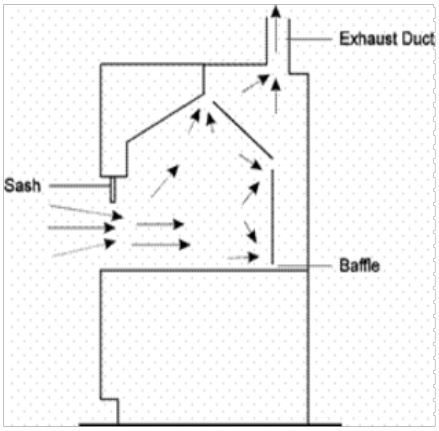
Fume Hood Safety



Fume hoods exhaust toxic, flammable, noxious, or hazardous fumes and vapors by capturing, diluting, and removing these materials. Fume hoods also provide physical protection against fire, spills, and explosion. Laboratory fume hoods only protect users when they are used properly and are working correctly. A fume hood is designed to protect the user and room occupants from exposure to vapors, aerosols, toxic materials, odorous, and other harmful substances. Fume hoods provide the best protection when the fume hood sash is in the closed position. All chemical fume hoods must be ducted to the outside of the building.

TYPES OF FUME HOODS

Constant Air Volume Hoods (CAV)
CAV fume hood exhausts the same amount of air all the time, regardless of sash position. As the sash is lowered and raised, the velocity at the face of the hood changes. The opening is marked where the correct face velocity occurs.

Variable air volume hoods (VAV)
VAV hoods modulate air flow based on sash height and maintain 100 ft/min face velocity at all sash heights. They are equipped with a monitor that indicates whether the hood is in the “standard operation” or “standby operation” mode. The fume hood monitor also has an “emergency purge” button, which increases airflow through the hood to maximum and can be used to quickly remove air contaminates from the lab. VAV fume hoods are equipped with flow sensors that activate an audible alarm when malfunctions occur.

Biological Safety Cabinet

A biological safety cabinet, (BSC), is used for work with infectious agents. BSCs are designed to protect the worker and the environment from biological agents, and to protect the research materials from contamination. BSC's are manufactured in three different classes (Class I, II and III). The common feature in all BSCs is the high efficiency particulate air (HEPA) filter. HEPA filters can remove particles down to 0.3 microns with 99.97% efficiency and will trap most bacteria and viruses. Vapors (from ethanol, formalin, etc) and gases will not be captured and removed by the HEPA filter. Contact ESCO for use of a BSC.

Laminar Flow Cabinet

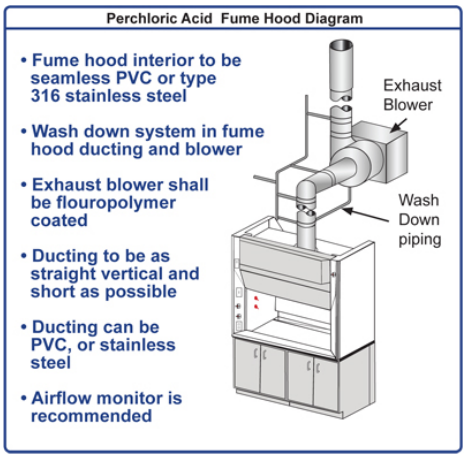
A **laminar flow cabinet** or **laminar flow closet** or **tissue culture hood** is a carefully enclosed bench designed to prevent contamination of semiconductor wafers, biological samples, or any particle sensitive materials. Air is drawn through a HEPA filter and blown in a very smooth, laminar flow

towards the user. The cabinet is usually made of stainless steel with no gaps or joints where spores might collect. Such hoods exist in both horizontal and vertical configurations, and there are many different types of cabinets with a variety of airflow patterns and acceptable uses.

Glove Box

For highly toxic materials a glove box or another containment device is preferred over a chemical fume hood. They can be configured as negative pressure to protect the operator against hazardous or infectious agents. or as positive Pressure glove box to protect sample and products against airborne particles. Contact the ESCO before using a glove box.

Perchloric Acid Hoods



A conventional fume hood must not be used for perchloric acid. Perchloric acid vapors can settle on ductwork, resulting in the deposition of perchlorate crystals. Perchlorates can accumulate on surfaces and have been known to detonate on contact, causing serious injury to researchers and maintenance personnel. Specialized perchloric acid hoods, made of stainless steel and equipped with a wash down system must be used for such work.

