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CCB Chemical Spill Policy

A. Introduction

Although chemical spills are among the most common of laboratory accidents they are potentially the most serious. The hazards resulting from a spill depend on variables that include the spilled material's chemical and physical properties, location, and quantity. This document provides criteria to assist in evaluating when a chemical spill can be addressed by local researchers (minor spills) and when outside help is necessary (major spills). It also offers guidance on how to clean-up a minor spill. ***No researcher is responsible for addressing a spill themselves if they are not comfortable doing so, even if the spill meets the characteristics of a "minor" one***. Additional assistance can always be obtained from other qualified researchers, the CCB Safety Office, Harvard Environmental Health and Safety, Triumvirate Environmental (hazardous waste contractor), and the Cambridge Fire Department.

B. Emergency Phone Numbers

Office	Phone	Comment
CCB Safety Office	6-8285	*Allen Aloise (aloise@fas.harvard.edu), 226 Converse.*
Harvard Operations Center	5-5560	*Day or night they can contact relevant Facilities, EH&S, Triumvirate, CCB, and emergency personnel.*
Emergency Dispatcher	911	*Call to report emergencies that require police, fire fighters, paramedics.*

C. Minimizing The Potential For A Spill

Follow the guidance below to minimize the potential for a chemical spill.

- Plan your experiment carefully.
- Order/use the minimum amount of chemicals practical.
- Use rubber carriers to transport all glass bottles containing chemicals.
- Order solvents and acids in poly-coated glass safety bottles. The protective coating on these bottles can provide chemical containment should the glass shatter.
- Use secondary containment when possible.

• Do not store reagent bottles on the floor or near a ledge.

D. Being Prepared For A Spill

Your best efforts at preventing a spill must not preclude you from being prepared for a spill.

• Know the CCB Chemical Spill Policy.

• Be familiar with the chemicals you are working with and their associated hazards. Consult Material Safety Data Sheets and the chemical literature to discover their:
  - boiling points, flash points, and vapor pressures at room temperature
  - characteristic reactivities
  - toxicities
  - routes of exposure and target organs
  - first aid procedures for exposures
  - disposal procedures

• Minimize the number of potential ignition sources should a flammable material spill:
  - keep ovens elevated off of the floor
  - extinguish Bunsen burners immediately after use
  - be aware of the location of hot surfaces (e.g. hot plates, heat guns, ovens)

• Know the location of safety equipment:
  - fire extinguisher
  - eye wash station
  - safety shower
  - spill kits

There are a number of essential spill clean-up items that should be available in close proximity to any location where chemicals are being used or could potentially spill. These items should be pre-organized within a spill kit container or duffel bag that can be transported to the immediate vicinity of the spill.

Outside of the CCB Safety Office you will find several spill kits and a supply of many of the items listed below.

Spill Kit Essentials

• Instructions on how to clean up a spill.

• Personal protective equipment (PPE)
  - Eye protection
  - Gloves that are compatible with the substances you are working with
  - Lab coat, apron, and/or cover-alls
  - Shoe covers

- Other equipment as appropriate (see the Respirators section)

- Chemical absorbent

  Acid neutralizing
  A product specifically formulated to treat spills of common mineral and organic acids (e.g. sulfuric, hydrochloric, nitric, phosphoric, perchloric, formic, acetic). Often composed of magnesium oxide blended with other chemical additives. Example: SPILL-X-A Acid Neutralizing/Solidifying Spill Treatment Agent.

  Base neutralizing
  A product specifically formulated to treat spills of common caustics and organic bases (e.g. sodium hydroxide, ammonium hydroxide, aniline, diethyamine, potassium hydroxide, hydrazine). Often composed of citric and fumaric acid blended with other chemical additives. Example: SPILL-X-C Caustic Neutralizer.

  Solvent absorbing
  A product specifically formulated to treat spills of many common hydrocarbon solvents, reagents, and fuels. Often composed of carbonaceous based material. Example: SPILL-X-S Solvent Adsorbent.

  Multipurpose
  A product that absorbs oils, greases, water, and most chemicals. Not to be used for strongly acidic or basic spilled materials or for spilled oxidizing reagents. Can be formulated in granules that are dust free and easy to clean up. Example: Dri•Zorb (made from corncob).

  Specialty
  For some substances, special absorbent materials exist. See the Spills that Necessitate a Special Response section.

