



# Chemical Release (Spill) Response Guideline

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## INTRODUCTION

A chemical spill is any uncontrolled release of a hazardous substance, in the form of a solid, liquid or gas. Chemical spills at the University of Lethbridge may occur in a variety of worksites, from research & teaching laboratories, to trades workshops, to large scale utilities operations. Chemical spills in laboratories and workshops generally involve small volumes of a potentially large number of chemicals. Workers may be able to clean up small chemical spills if they have the tools and the training. However, at no time should workers put themselves at risk.

Regardless of the type or quantity of the hazardous chemicals involved, all worksites must implement measures to reduce the potential for spills, and must have a plan for responding to chemical spills. Since all spills can be different, this guide describes generic methods for preventing chemical spills and, responding to chemical spills in worksite. Identify the hazard of the chemicals used in the worksite. Conduct a hazard assessment prior to using hazardous chemicals in experiments or worksites.

Safety Services has prepared document templates and guidelines for completing hazard assessments. These can be found on [Safety Services](#) website.

**Be prepared** – know what to do in the event of a chemical spill **PRIOR** to conducting your experiment.

## ROLES AND RESPONSIBILITIES

### **SUPERVISOR / PRINCIPAL INVESTIGATOR**

1. Develop worksite specific hazard assessments for hazardous chemicals.
2. Implement measures to prevent potential spills of hazardous chemicals.
3. Ensure workers are trained in use and clean-up of hazardous chemicals.
4. Provide appropriate and adequate spill clean-up supplies and personal protective equipment.

### **WORKER**

1. Take all necessary precautions to minimize the likelihood of spills occurring.
2. Participate in training provided.
3. Follow established spill clean-up procedures.

### **CAMPUS SAFETY, SAFETY SERVICES**

1. Assist departments to develop worksite specific hazard assessments to determine appropriate spill response procedures and spill kits.
2. Assist departments to respond to chemical spills that are beyond the ability of local and departmental workers to address.
3. Investigate incidents involving hazardous chemicals to identify causes and recommend appropriate corrective measures.
4. Report spills to regulatory authorities, where appropriate.

# CHEMICAL SPILLS

## PREVENTION

The first step in chemical spill response is to prevent the spill from happening in the first place. Proper procedures for chemical storage, handling and disposal can be found in the U of L Chemical Safety Standard and the Laboratory Chemical Safety and Procedures Manual on the [Safety Services](#) website.

The worksite should be examined to identify measures that can be taken to minimize the risk of a chemical spill occurring. These measures can be identified during regular worksite safety inspections.

**Chemical spills occur during five types of activities:  
storage, transport, transfers, usage and disposal.**

### Storage

- Ensure shelving units are sturdy, and not overcrowded with containers. Shelves used for chemical storage should be securely fastened to the wall or floor to provide added stability.
- Ensure chemicals are stored within easy reach of everyone in the lab, and no higher than eye level. Large bottles and containers should be stored as close to floor level as possible.
- Do not store chemical containers directly on the floor where they might be knocked over and broken, unless they are in approved safety cans or still in their original shipping carton and packing.
- Do not store chemical containers on top of flammable storage or acid storage cabinets.
- Minimize the number of chemicals and size of containers stored in the lab. For commonly used chemicals (i.e. acids, solvents), a good rule of thumb is to keep quantities in the lab to either a single bottle or a one-week supply, whichever is less.
- Ensure that lighting and ventilation is adequate in the storage area.
- Regularly inspect chemicals in storage to ensure there are no leaking or deteriorating containers.  
Some items to note:
  - Keep the outside of containers clean and free of spills and stains.
  - Check that caps and closures are secure and free of deformation. Use only screw caps on chemical containers in storage; foil, Parafilm™, corks or other plugs are not acceptable.
  - Ensure that metal containers are free of rust, bulges or signs of pressure buildup.
- Do not store chemicals in unsuitable containers or containers made of incompatible material (eg. no HF in glass containers).
- Do not store incompatible chemicals together (e.g. acids with bases). Chemicals must be stored by hazard category and not alphabetically (except within a hazard group).
- Purchase solvents in containers with a plastic safety coating.
- Ensure that all gas cylinders are securely fastened and upright.

