1. Purpose

University of Alaska Anchorage (UAA) personnel, student workers, faculty, staff, and outside contractors who use work with mercury containing devices and equipment during their work functions face risks when these devices break, exposing them to mercury. The hazards associated with mercury exposure can be substantially reduced by following the proper procedures in the event of a mercury spill. This program for mercury spills is intended to ensure workers are knowledgeable in the hazards of mercury exposure and the steps to be taken to protect themselves and others in the event of a mercury spill.

2. Objective

UAA, in its continuing effort to provide employees with safe, healthful working conditions, and to comply with the Occupational Safety and Health Act is implementing the following program for mercury spills to protect people working at the University, by helping employees, student workers, faculty, staff, and outside contractors better understand mercury exposure and procedures to undertake in the event of a mercury spill.

3. Scope

This program applies to UAA employees, student employees, faculty, staff, and outside contractors working on UAA equipment who are working with mercury containing devices.

4. Definitions

Complex Spill - A mercury spill is considered complex if it involves more than 30 milliliters (mL) of mercury (> 1 pound), is located on a porous surface, is not easily cleaned-up, or is widely spread.

Mercury - a chemical element with the symbol Hg. It is the only metallic element that is liquid at standard conditions of temperature and pressure.

Mercury Containing Device - A device, item, or other article that contains varying amounts of elemental mercury. Some commonly recognized devices that contain mercury are thermostats, barometers, manometers, temperature, pressure gauges, and mercury switches.

Personal Protective Equipment (PPE) - equipment worn to minimize exposure to hazards that cause serious workplace injuries and illnesses. These injuries and illnesses may result from contact with chemical, radiological, physical, electrical, mechanical, or other workplace hazards. Personal protective equipment may include items such as gloves, safety glasses and shoes, earplugs or muffs, hard hats, respirators, or coveralls, vests and full body suits.

Simple Spill - A mercury spill caused by a laboratory thermometer, or other small device, involving less than 30 mL of mercury (< 1 pound), where all of the mercury is accessible on a non-porous surface.

Vapor Pressure - Force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure, the higher the concentration of the substance in the air.

5. Authority and Responsibilities

In addition to the roles and responsibilities outlined in the UAA Training Program, the following apply to the Mercury Spills Program.

EHS/RM

- Assist departments with disposal of any mercury containing devices.
- Primary responsible party for ensuring that complex mercury spills are handled appropriately.
- Assess air quality following a complex spill to ensure the air quality has achieved a satisfactory result before opening the arear to the general public.

Supervisor

- Identify all mercury containing devices in the department and secure them from accidental release as appropriate.
- Ensure any defective or damaged mercury containing devices are disposed of properly with EHS/RM assistance.
- Ensure periodic inspection of mercury containing device storage are occurring.
- Maintain applicable records in the department and provide EHS/RM a copy.
- Understand and enact the spill response measures if required.

Department Safety Coordinator

- Assist in the determination of defective or damaged mercury containing devices.
- Assist with assuring proper storage of mercury containing devices.

Employees/Student Workers

- Visually inspect mercury containing devices prior to use for damage or defects.
- Alert supervisor to any spills or damage involving mercury containing devices.

Outside Contractors

- Perform all work in compliance with the company's policies on handling mercury and mercury containing devices, which will be reviewed and approved by the EHS/RM department.

- Alert Department Supervisor in the case of a mercury spill.
- If the company does not have a mercury spill program, they must comply with this program.

6. Hazards Associated with Mercury Spills

Elemental mercury is the only metal that is liquid at room temperature. When spilled, mercury can fragment into small droplets which bounce and roll away from the location of the initial spill. Mercury can then pool up in unexpected locations and slowly vaporize, releasing mercury into the air. Mercury also has a relatively high vapor pressure. It can be very difficult to control mercury once it is spilled, thus the main emphasis on the use of mercury is to prevent uncontrolled spills.

Mercury is found in thermometers, manometers, vacuum pumps, switches, discharge tubes, and is sometimes used as a component in chemical reactions. Contamination of buildings can occur when mercury is spilled.

Vaporized elemental mercury can be readily absorbed through the lungs 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 causes of known health effects.

7. Engineering Controls

Engineering controls are design plans or changes to the working environment to prevent or reduce employee exposure to mercury. The following examples of engineering controls should be considered in area design to reduce the risk from mercury spills.