- Scoop for absorbent

- Absorbent pads or pillows

- Dustpan and brush

- Hazardous waste containers: bucket, wide-mouth bottle, polyethylene bag

- Hazardous waste tags

E. Assessing a Chemical Spill

There is no single chemical spill procedure that applies to every chemical spill. The methods used for addressing a spill must account for the specific circumstances and hazards presented. These hazards are dependent on many variables, some of which are listed in the table below.

For each of the variables in Table 1 there exists a spectrum of relative hazard. For instance, a spilled solvent will likely pose a fire hazard. A solvent with a flash point below room temperature would be much more of a fire hazard than one with a flash point above 200 °C. Likewise, a spilled pyrophoric substance (e.g. trimethyl aluminum) is much more of a reactive hazard than vacuum pump oil.

The researcher confronting a spill must evaluate these variables (and possibly others) while leveraging their own knowledge, experience, and judgment to determine if they are capable of addressing the spill themselves or should obtain outside help. ***When in doubt, get outside help.***

Variables	Lower Hazard	Higher Hazard	Comments
Flash Point	> 200 °C	< 25 °C	The lowest temperature at which vapor from a liquid can form an ignitable mixture in air.
Lower and Upper Explosive Limits	narrow concentration range	wide concentration range	The limiting concentrations (in air) for a gas or vapor to explode
Vapor Pressure	<1	>760	mmHg @ 20 °C
Physical Form	solids	gases	
Quantity	e.g. 20 mL	e.g. 2 L	
Location	inside fume hood	floor, hallway	
Reactivity	inert	water reactive, pyrophoric	
Corrosiveness (pH)	pH = 6-9	pH <2 or >12	Relevant for aq. solns.
Route of Entry into the Body	ingestion	skin absorption, inhalation	
Permissible Exposure Limit	>1000 ppm	<50 ppm	
Toxicity	mild irritant	carcinogenic, mutagenic	

Table 1. Some variables that should be considered when evaluating the hazards of a chemical spill.

F. "Major" Spill Protocol

A spill that is characterized by any of the following descriptions should be considered a "major" spill:

• Someone has been injured.

• A fire or explosion has occurred or is likely to occur.

• The type or quantity of chemical released poses an immediate risk to health.

• There is an impact on public spaces or spaces adjacent to the area where the spill occurred.

• You and/or your lab-mates are unable to address the spill without assistance.

If the accident involves personal injury or chemical contamination:
1) Attend to the injured or contaminated person and move them to safety if it is safe to do so.
2) Locate nearest eyewash or safety shower, remove any contaminated clothing, and thoroughly flush all areas of the body contaminated by chemicals for 15 minutes.
3) Administer first aid as appropriate (e.g. calcium gluconate for hydrofluoric acid exposures, amyl nitrate ampoules for hydrogen cyanide exposures) and seek medical attention (call the Operations Center at **5-5560**).
4) Print out Material Safety Data Sheets for chemicals involved in the exposure and ensure the attending medical personnel receives them.
5) As soon as practically possible, report the injury to your supervisor and the CCB Safety Office.

To evacuate the area and obtain outside help:
1) Alert nearby coworkers and evacuate to a safe distance.
2) If a fire, explosion, or toxicity hazard exists, pull the fire alarm and follow building evacuation procedures. A person familiar with the situation should greet firefighters on Oxford Street when they arrive and provide the relevant MSDS.
3) If you have not pulled the fire alarm, close doors to affected areas and prevent re-entry. Put up Do Not Enter signs or barrier tape (available outside CCB Safety Office).
4) Call the Operations Center at **5-5560** to obtain assistance (they will contact EH&S, Triumvirate, and/or the Fire Department). Call the CCB Safety Office at **6-8285** to inform them of the situation.
5) Do not re-enter the area until instructed to do so by the Fire Department or emergency response personnel.

G. Incidental or "Minor" Spill Protocol

A spill may be considered "minor" if the assessment (see above) reveals the spill to present relatively low hazards and no one has been injured or chemically contaminated.

