

Mercury Thermometers and Devices

Why Use Mercury-Containing Devices?

Mercury is a neurotoxin and can also damage the lungs and kidneys when mercury vapors are inhaled. However, as the only metal that is liquid at room temperature, mercury expands and contracts evenly with temperature and pressure changes. These characteristics make mercury useful in providing very accurate and precise measurements for temperature, pressure, and more. For these reasons, UMass does not prohibit their use, though **you should only use mercury-containing devices if no viable alternatives can be found**. Some examples of research equipment that may contain mercury are:

Device	Function	Non-Hg Alternative
Barometers	Measure atmospheric pressure.	Digital, or contains Aneroid or eco-celli liquid-gas silicon.
Flow Meters	Measure the flow of gas, water, air, and steam.	Digital and ball-actuated flow meters.
Hydrometers	Measure the specific gravity of liquids.	Lead ballast hydrometers.
Manometers	Measure the difference in the pressure of a gas or liquid, such as the air pressure within air ducts or compressed air lines.	Digital, or substitute any colored liquid for the mercury.
Pyrometers	Measure the temperature of extremely hot materials.	Digital or optical pyrometers.
Thermometers	Measure temperature. They work well at higher temperatures (-37°C to 350°C), but do not perform as well at lower temperatures.	Alcohol, mineral spirit-filled, and digital thermometers.

What are the Hazards?

- Mercury is very toxic to aquatic life with long-lasting effects.
- Mercury may cause health effects such as neurological and reproductive disorders, lung, or kidney damage.
- Some amount of mercury vaporizes when exposed to air, becoming a colorless, odorless vapor. Inhalation is harmful. The NIOSH recommended airborne exposure limit (REL) over a TWA for mercury vapor is 0.05 mg/m³, and 0.1 mg/m³ should not be exceeded at any time.⁴
- Spilled elemental mercury forms beads or droplets that can accumulate in the tiniest places and are very difficult to clean up.

Note: Mercury-containing devices usually hold the metal in sealed glass. So long as the glass is intact, exposure is not a concern. Just remember that the glass is fragile and can be broken easily with physical force, a rapid change in temperature, and by overheating the mercury.



What Activities Could Pose a Risk?

- Disassembling a mercury-containing device.
- Handling mercury-containing devices roughly, hitting the device against another object, dropping the device, and shipping or storing it without packaging protection (e.g., rolling loose in a drawer).
- Heating a mercury-containing device beyond its upper temperature limit, which can lead to glass rupture and potentially a mercury spill potentially and a release of vaporized mercury.
- Working near mercury that is exposed to the air.
- Improperly disposing of mercury and mercury-containing devices, such as in the trash, in an autoclave, or down the sink.



How Can You Minimize the Hazards?

- Substitute non-mercury devices whenever possible.
- Ensure that a mercury spill kit is available in any room where mercury-containing devices are used.
 - Spill kits should contain a mercury absorbent or amalgamation powder (containing zinc), a scraper or dust pan, wipes, disposal bags or containers for the mercury, and PPE (e.g. gloves, goggles, face mask). Some kits may include sponges with granulated zinc, an aspirator bottle, or spatulas.
 - Here are some places where you can purchase Mercury Spill Kits: [Fisher Scientific](#), [New Pig](#), [Absorbents Online](#), [Grainger](#).
- Regularly inspect your mercury-containing device for any cracks or other visual defects. Refer any damaged devices for disposal and do not attempt to use them. Follow the [process for laboratory equipment disposal](#) described on the EH&S website.
- Never disassemble a mercury-containing device.
- Store and handle mercury-containing devices with care. The glass bulbs can be easily broken.
- Do not exceed the upper temperature limit of a mercury device, which is around 350°C (~660°F). Never autoclave mercury-containing devices. The glass containing the mercury will not be able to handle the increased internal pressure and will break, releasing vaporized mercury.
- Do not dispose of mercury-containing devices in the garbage, recycling, or pour the device's liquid contents down the sink. This could cause an environmental exposure.

Exposure and Spill Procedure

If a small mercury spill occurs but is contained (e.g. in a fume hood, bucket, etc.), it is at ambient temperature (not heated), and you are comfortable doing so, use the mercury spill kit kept in the lab to collect the metal. Wearing appropriate PPE, completely cover the mercury with the zinc absorbent powder: this reacts with mercury droplets, resulting in a solid zinc amalgam. After a few minutes, sweep

up the stabilized mercury, transfer the mercury amalgam to the SAA and [refer for disposal through CEMS](#) as hazardous waste. Decontaminate the spill surface area with mercury clean up wipers to remove any residues. Transfer all used kit materials into a disposal bag and refer for disposal as solid hazardous waste. Call EH&S after the cleanup to ensure it was completed appropriately.

If a mercury device breaks in heated equipment, shut off the heat, evacuate the immediate area and notify EH&S (413-545-2682) for assistance.

In the event of a mercury spill that is not contained or is more than about 5 mL of metal, evacuate the immediate area and notify EH&S (413-545-2682) for assistance.

After any emergency, spill, or near-miss circumstance, notify EH&S ([413-545-2682](tel:413-545-2682)) as soon as possible and complete the [lab incident form](#).

References and Sources

1. Fact Sheet on Mercury Use in Measuring Devices:
https://www.newmoa.org/prevention/mercury/imerc/factsheets/measuring_devices_2015.pdf
2. Mercury Device Handling and Disposal Guidelines:
<https://dec.vermont.gov/sites/dec/files/wmp/SolidWaste/Documents/hgdevices.pdf>
3. Mercury in Glass Thermometer: <http://www1.mscdirect.com/MSDS/MSDS00013/56473192-20160527.PDF>
4. Health Effects of Exposures to Mercury (EPA): <https://www.epa.gov/mercury/health-effects-exposures-mercury>
5. Mercury: Lung Damaging Agent (CDC):
https://www.cdc.gov/niosh/ershdb/emergencyresponsecard_29750021.html
6. What EPA is Doing to Reduce Mercury Pollution, and Exposures to Mercury:
<https://www.epa.gov/mercury/what-epa-doing-reduce-mercury-pollution-and-exposures-mercury#:~:text=2015%20final%20rule-,In%20your%20drinking%20water,exceed%20the%20MCL%20for%20mercury.>