

# Guide for Identifying Mercury Switches/Thermostats in Common Appliances



Prepared by: Jim Giordani, Burlington Board of Health, Revised 12/27/00  
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## Guide for Identifying Mercury Switches/Thermostats In Common Appliances

This reference contains guidance for responding to a mercury spill, and how to recycle mercury bearing products. This document also contains specific recommendations for the following types of products: batteries, fluorescent lights, high intensity discharge lamps (HID) lamps, ballasts, thermostats, switches, float switches, sump pumps, silent light switches, washing machines, tilt switches, freezers, flow meters, manometers, barometers, vacuum gauges, flame sensors on gas appliances, rubber flooring containing mercury, and mercury accumulation in sanitary drains. This reference also contains a general checklist of products found to routinely contain mercury.

Mercury is a dangerous element in the environment today. It can cause serious health problems such as neurological and kidney damage. Mercury is found in many products that end up in landfills and incinerators allowing the mercury to re-enter the environment and pollute drinking water and contaminate the food chain.

The following information is a helpful guide to identify products that contain mercury switches and thermostats. This guide describes where mercury switches and thermostats are located and how to remove and dispose of these properly. Mercury bearing articles should not be thrown in the trash, and serious care should be taken when dealing with this element.

### **Safe Disposal**

- Store mercury thermostats and switches in a suitable sturdy, sealed container. A five gallon plastic bucket with a lid may work.
- Each container must be labeled "Mercury Thermostats or Switches/Universal Waste."
- Be careful to keep the devices from breaking and releasing mercury into the environment.
- If a release occurs, take immediate steps to contain and clean up the spill.
- It is recommended that if you have any elemental mercury, to store the elemental mercury in a sealed glass jar, and then place the jar in a sealed plastic container.
- Burlington offers a program for recycling mercury-containing products. For more information on this program contact the Board of Health at 781-270-1955.
- Keep records of the devices that you have recycled, including copies of invoices containing information on the date of shipment, number of switches/thermostats, location from where the switches are being shipped, and destination of shipment.

The following list provides a general description of common items that contain elemental mercury or mercury switches. The mercury switches and thermostats must be removed prior to the disposal of these appliances. Where possible tips and suggestions have been provided to aid in locating and identifying mercury bearing articles in the item of concern.

**Known Mercury-Containing Products and Applications** (adapted from a list compiled by John Gilkenson of the Minnesota Office of Environmental Assistance.)

Note that in some devices the mercury serves a function that is different from the main purpose of the device. For example, in a DC watt hour meter, the mercury serves primarily a mechanical function as a low friction bearing. In a conventional thermostat, the mercury serves an electrical function in a tilt switch and serves no thermometric function. Mercury in a glass thermostat, the mercury serves both thermometric and electrical functions. Note also that many of these devices/products are used in educational institutions, as well as in commercial applications.

Mechanical properties – High Density/Low Friction Metal Fluid

Telescope Mirror

Canter Tube: ~6' tube used in medical procedures to trace GI tract

Bougie Tube: used in medical procedures for esophageal dilation

Lighthouse lamp bearing

Waste water treatment plant pivot bearing arm

Bow Stabilizer (archery); two models: 6" 8 oz.; 10" 11oz. (Neutralizer™)

DC watt hour meters (e.g., Duncan, no longer manufactured but may still be in use)

Bubbler/trap – Laboratory use (seals reaction vessel, for monitoring gas evolution, uses oil or mercury)

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Jewelry from Mexico (reported by a college in the Lake Superior basin where an item of jewelry broke)  
Weight/counterweight in grandfather clocks

Pressure and Flow rate measurement and control devices/manometers; tube type and well type (note that devices in this category have extensive application in the natural gas industry)

Ventilation Hoods in Labs (used to measure outflow)

Sphygmomanometers (blood pressure measurement)

Laboratory manometers

Educational institutions (many types and uses)

Commercial-Industrial manometers (many types and uses)

Dairy barn manometers (tube type, measures milking system vacuum)

Barometers-atmospheric pressure (well type, climatology/meteorology uses)

Gas meter pressure safety device (tube device, likely no longer manufactured but many in use)

Perimeter-used to measure the permeability of sand mass to flow of air (foundry and other applications, may also be called an airway controller)

Mercury diffusion pump (laboratory/educational use)

Bilge Pump

Temperature Measurement and Sensing Devices/Thermometers etc.

