



Mercury Replacement Program

I. Policy

It is the policy of California State University, Fullerton to remove mercury containing devices throughout campus, insofar as is reasonably possible, and provide a campus environment for faculty, staff, students and the public that will not adversely affect their health and safety nor subject them to avoidable risks of accidental injury or illness. Furthermore, the University has an obligation to safeguard employees from the potential health effects of mercury vapor while they are performing research in laboratories, servicing or maintenance on machines and equipment throughout campus.

II. Authority

Department of Toxic Substances Mercury Collection Act of 2008

III. Scope

This program applies to all University departments using mercury containing devices.

IV. Definitions

Barometers - An instrument used to measure atmospheric pressure. It can measure the pressure exerted by the atmosphere by using mercury.

Batteries - Mercury batteries, also called mercury cell, contain mercury oxide. Mercury batteries were commonly made for watches and calculators, and in larger forms for other applications.

Counterweights and Dampers - Mercury counter weights are used to balance the movement of various equipment and can be found in grandfather clocks, and conveyer systems. Mercury dampers are devices used for damping the nutation of a rotating body.

Manometers - Generally have a U-shaped glass or plastic tube containing elemental mercury. The mercury level rises or falls in response to pressure changes in the system. The pressure is read from the side of the mercury-containing tube.

Mercury - Mercury (Hg) is a naturally occurring element. This silver-colored liquid metal can be found in rocks, soil and the ocean. Mercury can be released into the environment through natural processes when volcanoes erupt, rocks erode and soil decomposes. As a liquid metal at room temperature, mercury has been widely used throughout industry. Man-made sources of mercury include abandoned mines, energy production, sewage, industrial

processes, mining, smelting, scrap metal processing and incineration or land disposal of mercury products or waste.

Switches - A mercury switch is also known as a mercury tilt switch whose primary purpose is to allow or interrupt the flow of electricity within an electrical circuit.

Thermostats - Used in heating, ventilation and air conditioning (HVAC) devices and in temperature controls for heat pumps.

V. Accountability

A. Department

The director, supervisor, dean, department chair is responsible for determining if activities involving the use of mercury containing devices are subject to this program. Environmental Health and Safety (EHS) will assist academic departments in procuring substitute devices.

B. Capital Programs and Facilities Management (CPFM)

A majority of mercury switches, thermostats, and counterweights & dampers on campus are the responsibility of CPFM. They are responsible for the following:

1. Identify all CPFM maintained machinery or equipment which would be subject to this program.
2. Identify employees within CPFM who use mercury containing devices.
3. Ensure that all CPFM employees receive proper training on the handling, disposal, and replacement of mercury containing devices.
4. Ensure all new and refurbished equipment is mercury-free.
5. All mercury containing devices removed from equipment must be disposed of properly by contacting EHS.

C. Academic Departments

The director, chair, or head of each department is responsible for determining if activities involving the use of mercury containing devices are subject to this program. EHS will assist academic departments in procuring substitute devices.

D. Environmental Health and Safety (EHS)

EHS will be responsible for the following:

1. Maintain the Mercury Replacement Program which complies with the requirements of the California Code of Regulations Title 22 and Title 8 of the Health and Safety Code.
2. Provide training and assistance to all Departments regarding the Mercury Replacement Program.

VI. Program

Mercury containing devices; thermometers, thermostats, diostats, manometers, barometers, mercury button batteries, counterweights and dampers are commonly found on campus. Damaged/broken thermometers are one of the most common hazardous materials emergency response on campus. Mercury vapors from broken manometers, thermometers, thermostats, and mercury switches present an inhalation hazard for faculty, staff and students. Mercury vapors can damage the nervous system with prolonged exposure. Mercury also presents a hazard to the local environment. Thermometers broken in a sink release its contents into the sanitary sewer and ends up at the publically owned treatment works. Mercury discharged into the environment can threaten the health of wildlife and accumulates in the food chain, such as edible fish, and threatens human health.

Academic Departments, principal investigators, science technical staff, and CPFM personnel that have mercury containing devices must identify these sources and make plans for replacing these mercury containing device(s) with non-mercury containing devices of acceptable performance, when appropriate.

Academic Departments are encouraged to contact EHS to replace their mercury thermometers, mercury manometers, barometers, and mercury-containing vacuum gauges.

A. Selecting equivalent non-mercury thermometers

Before purchasing a replacement, take an inventory of the thermometers in your laboratory. Remove mercury thermometers from areas where there is a high risk of breakage such as heating blocks, drying ovens, water baths, and refrigerators. Many times when a thermometer is broken in one of these devices the first available thermometer is grabbed as a replacement. Often it is an expensive thermometer, which may be used as your replacement and it can be replaced with an inexpensive substitute.

1. Identify the properties needed for the replacement thermometer:
 - a. Partial immersion/total immersion
 - b. Accuracy
 - c. Range
 - d. Certification yes/no

- e. Application - Most non-mercury thermometers do not have as large of a range as mercury. The most cost-effective replacement may not exactly duplicate the properties of the original thermometer but will meet the properties required for the application.

2. Additional considerations:

- a. In general, non-mercury thermometers have a lower usable temperature range. Therefore, guaranteed accuracy is +/- one scale division below 105 °C (221 °F) +/- 1.5 scale divisions above 105 °C (221 °F), and +/- two scale divisions above 200 °C (392 °F). These ranges are comparable to most mercury thermometers of the same type and range. An exception is on the high end of the temperature scale. Typically, 260 °C is the limit for non-mercury thermometers.
- b. The diameter of the stem may be different than a traditional thermometer and the apparatus may need to be modified.
- c. If scientific procedures cannot be performed with non-mercury thermometers due to the temperature ranges or other factors, digital or Teflon-coated mercury thermometers can be used. Teflon coating will help to reduce releases of mercury should a thermometer be broken.

B. Storage of Non-Mercury Thermometers

Non-mercury thermometers, or spirit thermometers, are much less toxic and contain either ethanol, toluene, kerosene or isoamyl acetate and dye. The science and development of non-mercury thermometers have made vast improvements over the past few years. However, although their separation rate is now equal to or better than mercury thermometers, the manufacturers and distributors still recommend storing them in the upright position to prevent column separation. Some have instructions available for recombining a separated thermometer.

C. Recommended Manufacturers

There are a number of manufacturers of non-mercury and digital thermometers that may meet your expectations. Below are a small sampling of companies which provide non-mercury and digital thermometers:

- 1. Red Spirit
Cost: similar to mercury
Range: -100 to 200 °C
Comments: Most cost effective alternative for water baths, ovens, and refrigerators.
- 2. Ever-Safe

Cost: comparable to, to substantially more than mercury depending on range and accuracy.

Accuracy: Varies, similar to mercury

Range: -10 to 260 °C

Comments: Used successfully in many mercury replacement programs.

3. Enviro-Safe

Cost: Comparable to mercury

Accuracy: varies

Range: -10 to 225 °C

Comments: Some users have experienced problems with liquid remaining on the walls of the capillary tubing resulting in inaccurate readings.

4. Digital

Cost: Depends on the accuracy, some are comparable to Ever-safe.

Accuracy: Similar to or much better than mercury

Comments: Comparable to the Ever-Safe thermometer and can be stored in a drawer without the separation problems associated with non-mercury thermometers. Digital thermometers are rapidly improving and decreasing in price. Do not dismiss this alternative without consulting the most current information from vendors.

Responsible Executive: Vice President for Administration and Finance

Responsible Office: Environmental Health and Safety

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