## Transport

- When transporting large, heavy or a multitude of containers use a cart suitable for the load with high edges or spill trays that will contain any spills or leaks. Two people should be involved when transporting large amounts of chemicals.
- Carry glass containers in bottle carriers or another leak resistant, unbreakable secondary container.
- Use a gas cylinder handcart when transporting large gas cylinders. Ensure cylinder is securely strapped to the cart.
- Comply with the Transportation of Dangerous Goods Regulations when transporting hazardous material on public roads.
- Refer to the **Safe Transportation of Hazardous Materials Procedure** and the **Laboratory Chemical Safety and Procedures Manual** for additional information and requirements.

## Decanting

- When transferring chemicals between containers, pay careful attention to the size of the receiving container to prevent overfilling it.
- When transferring liquids from large containers, use pumps, siphoning (not initiated by mouth) or other mechanical means instead of pouring.
- Use spill containment trays to catch leaks and spills when transferring liquids.
- When transferring flammable liquid from drums, ensure that both the drum and receptacle are grounded and bonded together to avoid an explosion initiated by a static electric spark.

## Handling & Use

- In laboratories, work in a fume hood whenever possible.
- When setting up and working with laboratory apparatus:
  - Inspect laboratory glassware for cracks or defects before using it.
  - Secure flasks and beakers to prevent them from tipping over.
  - Do not stage experiments below heavy objects which might fall on them. Ensure the work area is free of unnecessary clutter.
  - Select equipment that has a reduced potential for breakage (e.g. Pyrex).
  - Replace mercury with alcohol thermometers or other alternate type of temperature measuring device.
- When planning experiments, anticipate possible accidents and provide controls to deal with problems that may occur.
- If you must work alone, ensure the working alone protocol addresses chemical spill response as part of the emergency procedures.
- Check gas cylinder valves and gas tubing for leakage before use.
- If possible, keep cylinders of highly toxic or corrosive gases in a fume hood or other ventilated enclosure.
- Ensure you have access and know the location of a suitable chemical spill kit before you start working with chemicals.

## Disposal

- Do not mix incompatible wastes together to avoid uncontrolled chemical reactions.
- Properly identify the contents of all waste containers to avoid inappropriate disposal.
- Leave at least 20% air space in bottles of liquid waste to allow for vapor expansion and to reduce the potential for spills due to overfilling.
- When not in use, keep waste containers securely closed or capped. Do not leave funnels in waste containers.
- Dispose of waste on a regular basis; do not allow excess waste to accumulate in the work area.

## **SPILL KITS**

An appropriate chemical spill kit must be available in each lab or work area that uses hazardous chemicals. It can be used for an immediate response to most spills, and to clean up small, low hazard spills. Spills kits can be assembled from individual parts, or may be purchased from chemical or safety supply companies. If you choose to purchase a commercial kit, ensure it contains all the necessary items listed in the sections below and to meet the specific spill control needs of each lab, work area, or department. Recommendations for spill kit contents are provided below. **Contact Safety Services for advice.**

<b>Laboratory Chemical Spill Kit</b>	
<b><i>Personal Protective Equipment</i></b>	<b><i>Spill Cleanup Supplies</i></b>
Safety goggles	Plastic dust pan & brush
Lab Coat	Heavy Plastic Bags (at least 3 mil thickness).
Heavy nitrile or neoprene gloves	Universal Spill Absorbent (1:1:1 mix of sodium carbonate: kitty litter: sand), Spill Pillows, or other suitable spill absorbent (enough to absorb a spill of the largest container in the work area).
Respirator (dependent upon the results of the hazard assessment)**	Other absorbents / neutralizers as required for the chemicals in the lab.

**\*\*All persons using a respirator must be fit-tested prior to use. Do not store PPE in the spill kit.**

Every department that has significant quantities of hazardous chemicals must have a departmental chemical spill kit containing supplies, to complement the smaller work area kits, and as back-up supplies for outside responders. The number and location of these departmental chemical spill kits will depend on several factors, including but not limited to: the size of the department, whether the department is located on several floors or in several buildings, and the number and hazard level of chemicals in use.