Mercury in glass thermometers

ASTM and Laboratory

Cup case (for tank sample testing)

Tapered bulb (armored)

Sling psychrometer (for measuring relative humidity)

Mason's hygrometer (stationary, for measuring relative humidity)

Oven (home and commercial)

Candy/deep fry (home and commercial)

Weather (home, commercial, scientific)

Minimum/maximum (home, commercial, scientific)

Maximum registering

Fever (home, commercial, veterinary)

Other specialty uses e.g., Clerget sugar test, blood bank, incubator/water bath, dairy, etc.

Mercury Flame Sensor/mercury safety valve (stainless steel bulb, capillary tube, and bellows/control device) (used for 'unsupervised burners' in certain gas fired devices with standing pilot or electronic Ignition pilot, e.g., residential and commercial ovens/ranges, commercial griddle with concealed pilot, unit heaters, some light industrial oven applications, furnaces, infrared heaters, 'cycle pilot' devices) (Robertshaw and Harper-Wyman produce devices primarily for residential and commercial appliances, White Rodgers produces devices for 'furnace' applications.)

Mercury thermostat sensors (w/stainless steel capillary tube) (used in gas ovens operating up to 750°F) (Not used in self-cleaning ovens), discontinued in 1970's. Currently produced devices use oil or sodium-potassium mixture.)

Thermo-electric devices (mercury column movement opens and closes an electrical circuit at a preset or adjustable set point)

Mercury in glass thermostat tubes and devices (tube is thermometer like device, mercury column opens and closes circuit via metal contacts) (1,2, or 4 tubes used in conjunction with relay control device)

Mercury in glass thermal switch with integral or remote mounted solid state control (similar to above)

Thermoregulator (an adjustable mercury in glass device with an electrical output dependent on the position of the mercury column)

Electrical Properties/Switches, Relays, Sensors

Displacement/plunger relays (1 to 4 poles, NO, NC, many voltage and current ratings, generally for high current, high voltage applications; resistance heating, welding, lighting, tungsten, power supply switching, industrial process controllers) (known to be used for street lighting)

One model designed as exact replacement for non-mercury 'definite purpose relay' for 30 motors

Mercury to steel or tungsten contact

Mercury to mercury contact (for short time delay)

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Wetted reed relays (printed circuit board mount, 8/11 pin mount (may also be called can type), unmounted (typically referred to as the wetted reed switch)

Primarily used in test, calibration, measurement equipment where stable contact resistance over the life of the product is necessary, one industry source states that 90% of market is for specialized equipment produced in quantities of 10-200 units per year, mass production applications do not need mercury-wetted reed relays.

Telecommunications industry – switching equipment and boards used in central facilities.

Tilt switches (including SPST, SPDT, NO, NC, wide angle, omni-directional, circuit board mount, etc.)

Temperature control (mounted on bimetal coil or attached to bulb device)

Pressure control (mounted on bourbon tube or diaphragm)

Fluid level control (mounted in float, on lever arm, on diaphragm or on plunger)

Airflow/fan limit controls (mounted to vane in airflow)

Pneumatic tube communication systems

'man down' alarms

Swimming pool alarms

Safety shut off

Steam irons (most brands with shut off feature are know to use a mercury device, Proctor-Silex/Hamilton Beach claims to use only non-mercury devices, still contacting other manufacturers; look for one-hour timer as non-mercury device)

Electric Space heaters (may have been discontinued by early 1995)

Outboard motors

Limit switches for industrial machinery

Automobile hood, trunk, vanity mirror, glove box, emergency brake lights

Automobile automatic roll bar

Automobile 'ride control' automatic leveling suspension

Automobile security systems (tilt and trembler devices)

Building security systems (tilt and trembler devices)

'Silent' wall switches, single pole and three-way; also identifiable by "top" marked on one end the switch (discontinued by GE (1991) and Leviton, reportedly the only manufacturers.