- When transferring mercury from or into a device, a fume hood should be used to protect the worker.
- When items are not in use, storage on a tray with sufficient volume to collect any spilled or leaked mercury is required.
- Utilize charcoal-filtered vacuums or suction pumps when cleaning mercury.
- Utilize localized ventilation with appropriate charcoal-filtration when handling complex mercury spills.

8. Administrative Controls

Administrative controls are safe work practices and procedures designed to reduce the risks associated with mercury spills. Examples of administrative controls include the following:

- Proper labeling and storage for mercury containing devices.
- Preventing access to the general public in areas where mercury has spilled.
- Providing employees with hazard information and training.
- Replacing mercury-containing devices with mercury-free devices whenever possible. For example, using alcohol or digital thermometers instead of mercury-thermometers.

9. Storage and Use of Mercury and Mercury Containing Devices

Store mercury and mercury containing devices in unbreakable containers with closed lids located in a well-ventilated area. Never store with acetylene, fulminic acid, or ammonia as mixing mercury with these materials can result in an explosive material.

Instruments should be placed in on easily cleaned container large enough to contain all the mercury within the device. All transfers of mercury from one container to another must occur in a fume hood over a container large enough contain all the mercury being handled. Never handle mercury near sinks or floor drains. Always use gloves when transferring mercury.

Ensure that any 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 all devices which utilize mercury as "mercury containing devices".

10. Spill Response Procedures

The following section provides the actions that should be taken in the event of a mercury spill. All spills must be reported to EHS/RM as soon as possible. Simple spills may be managed and cleaned-up by the lab or area that created the spill if the conditions addressed below are met. If > 1 pound of mercury is involved in the spill, cordon off the area and contact EHS/RM for an evaluation.

Spill Response

- If a spill occurs, isolate the area and prevent people from entering using warning signs and tape. The isolation area should be set at least 3 feet from the edge of the spill.
- Women who may be pregnant and people with a history of kidney disease remain outside of the mercury spill area until the clean-up is completed.
- Use a flashlight to confirm the spill. Look for beaded drops of mercury shining in the light. Be sure to check the surrounding area thoroughly. Avoid spreading any contamination.
- Assess the size of the spill. If the spill was caused by a thermometer or other small device (< 30 mL of mercury or < 1 pound), you can utilize a mercury spill kit to clean the spill –

see Simple Response below. If the spill was of more than 30 mL of mercury, contact EHS/RM. EHS/RM will follow the procedure under Complex Spill Response below. Complex spills will be addressed through the use of an outside contractor.

Simple Spill Response

- Simple spills may be addressed at the laboratory or area where the mercury was used with a mercury spill kit. Clean-up of a simple spill should require less than 2 hours to address.
- Typical mercury spill kit contents include treated sponges, mercury absorption powder, spray bottle, disposable gloves, shoe coverings, flashlight, small dust pan, plastic scoop, and sealable disposal bags.
- Before cleaning up a mercury spill, remove all rings, watches, bracelets and other jewelry as mercury can bond to the metals. Put on appropriate PPE including gloves and boot covers.
- Work the spill from the outside-in, starting on the outside edge of the identified spill area and working towards the center. Go slowly and use your flashlight for verification. It can be easy to miss droplets and it is important to collect all the mercury as it will continue to vaporize in the environment if left in place.
- NEVER sweep or use a normal vacuum for mercury clean-up. This can disperse fine droplets throughout the clean-up area and increase the concentrations of airborne mercury.
- The mercury powder binds with the mercury droplets to for a solid metal amalgam which is easier to work with. Use a damp sponge from the kit to work the powder into a paste to clean contaminated areas. The dried paste can then be collected into the dust pan with a card or squeegee type tool. Beads of mercury can also be collected using disposable pipettes.
- Re-clean the spill area, as necessary. Pay special attention to any cracks and crevices as mercury can accumulate in those areas.
- Place sponges, used powder, rags, shoe covers, gloves, and all items used for the cleanup into a plastic bag for disposal. Seal and label the bag trash. Call EHS/RM to arrange for disposal.
- EHS/RM can perform air sampling in the area to ensure clean-up is complete.

Complex Spills Evaluation (EHS/RM Instructions)

- When responding to evaluate a mercury spill, take a mercury spill kit that includes this program, protective foot coverings, gloves, respirator with mercury cartridges, flashlight, mercury absorbing powder, mercury vapor adsorbent, plastic waste bags, warning signs

and marker, duct tape, barrier tape, waste labels, mercury vapor analyzer, and hand collection pump or pipet with disposable tips. This kit has additional requirements above and beyond what is necessary for the treatment of a simple mercury spill.

