALLY EXPLOSIVE – DO NOT HANDLE!"
- ✓ Move away from the area and prevent others from entering.
- ✓ Inform all lab personnel of the potential risk.
- ✓ Contact your local safety coordinator and SRS immediately to arrange for disposal.
- ✓ Wait for SRS to inform you of the next steps and what options exist.
- ✓ ESF may be able to arrange for direct waste pick-up by an approved external chemical waste contractor.
 - Some contractors only accept very low concentrations (per company's SOPs).
 - Ensure your TDG certification is up to date – lab generators must sign waste manifests.
 - Obtain payment approval from your PI/department – **waste generators are responsible for the cost of disposal via external contractor**.



- ✓ Dispose of potentially explosive chemicals within a month of the risk assessment.

Peroxide Forming Compounds:

- ✓ Review the current SRS safe work procedures (SWP) "*Working with Peroxide Forming Compounds*" for additional lab safety information.
- ✓ Check for peroxides before sending peroxide forming chemicals (e.g. ethers) for disposal.
 - Test chemicals every 3, 6 or 12 months depending on peroxide class.
- ✓ Acceptable for disposal by ESF via HWIS:
 - Peroxides within expiration date.
 - Peroxide concentration is less than **20 ppm**, if expired.
 - If the peroxide concentration exceeds 20 ppm, the chemical must be stabilized prior to collection by ESF.
- ✓ NOT acceptable for disposal by ESF:
 - Chemical has tested positive for >20 ppm of peroxides and cannot be stabilized
 - Peroxide container is more than a year past its expiration, or of unknown age
 - Container has solid/crystal formation around the cap or inside

Perchloric Acid:

- ✓ Review the current SRS safe work procedures (SWP) "*Working with Perchloric Acid*" for additional lab safety information.
- ✓ Inspect perchloric acid stocks monthly for signs of degradation (darkening or crystallization).
- ✓ Dispose within 1 year (open bottles) and 2 years (unopened bottles).
- ✓ Verify perchloric acid concentrations before sending for disposal (unstable if > 72%).
- ✓ Acceptable for disposal by ESF via HWIS:
 - Perchloric acid aqueous solutions with less than 72% concentration.
- ✓ Use original containers for disposal. **Do NOT mix with organic waste!**

Picric Acid (2,4,6-trinitrophenol):

- ✓ Review the current SRS safe work procedures (SWP) "*Working Safely with Picric Acid*" for additional lab safety information.
- ✓ Inspect picric acid quarterly, to ensure solutions are kept properly hydrated – keep a layer of water showing above the crystals.
- ✓ Dispose of Picric Acid as chemical waste within two years of initial receipt.
- ✓ **Do NOT pour any picric acid into drains, this could easily lead to an explosion due to the formation of unstable picrate compounds.**
- ✓ Acceptable for disposal by ESF via HWIS:
 - Saturated aqueous solutions containing 1.3 % picric acid
 - Staining or fixing solutions (Bouin's, Van Gieson, etc.) all contain approx. 1% or less of picric acid
- ✓ NOT acceptable for disposal by ESF:
 - Yellow slurries (moist crystals) of picric acid with less than 30% water – under TDG regulations, *picric acid, dry or wetted with less than 30% water, by mass* is classified as highly explosive (class 1.1D)