Commercial popcorn poppers

Film editing equipment

Greenhouse louver positioning devices

Washing machine lids (for spin cycle shut-off) (believed to be no longer in production)

Chest freezer lid switches (for light) (believed to be in production)

Security System applications (various, including automobile, computer lockdowns, and other applications where movement of a 'momentary contact' switch can trigger an alarm)

Anti Tamper devices in gas meters and pay phones (unable to confirm gas meter application with major gas meter manufacturer)

Automatic car washes (Ryko: treadle on/off switch and detection of top brush position)

Ice fishing tip-up lights

Fishing lure (manufactured in Canada, no further information at this time, possible for tip ups)

Lawn tractor/riding mower fuel level indicator

Electric organs-non-keyboard controls such as tone

Fire alarm box switch

Level and rotation sensors and controls (automobile, aircraft, and defense applications)

Laptop computer – screen shutoff when cover closed

Portable phone mute/privacy switch when phone is in horizontal position

Cameras (still, video, film) over-ridable position sensor to protect CCD from sunlight damage

Magnetically operated switches (similar to a wetted reed relay or plunger relay): Applications unknown

Proximity sensors, magnetically activated: Applications unknown

G-sensors

Automobile ABS sensors (used to pulse system and disengage auto 4wd)

Possibly automobile air bag sensors

Auto seat belt mechanisms (electrically activated inertia lock)

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### Security system applications

Rectifiers, oscillators, phanatrons, thyratrons, ignitrons, excitatrons, cathode tubes; inverters, no further information at this time.

Miscellaneous: Some type of switch or relay is used in remote reading devices for utility meters, definitely in receiving device and possibly in sending device, unable to confirm or refute latter. Purpose unknown at this time.

### Electrical Discharge Properties/Lighting

#### Fluorescent Lamps

General purpose straight, U-bent, circuline, compact

High output

Bilirubin blue

Blacklight

“Bug Zappers” Devices

#### High Intensity Discharge

Mercury vapor lamps

High pressure sodium lamps

Metal Halide Lamps

Automobile Headlights (new use, xenon-mercury-halide)

‘CS – compact source mercury lamps’ (photographic, lab uses)

‘Special mercury lamps’ (UV properties)

Neon lamps (most colors except red, orange, pink)

Spectral lamps – monochromatic light source for laboratory and research applications

Cold Cathode Lamps – Illumination

#### Germicidal Lamps

Hot cathode

Cold Cathode

Slimline

Possibly a component of cathode ray tube phosphors

Electronic Properties/Semiconductors: Mercury-cadmium telluride semiconductors/Infrared sensors; extensive defense and satellite users; no substitute with comparable performance for many applications; use limited by need to operate at low temperature (80k) for most applications; one researcher estimates annual consumption at 100 pounds, but significant amounts of waste are generated since material is sprayed onto substrate. PV semiconductors can be used at room temperature for ‘short wavelength infrared’ (SWIR) applications, 1 to 3 um

Photovoltaic

Photoconductive-primary type in use, for tactical applications

### Chemical Compounds and Applications

#### Medical, Pharmaceutical, cosmetic/human contact

Vaccines and other biologic products (US FDA has responded to FOIA request)

Homeopathic Medications (at least 17 compounds used, many applications)

OTC Nasal sprays (preservative)

OTC Ophthalmic and contact lens products (preservative)

Eye area cosmetics (up to 65 ppm mercury) (preservative)

Hemorrhoid ointments and creams (preservative, discontinued early 1995)

Teething powder (discontinued in early 1950’s)

OTC disinfectants (mercurochrome, tincture of merthiolate, both alcohol solution’s)

Merbromin/water sol’n used in plastic/reconstructive surgery as disinfectant and marker

Mercuric chloride peritoneal lavage in cancer surgery (Great Britain)

Skin Bleaching creams (OTC discontinued in US by the early 1970’s, available by prescription?)

