

Chemical Spill Control

How to Prevent and Respond to Laboratory Chemical Spills

No matter what precautions you take, sooner or later an accidental chemical spill will occur. A responsible science teacher will take steps to prevent spills, make sure proper safety equipment is available to contain and control the spill, and understand how to use the safety equipment.

Spill Prevention

The first precaution to take for spill control is spill prevention. Experiments and laboratories should be designed to minimize the possibility of chemical spills. Experiments should use the minimal amount of chemicals whenever possible. The less chemical available, the smaller the spill.

Store and dispense chemicals in unbreakable bottles, such as plastic or PVC-coated glass bottles. Highly toxic materials should be stored in a secondary containment device, such as a *Chem-Saf*[™] bag (heavy-duty plastic bag) or a *Saf-Stor*[™] can (metal paint can). If a bottle is dropped, secondary containment will contain the spill and may actually prevent the spill from occurring.

Spill Control Equipment

Proper spill control equipment includes fire blankets, spill control materials such as sand, absorbent, neutralizer, and a mercury spill control kit.

A 100% wool fire blanket is an excellent spill control device because it will contain and control a spill and its vapors. If a spill occurs and other spill control materials are not available, simply throw the fire blanket over the spill. The blanket will begin to absorb the liquid, contain the vapors, and will enable a person to walk over the spill without slipping. Remember, acid spilled on a tile floor will make the floor very slippery—the potential for slipping and falling into the acid spill is a real danger.

Every lab should have spill control materials that contain at least three components: sand, an absorbing agent, and a neutralizer. Spill control materials should be capable of handling a spill from the largest bottle used in your laboratory, which is usually a 2.5-L acid bottle (remember, Murphy's Law states that the largest bottle is the one that will break). Sand is used to contain a spill, provide traction, and prevent the spill from rapidly spreading across the tile floor. The absorbent contains and absorbs the liquid spill so it is easier to clean up, transport, and dispose. Neutralizer is usually a base such as sodium carbonate or calcium hydroxide and is used to neutralize inorganic acid spills. If strong bases are used in your

laboratory, it is also a good idea to keep a supply of citric acid on hand to neutralize base spills. A 2.5-kg bottle of citric acid is large enough to neutralize the entire contents of almost any bottle of base.

To save money, a homemade spill control kit is easily prepared using three 5-gallon plastic buckets. Fill the first 5-gallon bucket with 30 pounds of clean, dry sand (available as play sand at a discount or hardware store). Fill a second 5-gallon bucket with a 20-lb bag of unodorized kitty litter or oil absorbent. Fill the last bucket with 30 lbs of sodium carbonate, anhydrous, also known as soda ash. Soda ash is available at industrial chemical, building supply, and swimming pool supply distributors. Label each bucket with the contents and cover the top with plastic wrap to keep the contents fresh and so the containers aren't used as garbage cans. Place a plastic broom, plastic dustpan, and several large heavy-duty plastic garbage bags near the spill control kit for cleanup and disposal.

If mercury or mercury thermometers are used in your classroom, mercury spill control materials should be readily available. Mercon spill control spray, wipes, and sponges are available from Flinn and are ideal for cleaning up mercury spills. Small droplets of mercury can also be cleaned up by sprinkling zinc dust on the spill area. Zinc dust reacts with mercury to form a very stable and safe amalgam that is easy to handle and safe to dispose of in the trash.

Spill Control Procedures and Training

A written contingency plan on how to handle chemical spills should be part of every school's Chemical Hygiene Plan. The following procedure is an example of a contingency plan.

1. Quickly assess the spill, its hazards, and the danger to yourself and your students and take appropriate action. If the spilled chemicals are unknown, assume the worst and evacuate.
2. Notify other laboratory personnel of the accident, and if necessary, evacuate the area. The safety of you and your students is always the top priority.
3. Tend to any injured or contaminated person and if necessary request help. If the chemical is splashed into an eye or onto skin, immediately irrigate using an eyewash or shower. If the chemical is splashed on your clothes, you may have time to first contain the spill with a fire blanket or spill control materials and then treat yourself. Remember, if you use a safety shower near

a chemical spill, the water may expand the spill area.

4. Take steps to contain and limit the spill if this can be done without risk of injury or contamination.
5. Clean up the spill using appropriate procedure. Dispose of contaminated materials properly.
6. Call in emergency personnel if at any time your safety or your students' safety is in jeopardy.

To contain and control a chemical spill, the following procedure works well. Gently pour sand around the spill and onto the spill. The sand will contain the spill, prevent it from spreading, and also provide traction if you need to walk over it. Next, pour absorbent (kitty litter, oil absorbent) around the spill and onto the spill. This will absorb the liquid and also begin to contain any vapors. For both the absorbent and sand, it is best to gently drop or sprinkle the spill control material around the spill and then onto the spill to avoid spreading the spill. Lastly, if the spill is an inorganic acid or base, apply the appropriate neutralizer around the spill and onto the spill. The neutralizer needs to be mixed well with the sand and absorbent to come in contact with all of the spilled chemical—use a plastic broom to mix well.

After the spill is controlled, students are evacuated and injuries are addressed, then the cleanup begins. If the material is warm or still giving off vapors, ventilate the room and wait before cleaning up. Use a plastic dustpan and plastic broom to sweep up the now solid mess and place it into large, heavy-duty garbage or leaf bags for disposal. If at any time during the chemical spill containment or cleanup step you don't feel comfortable, leave the area and get help.

Make spill control containment and cleanup part of your annual safety training. Simulate a chemical spill with water and use sand as the control material. Note how quickly the "spill" spreads. Practice applying the spill control material around and then onto the spill. Determine the most convenient location for storing your spill control materials. Training is one of the most important components of an effective safety program.

Chemical spills will occur in your laboratory. With proper equipment, procedures, and training, most spills can be prevented and the spills that do occur can be handled safely and effectively.