<b>Departmental Chemical Spill Kit</b>	
<b><i>Personal Protective Equipment</i></b>	<b><i>Spill Cleanup Supplies</i></b>
Respiratory (protection dependent upon hazard assessment)**	Appropriate absorbent (20 litres)
Safety goggles (2)	Plastic pail (20 litre) with lid (2)
Face-shield (1)	Heavy plastic bags; 3 mil thickness (12)
Disposable coveralls (Tyvek™) (6)	Plastic bucket with handle (1)
Gloves - Neoprene (4) - PVC (4) - PVA (4) Nitrile (4)	Plastic dust pan (1)
Plastic shoe covers (box)	Detergent (box) Activated charcoal (500g) Citric acid (500g) Sodium bicarbonate (500g)
Duct tape (roll)	Extra sponges (4)
Alcohol swabs (box)	Broom (1)
	Long handle sponge mop (1)

**\*\*All persons using a respirator must be fit tested prior to use. Do not store PPE in the spill kit.**

## **GENERAL SPILL RESPONSE**

Spill response actions depend on the magnitude, complexity, and degree of risk associated with the spill. The following steps outline the general actions to be taken in response to a chemical spill.

### **1. Stay clear and warn others.**

Proceed with caution and advise others that are in the immediate area of the spill of the potential danger.

### **2. Assist injured or contaminated persons.**

If persons are injured, **call 911** if a life threatening injury, **Security Services 403.329.2345** for medical assistance and first aid. Provide first aid if you or another available individual is trained to do so. If persons have been contaminated by the spilled chemical, lead them to the nearest eyewash or emergency shower (depending on the extent / location of the contamination), and assist in washing off the material. Injuries resulting from chemical spills are often medical emergencies. Do not put yourself at risk.

### **3. Assess the situation. Is this an emergency?**

- An emergency situation exists when there is a high risk to: persons, property, or environment.
- For spills greater than one litre of highly flammable solvents, highly toxic or corrosive materials, secure the area and call **Security Services 403.329.2345**.
- Whenever a hazardous spill occurs in a public area call **Security Services 403.329.2345**. They may be required to secure the area and re-route traffic.

**If it is a fire and/or life emergency, call 911 immediately.**

- Provide the following information when requesting assistance:
- Identify yourself, nature of the incident (e.g., fire, explosion, chemical spill, gas leak), location of the incident (building and room number), presence of any injuries, when and how the incident occurred.

### **4. Non-Emergency Response**

Evaluate the following to assess the situation:

- a) Name of the chemical spilled
- b) Quantity spilled
- c) Review Safety Data Sheet to assess potential hazards. Consider the following properties:
  - flammability,
  - reactivity with air or water
  - toxicity and
  - corrosive nature
- d) Determine spill clean-up procedure, clean-up supplies and personal protective equipment required. Refer to the spill response guides for more information on specific categories of chemicals.

## 5. Clean-up Procedure:

Perform only if all hazards have been identified and assessed, appropriate personal protective equipment and clean-up materials are available and someone is available to assist.

- a) Gather **spill kit** supplies.
- b) Put on the appropriate **personal protective equipment**.
- c) **Contain the spill** using an appropriate spill absorbent (that will not react with spilled chemical) or spill pillow/sock dike. Note that special absorbents are required for chemicals such as hydrofluoric and concentrated sulfuric acids.
- d) **Cover the spill** starting from the perimeter working your way in.
- e) Slowly **mix the spill absorbent** with the spill.
- f) Once all the spilled material has been absorbed, carefully scoop the material into an impervious container or double heavy plastic bags and **dispose as hazardous waste** through CHEMATIX.
- g) **Clean the affected area** with soap and water. For most spills, conventional cleaning products, applied with a mop or sponge, will provide adequate decontamination. If you have any question about the suitability of a decontaminating agent contact Safety Services.
- h) Remove and clean personal protective equipment or dispose as hazardous waste through CHEMATIX.
- i) **Ensure spill kit supplies are restocked.**

## SPILL REPORTING

**All spills, even those that do not require outside assistance, must be reported.**

**Spills must be reported using the Campus On-line Incident Reporting system:**

**Campus Accident and Incident Report**

**Environmental releases** may have specific reporting requirements as per applicable legislation. Campus Safety will investigate and report to regulatory bodies on behalf of the University.