Diuretic (mersalyl and salts are still manufactured, extent of use unknown)

Traditional Chinese medicine

Spiritual use

Tattoo pigments (discontinued in the US likely in the 1970’s)

#### Medical and Laboratory/no human contact (active ingredient or preservative)

Tissue fixatives for pathology, Zankers, B5, others

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Tissue stains (Harris hematoxylin stain may be mercury free)  
Haymen diluting fluid (for red blood cell count; contains mercuric chloride)  
Reagents for various diagnostic and laboratory tests  
    Arsenic-Calcium reagent (260 ppm)  
    Precision reagent (240 ppm)  
    CPK reagent (2.7 ppm)  
    Colorimetric chloride analysis (mercuric thiocyanate or mercuric nitrate titration; alternative method silver nitrate)  
    Nessler's reagent /Channing's solution (mercury potassium iodide, used for:  
        Total Kjeldahl nitrogen, no apparent alternative method  
        Nitrogen-ammonia (USEPA accepted and approved) alternative method salicylate  
    Millon's reagent (mercury-nitric acid solution, for albumin)  
    Salinity (mercuric nitrate titration, alternative methods unknown)  
Radiometer (brand) gas analyzer reference electrode  
ESA (Brand) Model 3010B Lead Analyzer Electrode, Metexchange reagent, plating solution (used for testing blood samples)  
Preservative in various products such as early pregnancy kits and possibly in similar diagnostic products  
Thimerosal used as a preservative for sucrose buffers in disc electrophoresis

#### Veterinary Medicine and other Veterinary/livestock uses:

Vaccines: Thimerosal 1:10,000 approved by USDA for use in leptospirosis bacterium vaccines for cattle, swine, and dogs

#### Other Medications:

Dip-a-way (contains merbromin, mfd by universal aquarium systems)  
Wound Control (contains merbromin, mfd by universal aquarium systems)  
RX ICK control (contains merbromin, mfd by Wardly Corp.)  
Aqueous Red mercury blister (contains mercuric iodide, mfd by QA Laboratories/P.C. Laboratories)

Udder wash with thimerosal-discontinued many years ago

#### Pesticides

All food uses canceled in 1969 and all US pesticide registrations canceled by early 1995  
Last four uses to be canceled fungicides, mildewcide for fresh cut wood, latex paint  
    Fungicide/preservative, and outdoor fabric treatment  
Marine anti-fouling paint (discontinued in 1970's)

#### Pigments

Reds and oranges always used with cadmium; reportedly the only remaining manufacturer is SLMC in France. Used in engineering plastics where high temperature stability is required. Past uses included many automotive parts, vinyl, ABS, polycarbonate. Today's cadmium sulfide based pigments (also contain Se, Ca, Zn) are more stable.  
    High heat orange paint (primarily automotive use) reported by one paint manufacturer  
    One US auto manufacturer reports discontinuing a mercury-containing color concentrate used in plastic component manufacturing.

#### Catalysts (primarily for urethane and vinyl)

Polymer curing  
Monomer production  
Acetylene Production (probably no longer in use)  
Production of vinyl from acetylene  
Anthraquinone production (no further or confirming information at this time)

#### Other

Battery electrode (mercuric oxide battery, mercury-cadmium battery)  
Battery anti-gassing (zinc anode coating in alkaline, carbon zinc batteries)

#### Fireworks

No longer used by US manufacturers. May be used in manufacturing elsewhere  
Explosives: Mercury fulminate apparently no longer manufactured

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School Laboratory experiments and demonstrations: Mercury and compounds are often used in lab experiments and demonstrations. These are particularly prone to mismanagement and release. They also generate hazardous non-recyclable products. Chemical principle and phenomena can be demonstrated with less toxic or non-toxic substances or with videotapes of experiments that use mercury.

