

Mercury Spills

Description

Mercury Spills

These procedures lay out the actions that shall be taken in responding to elemental mercury spills. Simple spills are to be managed and cleaned-up by the lab or area creating the spill, and are discussed in Section 1. More complex spills are evaluated by an industrial hygienist from Environmental Health and Safety, and then referred to the Hazardous Waste Coordinator, or an outside contractor for clean-up. These procedures are discussed in Section 2. Costs associated with mercury spill clean-up are the responsibility of the Department creating the spill.

[su_spoiler style="fancy" icon="chevron" title=" Introduction "] Elemental mercury is a commonly used toxic material. It is the only metal that is liquid at room temperature. When spilled, mercury often fragments into small beads that can bounce and roll away from the location of the initial spill. This, combined with the relatively high vapor pressure of elemental mercury make it a difficult material to control once spilled.

Mercury is found in thermometers, manometers, vacuum pumps, switches, discharge tubes, dental amalgams, and as a component in chemical reactions. Because of its frequent use, it is not unusual for mercury to be spilled, or otherwise contaminate laboratory, storage, or office areas. Contamination of laboratory spaces from historic mercury spills is also common.

Once vaporized, the lungs readily absorb elemental mercury from inhaled air. Much of the elemental mercury absorbed by the lungs reaches, and enters, the brain before it can be oxidized by the red blood cells. Oxidized mercury accumulates in the kidneys. At sufficient dose levels, mercury can cause salivation, coughing, chest pain, tremors, emotional instability, kidney damage and reproductive effects. High level acute doses and lower level chronic doses are both cause for concern.

[/su_spoiler] [su_spoiler style="fancy" icon="chevron" title=" Prevention "] Due to the toxic properties of mercury, and the difficulty in cleaning it up, mercury is one of the most expensive materials to clean-up and dispose of after a spill. Serious consideration should be given to replacing mercury with substitute materials when possible. Mercury free thermometers are available that are filled with non-toxic materials. Teflon coated thermometers are available that will help reduce spills from breakage. Electronic or mechanical thermometers or manometers can be used in place of mercury filled devices. Manometers can be filled with other, non-toxic materials.

Always store mercury in unbreakable containers with closed lids located in a well-ventilated area. Do not store with acetylene, fulminic acid, or ammonia. Mixing mercury with these materials can result in an explosive material.

When breakage of an instrument containing mercury is a possibility, the instrument should be placed in an enameled or plastic pan that can be cleaned easily. Be sure the pan is large enough to contain the mercury. Transfers of mercury from one container to another should be carried out in a hood, over a tray or pan to confine any spills. Do not handle mercury over sinks where it could spill down the drain.

Always wear nitrile or latex gloves while handling mercury.

Ensure that hose connections on manometer tubes are tightly clamped to prevent loss of connection while under pressure. Manometers with open tubes shall be fitted with traps to prevent the release of mercury in the event of over-pressurization. Label pumps and other devices that contain mercury which is not immediately apparent.

[/su_spoiler] [su_spoiler style="fancy" icon="chevron" title=" Spill Response "] When a spill occurs, isolate the area to prevent people from entering the spill area and spreading the contamination. This is done with warning signs and barrier tape, locked doors, or other similar actions. Make the perimeter of the isolated area three feet beyond the most distant visible beads of mercury. Use the flashlight from the spill kit to help locate the smallest beads of mercury. Women who might be pregnant, or people with a history of kidney damage, should be kept away from the spill area until the clean-up is finished.

Next, determine if the spill is a simple spill. A simple spill is one caused by a laboratory thermometer, or other small device involving less than 30 milliliters of mercury (about one pound), where all of the mercury is accessible on a non-porous surface. This type of spill can be cleaned-up with less than two hours of actual cleaning.

A spill is considered complex if it involves more than 30 milliliters of mercury (>1 pound), is located on a porous surface, is not easily cleaned-up, or is widely spread. Assessing and cleaning complex spills requires specialized equipment, knowledge and training. Therefore, only qualified personnel shall clean-up spills of this nature. Users shall contact Environmental Health and Safety at 392-1591 if a complex spill is suspected. These spills may be cleaned-up by Hazardous Materials staff if available, or hired out to contractors, depending on the scope of the project and the availability of personnel. After business hours, contact UF Police Department at 392-1111.

