CHEMICAL HANDLING & SPILL PROCEDURES

GENERAL GUIDELINES:

If handled properly, a spill may be nothing more than a nuisance. If handled improperly, a spill can seriously disrupt your activities and the work of your colleagues. At worst, a spill can cause bodily harm or property damage.

In most cases, laboratory spills involve small quantities of materials and, if precautions are taken, present minimal hazards. Teachers are usually the most appropriate people to clean up their spills because they are more likely than others to be familiar with the spilled material's hazardous characteristics; can respond more quickly than, anyone else; know about other potential hazards or complicating factors in their work area; and should be familiar with the proper cleanup techniques for a particular spill.

To prepare for spills, staff must:

- ☐ learn about the hazards of the chemicals in the laboratory,
- ☐ know the response procedures to address those hazards, and
- ☐ ensure that you have the equipment and training necessary to follow those procedures.

When planning laboratory work and preparing for potential problems, determine the hazard class of all the chemicals to be used. The following chemical properties are of most concern when preparing for possible chemical spills:

- ☐ flammability,
- ☐ reactivity to air or water,
- ☐ corrosion, and
- ☐ high toxicity.

Before starting any work with chemicals, verify that all necessary safety equipment and spill cleanup materials are available and in good working order. Additionally, ensure that the individuals who may be involved in spill response are properly trained in equipment use and spill cleanup procedures. Finally, regularly inspect all materials and equipment to ensure that they will function properly when needed.

SPILL PREVENTION METHODS:

Laboratory spills can occur during a chemical's storage, transportation, or transfer, as well as in the actual experiment. A spill prevention program for storage areas should include the following:

- ☐ sturdy shelves and properly designed storage areas to minimize breakage and tipping;
- ☐ containers stored by hazard class;
- ☐ larger containers stored closer to the floor;
- ☐ containers stored on shelves sufficiently away from the shelf edge to minimize the danger of falling;
- ☐ storage shelves with lips to reduce the danger of falling;
- ☐ regular inspection of the integrity of containers; and
- ☐ shelving is kept neat and tidy – small spills are cleaned up immediately.

To minimize spills during transport integrate the following:

- ☐ carts, where appropriate,
- ☐ use of chemical resistant basins on carts
- ☐ safety containers,
- ☐ rubberized buckets/totes for carrying bottles,
- ☐ straps to secure containers,
- ☐ no transportation during class changes or busy hallways, and
- ☐ properly trained and thoughtful workers.

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For the transfer of liquids from one container to another, the risk of spills can be reduced by

- □ paying careful attention to the size of containers to avoid overfilling;
- □ using pumps or other mechanical devices rather than simply pouring directly into a container;
- □ providing spill containment to capture any leaks; and
- □ bonding and grounding containers when flammable liquids are involved.

Finally, pay attention to physical details in the laboratory, such as

- □ reducing clutter and unnecessary materials,
- □ eliminating tripping hazards and other obstructions, and
- □ having all needed equipment readily available before starting work.

FIRST STEPS WHEN A SPILL OCCURS:

Three basic steps should be taken to determine whether a spill is simple or complex:

A. evaluating the spill's risks;
B. evaluating quantities; and
C. evaluating the spill's potential impact.

A. Evaluate the Risks

The first step in evaluating whether a spill is "simple" is to estimate the risks created by the spill. In spill response, the key risks of concern are human health effects, property damage, and environmental damage.

- □ **Human Health Effects -** Potential health effects is the most important hazard category to consider when deciding whether or not to attempt a spill cleanup. Some chemical releases may result in health hazards such as fires or explosions.
- □ **Physical Damage to Property -** The potential for physical damage to property (equipment, building materials, structures, or cleanup materials) also is important when determining whether you have a simple spill. Remember-a common first response to a spill is to try to protect equipment and property, but any real threat to such items will also threaten the persons cleaning up the spill.

B. Evaluate Quantities

The next step to take when determining whether a spill is "simple" is to evaluate the quantity of material released. If a spilled chemical is not hazardous, its cleanup is dependent on the ability to control the spill, as well as the availability of sufficient spill control materials (e.g., an absorbent for liquids).

C. Evaluate Potential Impacts

The third step to take when deciding whether a spill can be managed as a simple spill is to evaluate the potential broader impacts of the spill. A chemical spill in an area where its potential risks are magnified by specific situations (a spill's surroundings or the restricted access to a spill) must be determined on a case-by-case basis. When evaluating potential impacts, a prompt response can minimize adverse consequences. On the other hand, an inappropriate response can turn a simple spill into a complex situation.

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To determine whether a spill is simple or complex (which is often the hardest part of spill response), you need to know (1) the hazard(s) posed by the spilled chemical and (2) the spill's potential impact. Both these factors are, in large part, determined by the spill's size.

The following information will help you determine whether you have a simple spill:

- □ the type of chemical(s) spilled,
- □ the amount,
- □ the hazardous characteristics of the spilled chemical(s),
- □ the location,
- □ the proper method for cleaning up the spill,
- □ the personal protective equipment available, and
- □ the training of the laboratory's personnel.