**Amalgamating properties and amalgams**

Dental

Gold Mining/extraction (used in small scale 'artisanal' mining, large scale mining reportedly uses other chemical or mechanical processes)

Mirror silvering (tin amalgam, discontinued about 1900, painted back mirrors are non-mercury)

Gold porcelain paint (unable to confirm or refute use of availability in US)

**Home Uses (and misuses) that have resulted in documented mercury poisoning (a sampling)**

Fabrication of fishing sinkers with mercury, lead, copper, and solder (heating)

Gold Smelting (heating)

Recovery of silver from dental amalgam (heating)

Recovery of mercury from products such as batteries (heating)

Use of interior latex paints with high mercury preservative levels (ambient temperatures)

Vapor exposure from spilled mercury and broken products such as thermometers (ambient temperatures)

Consumption of treated grain or meat from animals fed treated grain

Fluorescent lamp breakage/acrodynia in 2 year old (ingestion/inhalation)

Use of 'folk' or 'traditional' medicines containing mercury (ingestion/inhalation)

"Quicksilver Maze" toy

LA Gear's "My Lil' Lights" if bought before June 1994 (shoes that light up)

Etch-a-sketch

**Cleaning Solvents**

Ajax Powder

Comet Cleaner

Lysol Direct

Soft Scrub

Alconox Soap

Derma Scrub

Dove Soap

Ivory Dishwashing

Liquid Joy Dishwashing

Liquid Murphy's Oil Soap

Soft Dish soap

Cidex

**Description of Mercury bearing Applications and Appliances**

**Batteries**

**Description:** Batteries are found in a variety of different appliances, toys and household items. They are commonly found in many sizes, shapes and brands. Alkaline, nickel cadmium, and mercuric oxide are the most common types of batteries found in the home. These batteries are used in cameras, watches, clocks, cell phones, cordless phones, electric razors, portable radios, pagers, computers, calculators, and a variety of toys.

Type of battery	Examples of Use	Mercury Content
<b>Alkaline</b>		
Cylindrical or rectangular cells; the most commonly recognized battery. Labeled "alkaline"	Flashlights, radios, toys, calculators, remote controls, electronic games, portable radios and televisions, garage door openers.	Previously contained an average of 0.5 percent mercury to control the zinc reaction. Alkaline button batteries contain no more than 25 milligrams of mercury.

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<b>Zinc Carbon</b>		
Cylindrical or rectangular cells; labeled as "General Purpose", "Heavy Duty", or "Classic"	Best used in slow drain applications like clocks, garage door openers, pagers, and smoke detectors. Have much shorter life span than alkaline batteries.	
<b>Silver Oxide</b>		
Button shaped with no distinguishing marks.	Watches, calculators, toys, greeting cards, musical books.	Contain about one percent by weight.
<b>Zinc Air</b>		
Usually button shaped. Identify by pinhole on one side.	Hearing aids	Contain about one percent mercury by weight.
<b>Mercuric Oxide</b>		
Button shaped, marked with larger mercuric oxide batteries looks like 9-volt or fat AA batteries.	Hearing aids, watches, and other items requiring a small battery. In consumer applications, zinc air button cells are replacing mercuric oxide batteries. The larger mercuric oxide batteries are often used in military, hospital, or industrial uses.	Contain significant amounts of mercury, total 33 to 50 percent by weight of battery.

**Alternatives:** Substitute zinc air or silver oxide batteries for your mercuric oxide (mercury-zinc) batteries.

### Fluorescent Lamps

**Description:** Usually used as indoor lighting; the most common is the tube style, which serves as overhead lighting in offices and businesses. A newer style is the compact globe shape for home or office use. The U-shaped bulbs have also been implemented in many offices and homes as well. Some fluorescent lamp names are bilirubin blue, general-purpose straight, U-shaped, circuline, compact, high output. Germicidal lamps such as, cold cathode, hot cathode, and slimline.

**Alternative Devices:** Fluorescent lamps are an excellent lighting choice because they are more energy efficient. However, it is essential that fluorescent lamps be disposed of properly, so as not to allow the mercury to enter the environment. The best disposal method is recycling. Low mercury fluorescent lamps are now available. These lights use less mercury.

**How to Locate the Device:** Fluorescent lamps are located in offices and businesses. The most common style is the long, skinny tube used in overhead indoor lighting. Compact globe styles are also used in homes and offices.

### High Intensity Discharge Lamps

**Location & Description:** Most HID lamps are used in security, outdoor, or warehouse applications. Probable locations are parking-lot light poles, warehouse rafters, and the outside walls of buildings. There are three types of HID bulbs; mercury vapor, high-pressure sodium, and metal halide. All three contain mercury.