- Collect the following information from the affected lab / work area: how the spill occurred, estimated quantity of mercury spilled, list of all people who may have come in contact with the spill, and the name of the Principal Investigator or Supervisor for the area.
- If >1 pound of mercury has spilled, it may be a reportable incident. Contact EHS/RM Director prior to reporting a spill. If it is a reportable quantity, contact the National Response Center (800-424-8802).
- Don PPE including gloves, respirator with mercury cartridges, and disposable shoe protection. Respirator requirement can be waived if air monitoring indicates levels of airborne mercury to be consistently less than 0.025 mg per cubic meter of air (mg/ m^3).
- Assess the isolation area. Pay special attention to the area demarcated as the perimeter and ensure that the isolation area has been set at least 3 feet away from any visible mercury droplets. Use the flash light and pay special attention to any cracks or other crevasses as mercury may pool in them.
- Isolate the air handling units. This typically involves blocking the return vents and closing doors leading into the spill area. Call the Facilities Maintenance Operations (FMO) office for assistance if required.
- Where there are large puddles or beads of mercury, cover with absorbing powder and mist to dampen and form solid metal amalgams. Beads or puddles can also be recovered using hand pipettes or a hand pump. After all the free mercury has been recovered or turned into an amalgam, scatter the entire isolation area with mercury absorbing powder to minimize the spread of any free mercury during a clean-up phase.
- Contact an outside contractor to clean-up the spill.
- Consult with EHS/RM Director once to assess if conditions and exposures warrant medical examination for mercury exposure for exposed individuals.

Complex Spills: Post-Clean-Up: EHS/RM Staff Instructions

- Following the clean-up of a complex mercury spill, air testing must be performed to ensure the area is safe to return to normal operations. Either an outside contractor or EHS/RM staff can conduct this air sampling.
- First, ensure that the area is free of all visible mercury droplets and dust/debris from the clean-up operations.

- Using an appropriate direct read instrument or laboratory test, ensure that the airborne levels of mercury do not exceed ½ of the American Council of Governmental Industrial Hygienists (ACGIH) threshold limit value (TLV). The TLVs are consensus derived health-based concentrations in which a worker being exposed repeatedly for a normal 8-hour work day and 40-hour work week may be exposed on a regular basis without an adverse effect. The TLV for mercury is 0.025 mg/m^3 and ½ the TLV is 0.013 mg/m^3.
- If even through repeat cleaning efforts, the airborne concentrations are still above 0.013 mg/m^3, but below 0.025 mg/m^3, the area can be released to normal operations with restrictions on occupancy. Periodic monitoring should occur until the area exhibits airborne mercury levels below 0.013 mg/m^3. Women who may be pregnant and people with kidney diseases should be restricted from entry to the area until the air results indicate levels below 0.013 mg/m^3.

11. Inspections

Prior to use, all mercury containing equipment should be inspected for any signs of damage or deterioration. These devices should be replaced (preferably with a non-mercury device) if signs of damage are indicated. The department should periodically inspect storage areas where mercury containing devices are stored to ensure their integrity.

12. Training

UAA shall provide a training program for each employee who uses mercury containing devices.

The program shall enable each employee to recognize hazards related to mercury exposure and shall train each employee in the procedures to be followed to minimize these hazards. This training will also cover the appropriate response to simple and complex mercury spills.

The employer shall ensure that each employee has been trained by a competent person in the following areas, as applicable:

- Common uses of mercury and common mercury containing devices
- Health hazards and symptoms of mercury exposure
- General procedures for working with mercury containing devices
- Labeling requirements for mercury containing devices
- Procedures for disposal of mercury containing devices
- Procedures for spill response to simple and complex spills

13. Program Evaluation

The Mercury Spills Program shall be evaluated on an annual basis utilizing the protocols set forth by EHS/RM. The evaluation team will consist of a department safety coordinator and a designee from EHS/RM. EHS/RM will define the scope of the evaluation. The final report will be developed by the EHS/RM utilizing the information received during the evaluation. The deficiencies determined in the report will be documented and corrective action plans will be developed.

14. References

OSHA regulations that apply to mercury are included below.

- 29 CFR 1910.1000 Table Z-1 - Limits for Air Contaminants
- 29 CFR 1910.1200 - Hazard Communications

15. Revision History

Revision Number	Date Revised	Description of Change	Revised By	Approved By
0		Initial Issue		
1				
2				
3				