RECOMMENDED PROCEDURES FOR CLEANING UP SIMPLE SPILLS

Review the Safe Work Procedure for Chemical Spill Clean Up. The following steps should be taken during spill cleanup:

A. Safety of the students.

Remove all students from the immediate area or from the classroom, if necessary. Notify the science program leader and the Divisional S&H officer if there is a possibility of an acute respiratory hazard present or if you need assistance with the spill cleanup.

B. Safety of the Staff.

DO NOT Proceed to clean up a spill if you do not know the hazards associated with the chemical or if you are unsure how to clean up the spill. If anyone is injured or contaminated, immediately send someone to notify the science program leader and the Divisional S&H Officer and begin decontamination measures or first aid, if required.

C. (M)SDS's.

Have the specific MSDS readily available, read all precautions listed. Locate and don all PPE from the spill kit as per the MSDS (splash goggles and nitrile / silver shield combination gloves and lab coat).

D. **Prevent the spread of dusts and vapors.**

If the substance is volatile or can produce airborne dusts, close the laboratory door and increase ventilation (through fume hoods, for example) to prevent the spread of dusts and vapors to other areas.

E. **Neutralize acids and bases, if possible.**

Spills of most liquid acids or bases, once neutralized, can be mopped up and rinsed down the drain (to the sanitary sewer). However, be careful because the neutralization process is often vigorous, causing splashes and yielding large amounts of heat. Neutralize acids with soda ash or sodium bicarbonate (or Acid neutralizer). Bases can be neutralized with citric acid or ascorbic acid (or base neutralizer). Use pH paper to determine when acid or base spills have been neutralized.

F. **Control the spread of the liquid.**

Contain the spill. Make a dike around the outside edges of the spill. Use the absorbent materials contained in the spill kit along with the spill pillows.

G. **Absorb the liquid.**
Add absorbents to the spill, working from the spill's outer edges toward the center. Use spill pillows to prevent the spills from expanding.

H. **Collect and contain the cleanup residues.**
The neutralized spill residue or the absorbent should be scooped, swept, or otherwise placed into a hazardous waste bags. For any waste that contains broken glass, place the broken glass into a box, seal and then place it into the hazardous waste bag. Ensure hazardous waste labels are secured to each bag.

I. **Decontaminate the area and affected equipment.**
Ventilating the spill area may be necessary. Open windows or use a fan unless the area is under negative pressure. For most spills, water applied to the area will provide adequate decontamination. Place all wastes into the hazardous waste bag and seal.

J. **Dispose of the wastes.**
Keep hazardous waste materials separate from normal trash. Follow the Pembina Trails guidelines for hazardous waste disposal.

SPECIAL PRECAUTIONS

The following precautions apply to chemicals that have hazardous characteristics. Note that some chemicals may exhibit more than one characteristic.

A. **Flammable Liquids**
Remove all potential sources of ignition. Vapors are what actually burn, and they tend to accumulate near the ground. Flammable liquids are best removed through the use of spill pillows or pads. Place the spill pads over the liquid and allow to adsorb. All used absorbent materials should be placed in heavy-duty hazardous waste bags, which are then sealed, labeled, and disposed of according to PTSD guidelines for hazardous waste disposal. Before resuming work, make sure the spill area has been adequately ventilated to remove flammable vapors.

B. **Volatile Toxic Compounds**
Use appropriate absorbent material to control the extent of the spill. Spill pillows or similar absorbent material usually work best. Place all used absorbent materials in heavy-duty poly bags. Seal the bags, label them, and disposed of according to PTSD guidelines for hazardous waste disposal. Again, make sure the spill area has been adequately ventilated before resuming work.

C. Solid Spills
Use the plastic scoop to place the spilled material into the polyethylene bag. Care should be taken so as not to create dust or cause the contaminated powder to become airborne. After the bulk of the material has been cleaned up, wet a spill pad and wipe the area down.

Place all waste into the hazardous waste bags. Wipe the area down with a wet paper towel. Dispose of paper towel with the waste generated from the spill cleanup. Seal bag and label the bag with an orange hazardous waste sticker. Do not leave with other garbage for end of day pick up. Dispose of plastic bags via hazardous waste disposal.

Note: Precautions must be taken to minimize exposure to the spilled chemical. Be careful not to step in the spilled material and track it around. Contact the science program leader & principal if an exposure to a chemical occurs.

D. Mercury Spills

No school labs should have mercury thermometers in use. When a thermometer is broken the toxic vapours from the mercury are emitted into the air. The main exposure route of mercury is via vapor inhalation. Consequently, if metallic mercury is not cleaned up adequately, the tiny droplets remaining in surface cracks and crevices may yield toxic vapors for years. When a mercury spill occurs, first cordon off the spill area to prevent people from inadvertently tracking the contamination over a much larger area. Use a mercury spill kit to clean up the spill and dispose of as hazardous waste following the PTSD hazardous waste disposal methods.