FUME HOOD SAFETY PRACTICES

- Ensure the exhaust is operating before beginning work. Check the baffles for obstructions. If the hood is fitted with an airflow monitor, check the monitor's status. Even while working, be alert to changes in airflow.
- Keep front air foil clear – don't block with lab bench liner
- When using the fume hood, keep your face outside the plane of the hood. Use the sash for partial protection during hazardous work.
- Work at least 6 inches inside the front edge of the hood, not on the edge.

- Do not stick your head into the hood.
- Use appropriate personal protective equipment such as splash goggles and gloves. This enhances safety in case of catastrophic spills, run-away reactions or fire. Wear a full face shield if there is possibility of an explosion or eruption.

- If there is a need for Safety/blast shields within the hood, they should be obtained separately; the sash alone should not be used as safety/blast shield.
- Do not make quick motions into or out of the hood, use fans, or walk quickly by the hood opening. These will cause airflow disturbances which reduces the effectiveness of the hood.
- When using large apparatus inside the hood, place the equipment on blocks, when safe and practical, to allow air flow beneath it.
- Substitute with less hazardous or less volatile chemicals where possible.
- **Do Not** store chemicals, equipment, or other materials in hoods. Unnecessary storage increases the chances of a small fire or explosion and decreases the required air flow.

- Keep sash below the mark on the hood frame for achieving the best face velocity and close it when the hood is not being used.
- The hood should be kept closed, except during apparatus set-up or when working within the hood is necessary. Keep the sash closed when not in use to maximize energy conservation.
- If the alarm activates, lower the sash a little until the alarm stops – Do Not disengage or over-ride the alarm (contact maintenance or the ESCO if your alarm sounds consistently).
- If any hazardous material is spilled or splashed inside the hood be sure to clean it up right away. Leave the hood surfaces clean.
- Care should be taken with the use of paper products, aluminum foil, and other lightweight materials within a hood. For example, a single paper towel or chemical wipe can potentially decrease the airflow into the hood if it restricts exhaust flow.
- Do not place electrical receptacles or other spark sources inside the hood when flammable liquids or gases are present. No permanent electrical receptacles are permitted in the hood.
- Should the fume hood malfunction in the middle of a procedure that releases hazardous fumes, mists, or particulates, follow this emergency plan:
    - Terminate all electrical and gas supply.
    - Pull the sash all the way down to the close position.
    - Alert supervisor and neighboring labs, advising everyone to evacuate the area.
    - Post “DO NOT ENTER, HAZARDOUS FUMES” on the entrance door **if** doing so will not compromise your safety.
    - Call maintenance (x8334) and the ESCO (x8441) to report the emergency and arrange for fume hood repair.

WORK ON FUME HOOD FANS AND EXHAUST DUCTS

If you work on the inside of the ductwork or on the fans, follow this procedure:

1. Notify the group that owns the hood five days before the work is to begin. Tell them that they won't be able to use the hood during the work. The lab must also take every container out of the hood for the duration of the shutdown.
2. Notify the Environmental Safety Compliance Officer (ESCO) and the Facilities Manager of the shutdown. The ESCO must verify that it has been cleaned and is safe to perform work on it.
3. Following the standard lockout procedure, lock off the fan and lock the sashes closed on all the fume hoods connected to the fan and ductwork.
4. Steam clean, pressure wash or clean with warm soapy water and a brush any parts that might be contacted during the work. Collect all the wash water for disposal if hazardous.

The person doing the cleaning must wear chemical splash protection during the procedure, including:

- Lab coat or apron,
- Disposable latex or neoprene gloves, and
- Full or half face respirator and splash goggles. The respirators should have high efficiency particulate air filters (HEPA).

WORK ON THE ROOF NEAR FUME HOOD EXHAUST STACKS

If maintenance/repair work must be done on the roof near hood exhaust(s), Facilities must first request the PI to provide them with information regarding chemicals used in their fume hoods on a regular basis and as requested. Contact the ESCO if necessary.

Tall Stacks
Work may occur around the exhaust stacks if they are at least eight feet high; stay out of the airstream.

Shorter Stacks
If the exhaust stack is less than eight feet, work upwind of the stacks or at least ten feet away from the stack.

Horizontal Stacks
If the wind is blowing in the same directionas the stack blows, work up-wind of the stack. Otherwise, stay off the roof.

If it is not possible to follow these procedures, contact the safety officer.

For more information and/or suggestions contact the Environmental Safety Compliance Officer (ESCO) at Ext. 8441 or Email hpl-safety@hpl.umces.edu