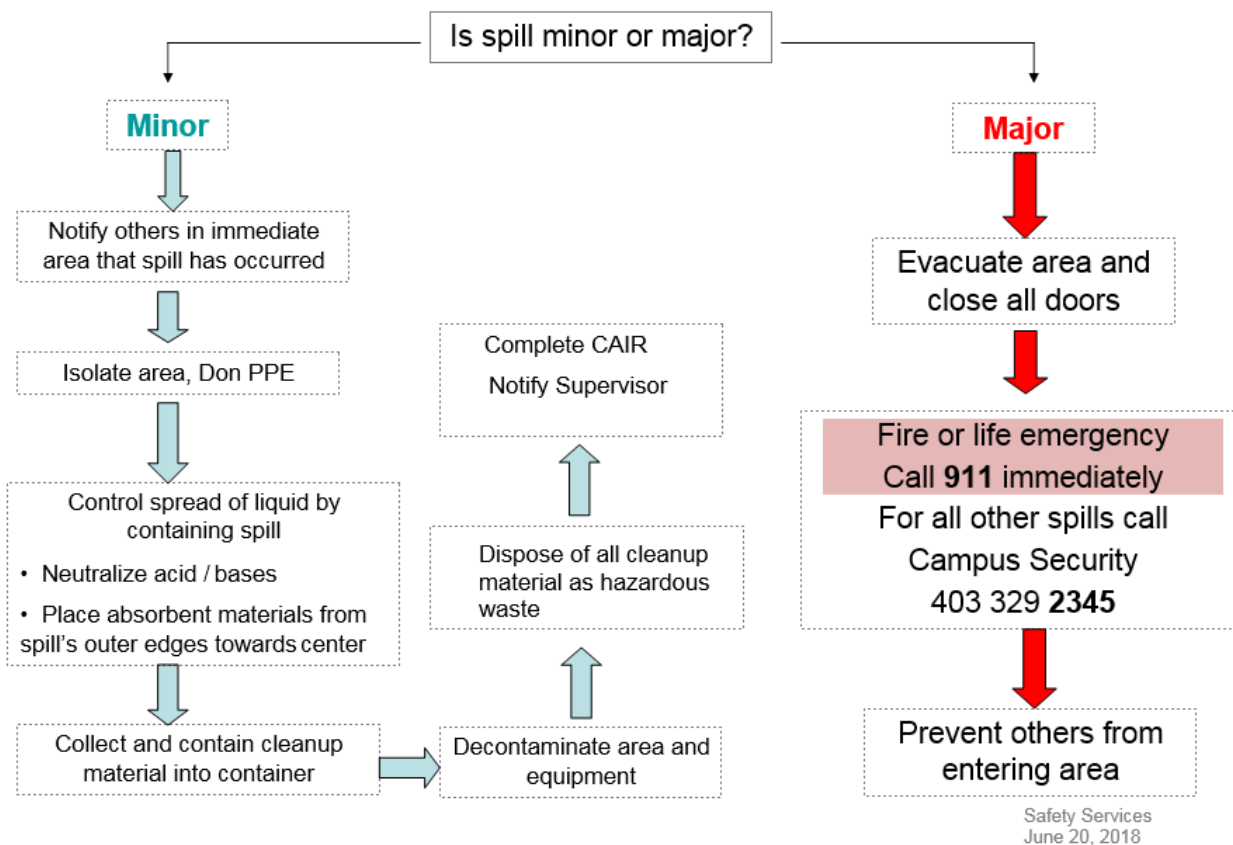
Refer to the University's **Incident Reporting and Investigation Standard** for further information.



## CHEMICAL SPILL PROCEDURE FLOW CHART

If a chemical spill or release occurs in your area, you must determine whether it can be handled locally (**Minor**) or if it requires the attention of the Chemical Release Officer (CRO) (**Major**).

If you are unsure, or if the release is significant (**Major**) call Security Services (403.329.2345) and they will contact the CRO.



## SPECIAL PRECAUTIONS

The following categories of hazardous materials and chemicals require specific procedures for clean-up. Please refer your laboratory's **Standard Operating Procedure (SOP)** before proceeding with clean-up:

- **Hydrofluoric Acid**
- **Perchloric Acid**
- **Mercury**
- **Air & Water Reactive Material**
- **Radioactive Materials Spill**
- **Biohazardous Materials Spill**

## Response Guidelines by Hazard Class

### 1) Highly Flammable Liquids – fire and explosion hazard

This would include most organic solvents: diethyl ether, methylene chloride (dichloromethane), methanol, acetone, acetonitrile, tetrahydrofuran, ethyl acetate, ethanol, petroleum ether, toluene, xylenes and others.

