

HOT PLATE SAFE WORK PRACTICES

Purpose

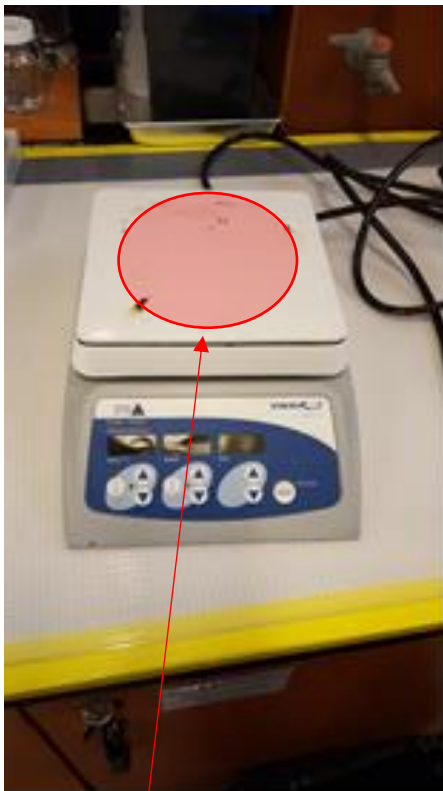
The Safety Office has received numerous hot plate near miss reports over the last several years. This document highlights examples of known hot plate risks and provides guidelines on mitigating against these risks.

Examples of Incidents Resulting from Hot Plate Malfunctions

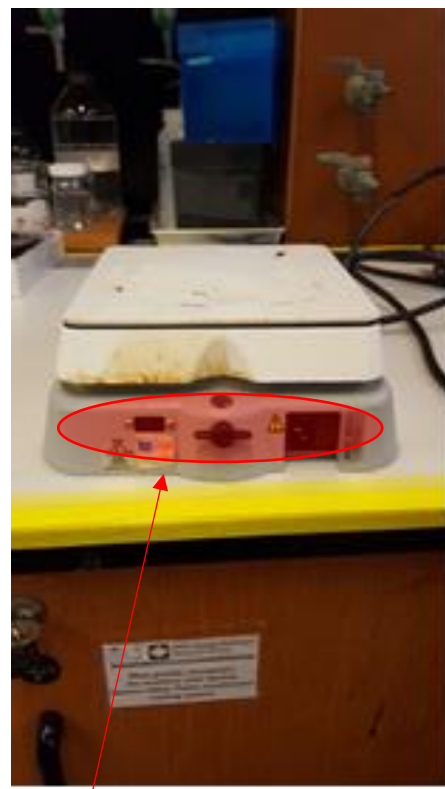
University of Waterloo

Incident 1

On April 16th, 2019, researchers smelt a burning odour as they entered the laboratory. After searching the lab, they came upon a VWR digital hot plate that was glowing red-hot. The hot plate was plugged in, but the stirrer and heater were both off. The fire potential was extremely high if this would have occurred after hours.



This was glowing red



This section warped from heat

Incident 2

On February 15th, 2023, a worker was walking past a fume hood and identified an unattended hot plate in the on position. They decided to turn off the hot plate, but because this model allowed for the dial to be rotated fully without a stop at the off position, the worker actually turned it hotter rather than turning it off. This caused the materials on the hotplate to begin splattering and smoking.



You can see how easy it would be to accidentally turn the dial to the wrong setting

University of Pennsylvania

Incident 1

On May 12, 2012, a fire occurred when a hot plate was left on and ignited combustible materials in the laboratory.



Incident 2

In July 2014, a chemistry graduate student entered the lab in the morning and found that his fume hood was on fire. The fire originated from a hot plate that was left plugged in overnight but was reportedly not turned on or being used for any experiment at the time. The suspected cause was a malfunction of the Corning PC-320 hot plate, which may have spontaneously heated to maximum temperature.



Lawrence Livermore National Lab

In 2003, a researcher switched off a hot plate off by placing the dial at “o.” The researcher noted that the switch “clicked” into the off position and the power indicator light extinguished. However, the heating coils remained energized, eventually overheating a beaker of oil on the hot plate and initiating a fire in the fume hood.



Defective Hot Plate



Damaged Fume Hood

Equipment Issues

Older Equipment

Hot plates manufactured prior to 1984 do not have temperature feedback controls and can spontaneously and rapidly heat beyond the set temperature while in the ON position. Models known to exhibit this problem include the Corning PC-35, PC-351 and the Thermolyne SP46925.

Newer Equipment

Turning the hot plate power to OFF does not disconnect the heater from the electrical source. Processors are running as long as the unit is plugged in. In the event of a firmware glitch, the unit may still begin to heat when the switch and light are off. Newer models with TRIAC or microprocessor-controlled heater switches may spontaneously heat when liquid comes into contact with the electronics.

Exposure to elements such as cold, moisture, corrosive gas, and vapor are known to increase the chance of processor failures. This problem has occurred in nearly new equipment.

Follow These Guidelines for All Work Involving Hot Plates

Using Hot Plates

- Turn off and unplug hot plates when not in use.
- Use stir-only plates when heat is not required. This is especially important when:
 - Stirring is required for a prolonged period or if the reaction will be left unattended for some time.
 - Mixing or stirring materials that should not be exposed to heat (such as flammable or explosive materials).
- Prior to use, check the electrical cord for signs of damage. Do not use if the plug or cord is worn, frayed, or damaged. Do not use if the grounding pin is removed or a spark is observed. Should these conditions exist, dispose of it at Chemstores.
- Do not store flammable or combustible materials near hot plates. Chemical containers, flammable liquids, and combustibles such as paper towels, cardboard, and benchkote can easily ignite in the presence of a heat source.
- Periodically test the function of the OFF switch. If when switched off, the hot plate does not cool rapidly, label the hot plate as “damaged” and dispose of it at ChemStores.
- Use only heat-resistant borosilicate glassware, and check for cracks before using. Do not place thick-walled glassware, plastic containers, soft-glass bottles or jars on a hot plate.
- The hot plate surface should be larger than the vessel being heated.
- Use a medium to medium-high setting to heat most liquids including water. Do not use the high setting to heat low-boiling liquids. The hot plate surface temperature can reach up to 540°C.

- Do not place metal foil or metal containers on the hot plate. The top can be damaged and a shock hazard may result.
- Unattended operation of a hot plate is not recommended. If unattended operation is desired, a detailed reaction plan should be submitted to your supervisor for approval PRIOR to commencing work.

Purchasing a New Hot Plate

- When acquiring new hot plates, select a housing design that is hermetically sealed to protect electronics from liquids and gases. In addition, look for two independent temperature control circuits that shut off power when the temperature exceeds a selected limit.
- Register the device with the manufacturer. This will allow you to obtain product updates and information on potential recalls.

Resources

[Catching up with Runaway Hot Plates](#)