1) Alert nearby coworkers of the spill and request their help (if they are qualified). Contact the CCB Safety Office at **6-8285** for additional assistance.
2) Isolate the area. Close lab doors and evacuate the immediate area if necessary.
3) Remove ignition sources (e.g. no open flames, turn off hot plates and heat guns).
4) If the spill *is not* in a laboratory with strong ventilation (e.g. fume hoods present and working), establish exhaust ventilation to the outside (e.g. open windows, use fans to force air outside).
5) Consult MSDS for hazard information and cleanup instructions.
6) Locate applicable spill kit.
6) Don appropriate personal protective equipment. At a minimum this should consist of safety glasses, gloves, and a lab coat.
7) Control the source and confine the spill using spill kit supplies.
8) Absorb/neutralize free liquid using appropriate absorbent. Sweep solid material into a plastic dustpan.
9) Place debris in an appropriate container (e.g. wide mouth bottle or 5 gallon waste bucket), close the container, attach a Hazardous Waste Tag, and place in a Hazardous Waste Accumulation Cabinet.
10) Notify the CCB Safety Office of all spill incidents.

H. Spills that Necessitate a Special Response

Some spilled substances necessitate a special response. If the spill of any substance fits the description of a "major" spill, follow the Major Spill Protocol above. For minor spills of these special substances, the following guidelines should assist in addressing them.

Leaking gas cylinders

- Check for leaks in gas delivery system using a bubble solution (Snoop) or leak detector. If a leak is found, shut off cylinder, then tighten hose or pipe connections. Never attempt to repair a leak at the valve threads or regulators.
- For minor leaks of a nonflammable, nontoxic gas, move the cylinder to a well ventilated, isolated area (preferably a laboratory fume hood) if it can be done safely. Do not move any cylinder if it is leaking from a hole in the cylinder wall.
- For major leaks or leaks of flammable or highly toxic gases, pull the fire alarm to evacuate the affected area. A person familiar with the situation should greet firefighters on Oxford Street when they arrive and provide the relevant MSDS.

Flammable metals (e.g. sodium, lithium, potassium)

- If it is safe to do so, cover the spilled material with the contents of a Class D fire extinguisher.
- Contact the CCB Safety Office for assistance. If no one answers or it is after hours, call the Operations Center to obtain assistance from EH&S.

Mercury
- Obtain a mercury spill kit (one is available outside of the CCB Safety Office).
- If you are able to clean up the spill, remove all metal jewelry (mercury can bond to some metals).
- Follow the instructions in the Mercury Spill Kit. Use an aspirator bulb or suction device to collect mercury beads.
- Dispose of the debris as hazardous waste.
- Notify the CCB Safety Office.

Hydrofluoric Acid
- Only HF specific absorbents should be used to address an HF spill. Typical spill absorbents contain silica, which can react with HF to produce the toxic gas silicon tetrafluoride.
- Obtain a HF spill kit from your lab or from outside of the CCB Safety Office.
- Read the "Guidelines for the Safe Use of Hydrofluoric Acid" document available on the CCB Safety Website (www.chem.harvard.edu/safety/labsafety.php).
- Carefully address the spill using the HF spill kit.
- Notify the CCB Safety Office.

Biological (including blood)
- Refer to the Emergency Response Guide flipchart posted near all CCB laboratory phones.

Radiation
- Refer to the Emergency Response Guide flipchart posted near all CCB laboratory phones.

J. Reportable Quantities

The University is legally obligated to report certain spills to the Federal Environmental Protection Agency within 24 hours of the spill. To ensure compliance with this requirement, always call the Operations Center (**5-5560**) to immediately report:
1. any release of a chemical to the environment (e.g. drains, the atmosphere).
2. spills over 500 g of a hazardous substance that occur anywhere.

K. Respirators

In general, CCB researchers should not use any type of respirator when addressing a spill. If the situation is hazardous enough to necessitate a respirator, the area should be evacuated and the protocol for a major spill implemented.

Any researcher who believes having access to a respirator is appropriate for their specific laboratory circumstances should contact the CCB Safety Office for more information about respirators and to schedule a respirator fit-testing session. The Occupational Safety and Health Administration (OSHA) requires that all researchers be medically cleared, trained, and properly fit tested before wearing a respirator. Respirators that have not been properly fitted are not effective.

Be advised that half- or full- face cartridge respirators may **not** be used in the following circumstances:

- atmosphere is oxygen deficient (< 19.5%)
- chemical has poor warning properties (e.g. little or no odor)
- specific chemical is not listed on the filter cartridge selection chart
- the contaminant exists at very high concentrations