**Any spill of more than 500 mL requires the immediate attention of the CRO.**

If spill pillows are available, try to contain and absorb the spill. It is critical than any local ignition sources – flames or electrical contacts – be shut down.

**Evacuate the area.**

### 2) Flammable and Nonflammable Organic Liquids – toxicity hazard

This would include less volatile or nonflammable solvents like chloroform, carbon tetrachloride, dimethyl sulfoxide, dimethyl formamide and high boiling organic specialty chemicals.

**Any spill of 1 L or more requires the attention of the CRO. Evacuate the area.**

### 3) Acids and Bases – corrosion hazard

Acids would include hydrochloric acid, hydrobromic acid, glacial acetic acid, nitric acid, sulfuric acid and phosphoric acid, concentrated or solutions of 1 M or greater. Bases would include sodium or potassium hydroxide, calcium oxide, etc.

**Any spill in excess of 500 mL liquid or 500 g solid requires the attention of the CRO.**

Small spills may be cleaned up by local personnel if they have the necessary expertise and materials. Otherwise, have security call the CRO.

**ALL HYDROFLUORIC ACID (HF) SPILLS REQUIRE THE IMMEDIATE ATTENTION OF THE CRO.  
Calcium Gluconate Ointment must be readily available.  
Any persons splashed with HF or HF liberators require IMMEDIATE MEDICAL ATTENTION.**

**ALL PERCHLORIC ACID SPILLS REQUIRE THE ATTENTION OF THE CRO.**

### 4) Mercury

Local personnel can clean up mercury spills if they have the necessary equipment and expertise.

**A specialized spill kit is required.  
Mercury spills in excess of 30 mL require the attention of the CRO.**

5) **Oxidizers – reactivity, toxicity hazards**

This would include potassium permanganate, dichromate and chromate salts, chromium oxide and chromium based oxidants.

**Oxidizer spills in excess of 500 mL liquid or 250 g solid require the attention of the CRO.**

6) **Highly Toxic Materials**

This would include bromine, cyanide and sulfide salts, mutagenic organic halides (benzyl halides, allylic halides, haloethers), phosphines etc.

**Spills of more than 100 mL liquid or 50 g solid require the attention of the CRO.**

7) **Low Hazard Materials**

Pump oil, alkali salts, sand etc. – materials that are not toxic or flammable. These can usually be dealt with by local personnel. When in doubt, contact the CRO.

8) **Air and Water Reactive Materials (fire hazard - ignite spontaneously on contact with air, oxygen or water)**

This includes hydrides (sodium borohydride, lithium aluminum hydride, calcium and sodium hydride), calcium carbide, all alkali metals (lithium, sodium, potassium). It also includes solutions of organometallics (Grignards, alkyllithium reagents, DIBAL and other hydride reducing solutions).

**ALL spills of air and water reactive materials require the attention of the CRO.**

**Specialized spill materials, such as powdered lime, may be required.**

**Pyrophoric fires require a Class D fire extinguisher.**

9) **Compressed Gas Leaks**

Gas leaks can be detected by sound or by applying leak solutions (Snoop or soapy water) and observing bubbles. Leaks downstream of the main tank can be stopped by closing the cylinder valve off. **If the main valve is not operating, call Security Services (403.329.2345).**

**Leaks of flammable gases** such as acetylene, hydrogen and natural gas present significant explosion hazards – **call Security Services (403.329.2345) and evacuate the area.**

**For leaks of toxic gases** (carbon monoxide, hydrochloric acid, chlorine, fluorine, the nitrogen oxides, ammonia etc.) and oxygen, where the tank is not in a ventilated enclosure, **call Security Services (403.329.2345) and evacuate the area.**

Leaks of inert gases (nitrogen, carbon dioxide, helium, argon etc.) can usually be dealt with by local personnel. **When in doubt, contact the CRO.**

## RESOURCES

- UofL Incident Reporting and Investigation Standard
- UofL Chemical Safety Standard
- UofL Laboratory Chemical and Safety Procedures Manual
- UofL Biosafety Code of Practice
- UofL Radiation Safety and Procedures Manual
- UofL Hazardous Waste Management
- UofL Spill Kit Locations

## REFERENCES

- [University of Alberta Spill Response Guidelines](#)

**Questions?? Email: [Safety Services](#) Website: [Safety Services](#)**