[/su_spoiler] [su_spoiler style="fancy" icon="chevron" title=" Simple Spills "] If the spill is determined to be a simple spill, it should be cleaned-up immediately using the mercury spill kit. All labs and facilities where mercury is used shall have access to a "mercury spill kit" for this purpose. Mercury spill kits, and refill materials are available from most lab safety supply companies. A typical spill kit will include treated sponges, mercury absorbing powder, water spray bottle, latex gloves, shoe coverings, flashlight, small dust pan, plastic scoop, and small plastic bags.

Prior to clean-up, remove all gold or silver rings, watches and bracelets. If mercury comes in contact with gold or silver jewelry, it can bond to the metal. Latex, or other impermeable protective gloves shall be worn during the mercury clean-up. Use caution and wear disposable shoe coverings so you do not contaminate your shoes with mercury during the clean-up.

Begin your clean-up at the outer perimeter of the spill. Work carefully, it is easy to miss contamination, or spread the contamination when the clean-up work is rushed.

Mercury should never be swept with a broom or vacuumed with an ordinary vacuum cleaner. These procedures will disperse mercury droplets, increase the airborne level of mercury vapor and contaminate the equipment used.

The preferred way to collect mercury is to dust the area of the spill with mercury absorbing powder. When used according to instructions, this powder will form a solid mercury-metal amalgam that is much safer and easier to handle than elemental mercury. Using a damp sponge, work the powder into a paste while scrubbing the contaminated surface. After the paste has dried, it can be collected with a

squeegee or stiff card and placed into the plastic container for disposal. For vertical, or overhead surfaces, use mercury absorbent sponges to slowly wipe the surface to remove mercury.

Another way is to use an index card or rubber squeegee to form a pile that can be sucked up or amalgamated with mercury absorbing powder. Beads of mercury can be sucked up with a disposable pipette or a hand-operated vacuum pump.

Look very closely, using a flashlight to help illuminate the smaller beads. Mercury beads will often be pinhead size, or smaller. Re-clean the spill site and perimeter if necessary. Pay close attention to cracks and crevices that may hide small beads of mercury.

Place sponges, used powder, rags, shoe covers, and anything used for the cleanup into a plastic bag for disposal. Do not mix these items with any free mercury you may have collected. Seal and label the bag, and place gloves in the trash. Call the Hazardous Waste division at 392-8400 to arrange for disposal.

The job is finished when the visible mercury is removed, the area has been cleaned with mercury absorbing powder or sponges, and the waste and supplies are packaged. Contact Environmental Health and Safety at 392-1591 to arrange for air sampling to confirm that the clean-up is adequate. If there are any questions, take steps to keep others from entering or spreading the mercury contamination site, and call Environmental Health and Safety for assistance.

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Complex Spills Evaluation: EH&S Staff Instructions

When responding to evaluate a mercury spill, take a mercury spill kit that includes:

- this policy
- protective foot coverings
- latex gloves
- respirator with mercury cartridges
- flashlight
- mercury absorbing powder
- spray mister
- mercury vapor adsorbent
- plastic waste bags
- warning signs and marker
- duct tape
- barrier tape
- incident form and pen
- waste labels
- mercury vapor analyzer
- hand collection pump

An assembled kit and the mercury vapor analyzer are available in the industrial hygiene lab in Building 179.

Upon arrival, complete an incident report describing the site, how the spill occurred, estimated quantity spilled and any other pertinent information. Record the names of all people who may have come in contact with the spill. Determine the name of the Principal Investigator or Supervisor for the area, and the Chair or Director. If conditions and exposures warrant, instruct persons who came in contact with the spill to make an appointment with the infirmary at 392-1161 to receive a medical examination for mercury exposure.

If a pound or more of mercury has spilled and escaped, it may be a reportable quantity spill. If the spill is determined to be a reportable quantity, it must be reported to the National Response Center (800-424-8802). Check with the Environmental Health and Safety Director's office before making this call.

Using the information collected for the incident report, evaluate the existing isolation of the spill zone. Wear disposable booties to prevent contamination and an appropriate respirator when entering the spill area to make an assessment. An appropriate respirator shall be worn at all times, unless air sampling determines the level to be consistently below 0.025 mg/m³.

Look for visible mercury beyond the established isolation perimeter. If necessary, reset the perimeter to three feet beyond the most distant visible mercury. Determine if the air handling system has been isolated. The system can be isolated by blocking the return vents, closing the doors and opening a window, or leaving an exhaust hood operating. Call the Physical Plant Division for the campus: 392-1121 or Health Center: 392-4411 for assistance in isolating the ventilation if necessary.