**Alternative Devices:** There are few alternatives for mercury containing HID lamps. The lamps provide high intensity, energy-efficient light. For this reason, the lamps should continue to be used. However, it is extremely important to properly recycle the lamps to keep the mercury used out of the environment.

### Ballast

**Location & Description:** Ballasts are located in many electrical appliances and light fixtures. They are used as a power regulator and contain toxic materials. Extreme caution should be taken when removing older ballasts from outdated appliances; these devices may contain PCB's and may be leaking.

**Alternatives:** No alternatives are currently available. These items should be recycled or disposed of as hazardous waste.

**Safe Removal:** To remove the ballast from a light fixture, start by shutting off the power at the service panel. With the power off, lift the diffuser from the fixture and remove the bulbs. This will reveal a channel cover that conceals the fixtures ballast and socket wiring. To remove this sheet metal cover, squeeze its sides until they clear the support tabs that are stamped into the fixture channel. With the channel cover removed, pull the lead wires from the ceiling box and undo the wire connectors, and remove the ballast.

### Mercury Containing Thermostats

**Description:** Mercury-containing thermostats use mercury tilt switches.

**How to Identify:** Most thermostats, other than electronic thermostats, contain mercury. To determine if a thermostat contains mercury, remove the front plate. Mercury-containing thermostats are usually constructed with one to as many as six glass ampoules containing elemental mercury.

**Alternative Devices:** Programmable electronic thermostats are mercury free. In addition, they are more energy-efficient than the mercury models. Look for programmable electronic thermostats that have the Energy Star label.

### Mercury Containing Switches

**Description:** Mercury is contained in temperature-sensitive switches and mechanical tilt switches. Mercury tilt switches are small tubes with electrical contacts at one end of the tube. Reed switches are small circuit controls that are used in electronic devices. A third type, Float switches, are used in sump pumps and bilge pumps to turn the equipment off when water reaches a certain level.

#### **Common Applications**

##### **Switches:**

- G-Sensors (alarms)
- Proximity Sensors, magnetically activated
- Wetted reed relay/wetted reed switch: test, calibration, measurement equipment

##### **Displacement/Plunger Relays:**

- Power supply switching
- Resistance Heating
- Tungsten Lighting
- Welding

##### **Tilt Switches**

- Silent wall switches
- Airflow/Fan limit controls (attic fans)
- Building security & fire alarms (tilt & trembler devices)
- Chest Freezer Lids
- Cameras (still, video, film)

- Fluid level control (mounted on float, on lever arm, on diaphragm or on plunger of sump pump)
- Greenhouse louver positioning devices
- Laptop computer (screen shut-off when closed)
- Pneumatic tube communication systems
- Portable Phones
- Pressure control
- Temperature controls
- Thermostats
- Washing machine lids (spin-cycle shut-off)
- Car hood and trunk lighting
- Gas regulator or meter
- Flow meter
- Gas appliances

**How to Identify:** A mercury switch is usually present when no mechanical switch is visible. They are used in thermostats, silent light switches, clothes washer lids, and chest freezers. Float switches, on the other hand, are visible.

**Alternative Devices:** Alternatives to mercury switches include hard-contact switches, solid-state switches, electro-optical switches, inductive sensors, capacitive sensors, photoelectric sensors, and ultrasonic sensors.

**How to Locate the Device:** Mercury tilt switches are used in a number of ways including light switches, chest freezers, and washing machine lift covers. These switches are typically found in furnace controls, light and traffic controls, lab equipment, high voltage industrial equipment, and motors. If a switch is suspected to be a mercury switch, remove the cover plate and look for the word "TOP" stamped on the upper end of the switch. If it is present, it is most likely a mercury switch.

### Silent Wall Switches (light switches)

**Description:** Mercury light switches are sometimes encountered in older buildings. These devices look like typical wall switches, but they do not make the audible "click" sound when activated. They operate on the principal of liquid mercury in a metal encased glass button that completes the electrical circuit when the switch is lifted up, submerging an electrical contact point. These switches

are often referred to as "silent switches."