If there are large beads or puddles of free mercury, cover these with mercury absorbing powder and mist to dampen and form a solid mercury-metal amalgam. Beads or puddles of mercury may be recovered with the vacuum or hand pump if it is available. When most of the free mercury is recovered or amalgamated, dust the entire isolation area with mercury vapor adsorbing powder. These steps will control further spread of the mercury, and minimize the release of mercury vapor during the clean-up phase.

When the site is secured and the information recorded, contact the Hazardous Material Coordinator at 392-8400 to discuss clean-up options. It may be necessary to call in an outside contractor to do the clean-up work. All costs for the clean-up will be passed onto the Department that created the spill.

Complex Spills Clean-Up: EH&S Staff Instructions

When responding to a mercury spill for clean-up, take a mercury spill kit that includes:

- protective coverings
- latex gloves
- respirator with mercury cartridges
- flashlight
- mercury absorbing powder
- spray mister
- mercury vapor adsorbent
- mercury absorbing sponges

- cleaning rags
- plastic waste bags
- mercury vacuum and attachments
- 3% Nitric Acid Solution
- hand brush
- pry bar
- carpet or razor knife
- screwdrivers, wrenches, pliers
- duct tape
- barrier tape
- waste labels
- mercury vapor analyzer

It will be necessary to install the mercury filter into the vacuum. This filter is kept wrapped in plastic to preserve its length of service. Check to insure that the hepa, impact and pre-filters are all in place. Run the vacuum and monitor the exhaust with the mercury vapor analyzer to verify that the mercury filter is working. Repeat this test periodically during the clean-up process.

At the site, set-up a staging area for entry and exit into the spill zone. Use disposable booties or protective clothing to prevent contamination of shoes and tracking of mercury when entering and exiting the spill area. Remove this clothing anytime you exit the spill area. An appropriate respirator must be worn at all times, unless air sampling determines the level to be consistently below 0.025 mg/m³.

Start cleaning from the staging area. Clean-up the mercury vapor adsorbent powder and mercury absorbent powder with the mercury vacuum, or other appropriate technique. Use the mercury vapor analyzer to periodically monitor the airborne level of mercury, and monitor the exhaust from the mercury vacuum. When this preliminary cleaning is completed, scan the area with the mercury vapor analyzer to identify areas needing further cleaning.

When a mercury spill occurs on carpeting, it is necessary to remove the contaminated carpeting. Cut the carpet into manageable strips to peel up and remove from the floor. Place the contaminated carpet into plastic bags. If the carpet is over vinyl tiles and some of the tiles are coming up with the carpet, contact the asbestos coordinator at 392-1591 for instructions.

Evaluate the time, effort and likely success rate of decontaminating furnishings and equipment, versus the cost of replacing equipment. It is often more practical to dispose of contaminated items that are not easily cleaned. For items that warrant keeping, but will be difficult to clean, place the item into a plastic bag and seal the bag. The item can then be decontaminated after the spill is resolved.

If the mercury vapor levels are too high after the initial cleaning, it will be necessary to do additional cleaning to reduce the airborne levels of mercury. Use a flashlight and small tool or vacuum to inspect and clean crevices and cracks that may harbor mercury. The mercury vapor analyzer can be used to identify contaminated areas that require additional cleaning. Wiping surfaces with a 3% nitric acid solution can help to remove residual traces of mercury.

Place all contaminated materials into plastic bags or disposal drums. Label all containers appropriately. At the end of the job, monitor the exhaust of the mercury vacuum with the mercury vapor analyzer to

determine if the mercury filter has become saturated. If it has, dispose of it while emptying the vacuum. Be sure to order a replacement filter. Empty and clean the mercury vacuum. If the mercury filter is still good, remove it from the vacuum and wrap it in plastic for storage.

For these complex spills, air sampling is used in conjunction with visual inspection to determine when an area is clean. The area is clean when there is no visible mercury, and the airborne levels of mercury do not exceed 0.013 mg/m³ in the breathing zone. This level is half of the ACGIH TLV of 0.025 mg/m³, and is intended to adjust for the possibility that areas may be occupied more than eight hours per day, or more than five days per week. This level also complies with the recommended level of 0.01 mg/m³ to protect against reproductive effects.

If meticulous cleaning is unable to reduce the airborne concentrations below 0.013 mg/m³, a level below 0.025 mg/m³ may be designated. Designation of a level between 0.013 mg/m³ and 0.025 mg/m³ will require restrictions on occupancy of the area, and periodic re-monitoring. An industrial hygienist, along with a user representative, must be involved in this decision process.