### **Mercury Containing Float Switches (Sump pumps and Septic tanks)**

**Description:** Float switches are used to maintain a given level of liquid. The float switch is a round or cylindrical float with a switch attached to it. (Sump pumps and septic tanks)

**Alternative Devices:** New versions of float switches are mercury free.

**How to Locate The Device:** Float switches are used in plants where levels of liquids such as water, oil or sewage need to be monitored. Sometimes float and level switches are hidden inside storage tanks and are not always visible. When this is the case, follow electrical leads from the control unit to the switch. Float switches usually have a large hollow float.

### **Washing Machines**

**Description:** Mercury tilt switches are used to shut off the spin cycle when the cover is opened on clothes washers. If no mechanical switch is visible or audible, suspect a mercury switch. It is typically mounted to an arm on the lid, which is concealed under the cover. Mercury tilt switches are known to have been used on Whirlpool, Kenmore, and Maytag washing machines.

**How to identify:** Whirlpool/Kenmore mercury switches are typically a blue or black plastic cylinder about a half-inch in diameter and one and a half inches long, with two wires. Most or all Maytag switches are glass of comparable size and the mercury is visible.

### **Freezers**

**Description:** Some chest freezers made with an internal lid light have a mercury switch incorporated in the light socket. If a chest freezer has a light in the cover and no visible mechanical switch, then it contains mercury switches. This device senses when the lid is raised and turns on the light.

**How to Identify:** The following steps will allow you to remove the switch and store it properly. The mercury is usually found in the rubber or plastic housing that holds the lamp. Some of the housings are marked "Hawkeye."

### **Vacuum Gauges/Manometers**

**Name:** Vacuum Gauges, Manometers, barometers

**Description:** The mercury in these devices responds to air pressure in a precise way that can be calibrated on a scale. Needle or Bourdon gauges operate under a vacuum with a needle indicator. Mercury manometers are used to calibrate these devices, it is necessary to properly maintain the manometer and check for leakage. If the manometer is hard to read because of dirt or moisture, the manometer is leaking and must be removed.

### **Mercury Containing Flow Meters**

**Description:** Flow meters are used for measuring the flow of liquids and gases, and steam pressure.

**How to Identify:** If the equipment has been replaced and or repaired, check drains located nearby for possible contamination. Always assume that the flow meter does contain mercury until you can obtain information from the manufacturer. Some devices contain large quantities of mercury - 5 kilograms and more.

**Safe Removal:** When pouring out mercury from the gauge (the flow is generally heavy) be sure to pour into a sturdy sealed container.

**Safe Disposal:** The parts that have been in contact with mercury should be managed as hazardous waste.

### **Mercury-Containing Flame Sensors**

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**Description:** The metal flame sensor consists of a metal bulb and thin tube attached to a gas-control valve.

**How to Identify:** Several types of gas-fired appliances that have pilot lights and mercury safety valves, like **ranges, deep fryers, grilles, griddles, ovens, clothes dryers, hot water heaters, furnaces, and space heaters, air conditioners and gas refrigerators** use mercury-containing flame sensors. Some makers that have routinely used these products include Robertshaw and Harper-Wyman. See attached pages for further reference of White-Rodgers Product catalog. Flame sensors are commonly found in many natural gas powered devices.

**Description:** Numerous heating/cooling devices used in commercial, residential and industrial properties contain mercury switches and thermostats some examples include: Unit heaters, furnaces, steam recorders in boiler panels, space heaters, gas fired refrigerators, gas fired air conditioners. All these gas products contain mercury flame sensors to monitor the temperature. Electric space heaters contain mercury tilt switches as well as a shut-off device if the heater tips over. All gas refrigerators and central air conditioners use flame sensors and contain mercury devices except for Norcold model 1082, and Norcold 600, 900, 1200 series gas or gas/electric refrigerators.

**Alternative Devices:** Electric flame sensors are mercury-free and have been used in some appliances. However many electronic pilot devices have a mercury safety valve.

**Safe Removal:** To prevent mercury from leaking out of the sensor, *all 3 parts must remain attached*. To achieve this, simply remove all the fasteners near the sensor control and sensor valve.

### Mercury in Pipes

Mercury is often found in dentist's offices in the form of amalgam, a compound containing about 50% mercury, which is used in dental fillings. Other buildings such as schools and laboratories should also be inspected for mercury in the drainpipes. Below are some tips for inspecting drainage pipes.

- Mercury tends to sink and deposit at the bottom of pipes.
- Mercury is most likely to collect in low spots along piping or tillage.
- When cutting pipes, be careful not to cut the bottom half of the pipe or lower sections of pipe. This will cause the mercury in the amalgam to vaporize and be dangerous to workers.
- Once the pipes have been cut open, examine the mud at the bottom of the pipe to see if there is mercury in it. You may need a mercury "sniffing" device or a hazardous materials worker to help you.

### Rubber Floors

**Name:** Mercury Containing Rubber Flooring

**Description:** Rubber flooring containing mercury compounds.

**Safe Disposal:** Dispose of the floor by contacting your local mercury handling facility.

### Mercury Containing Equipment Checklist:

- |  |   |
|--|---|
| <input type="checkbox"/> Anti-Fouling Agents   | <input type="checkbox"/> Float switches (in bilge pumps, chemical feed pumps, septic tanks, and sump pumps) |
| <input type="checkbox"/> Anti-tamper Devices of Payphones  | <input type="checkbox"/> Fluorescent lights   |
| <input type="checkbox"/> Barometers  | <input type="checkbox"/> Furnaces and heating systems   |
| <input type="checkbox"/> Batteries (see above chart)   | <input type="checkbox"/> G-Sensor security systems use mercury in some applications                         |
| <input type="checkbox"/> Bubblers/traps (mercury)  | <input type="checkbox"/> Heating and ventilation equipment  |
| <input type="checkbox"/> Cathode-ray oscilloscopes   | <input type="checkbox"/> High Intensity Discharge (HID) Lamps   |
| <input type="checkbox"/> Coulter Counters with manometers  | <input type="checkbox"/> High Voltage Equipment   |
| <input type="checkbox"/> DC Watt Hour Meters   | <input type="checkbox"/> Hot water heaters  |
| <input type="checkbox"/> Diffusion pumps   | <input type="checkbox"/> Household appliances   |
| <input type="checkbox"/> Distillation salts  | <input type="checkbox"/> Lamps (see above chart)  |
| <input type="checkbox"/> Dropping Mercury Electrode (DME) technique for polarography and voltammeter | <input type="checkbox"/> Manometers for calibration   |
| <input type="checkbox"/> Fan and air vent controls   | <input type="checkbox"/> Natural gas powered equipment  |
| <input type="checkbox"/> Fire Alarms   | <input type="checkbox"/> Otoscopes  |

Prepared by: Jim Giordani, Burlington Board of Health, Revised 12/27/00  
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- |   |   |
|---|---|
| <input type="checkbox"/> Pool alarms  | <input type="checkbox"/> Steam recorders in boiler panels                       |
| <input type="checkbox"/> pH meters  | <input type="checkbox"/> Switching equipment for telecommunications             |
| <input type="checkbox"/> Plunger/displacement relays (see above chart)            | <input type="checkbox"/> Temperature control or environmental testing equipment |
| <input type="checkbox"/> Products containing preservatives (see chemical sheet)   | <input type="checkbox"/> Thermometers   |
| <input type="checkbox"/> Rubber flooring  | <input type="checkbox"/> Thermostats  |
| <input type="checkbox"/> Security Alarms (e.g. automotive, building and computer) | <input type="checkbox"/> Thermostat probes                                      |
| <input type="checkbox"/> Sequential Multiple Analyzers                            | <input type="checkbox"/> Tilt Switches (see above chart)                        |
| <input type="checkbox"/> Silent light switches                                    |   |

**References:**

This guide was compiled by Jim Giordani, of the Burlington Board of Health with reference from Janet Bowen of EPA region 1 and John Gilkeson of Minnesota Office of Environmental Assistance.

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