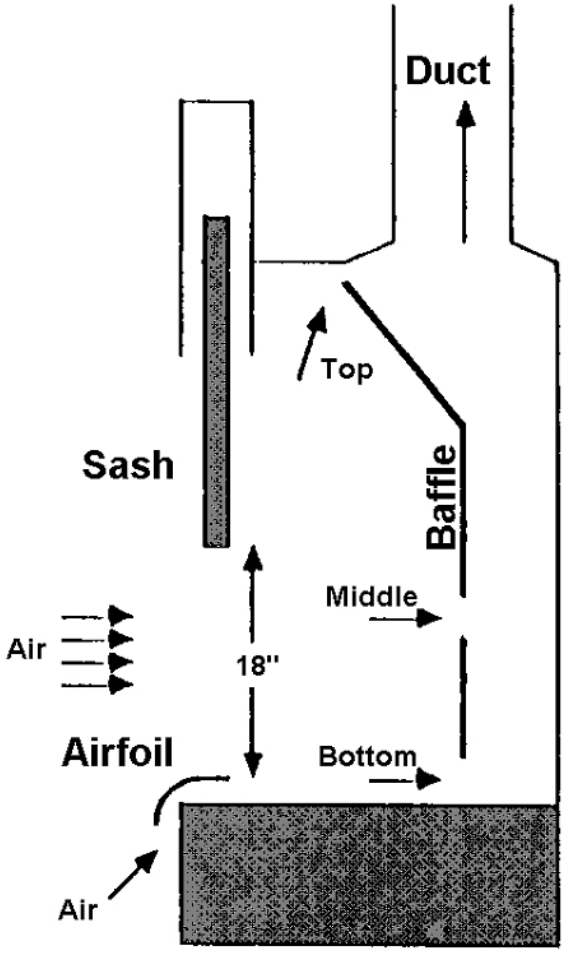
Fume Hood Inspection Program

Introduction

A fume hood is a ventilated enclosure used to contain gases, vapors and fumes. It is one of the most effective devices used to protect researchers from air contaminants associated with irritating and/or hazardous chemicals. Following safe work practices and understanding the limitations of fume hoods is imperative to ensuring adequate protection. Below is a diagram listing the basic parts of a chemical fume hood.



Sash- The sash is the glass "window" that travels in the plane of the hood face that opens or closes the hood and protects the user during use.

Baffles- The baffles are located in the back of the hood and direct air in the appropriate direction. The baffles can also be adjusted to account for different vapor densities of chemicals (i.e., chemical contaminants that are heavier than air or lighter than air).

Duct- The duct connects the hood to the ventilation system and exhausts to the outside air.

Air foil- The air foil is fixed to the bottom front edge of the hood and is a vent that keeps a minimum gap open at all times but more importantly gives aerodynamic properties that allow better, less turbulent air flow and better capture.

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Types of Fume Hoods

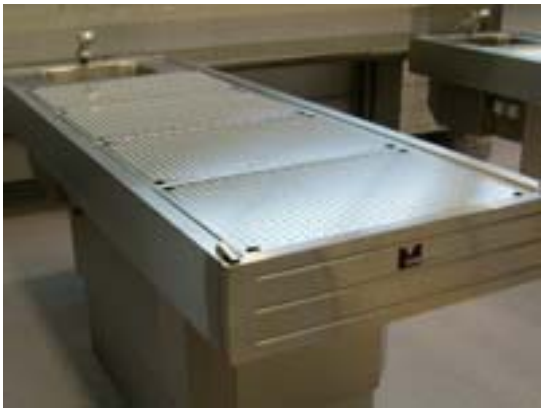
There are two main types of chemical fume hoods used in laboratories at the University.

1. ***Constant Volume*** fume hoods permit a stable air balance between the ventilation systems and exhaust by incorporating a bypass feature. This type of hood generally operates at a constant volume and is designed so that as the sash is closed, the air entering the hood is redistributed through openings above and below the sash area. The bypass feature minimizes the high velocity air streams encountered in conventional hoods by reducing fluctuations in face velocity as the sash is raised or lowered.

2. ***Variable Air Volume (VAV)*** fume hoods maintain constant face velocities by varying exhaust volumes in response to changes in sash position. Because only the amount of air needed to maintain the specified face velocity is pulled from the room, significant energy savings are possible when the sash is closed.

In addition, other types of fume hoods or ventilation controls may be required for specific applications or procedures.

1. ***Downdraft hoods*** are specially designed for work areas with ventilation slots on the sides of the work area. Unlike conventional fume hoods, the blower is usually mounted below the hood work area so that air is pulled down through a mesh work surface and then exhausted to the outside. This type of system is often used for animal perfusions and other uses of chemicals with vapor densities that are heavier than air.



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2. ***Canopy hoods*** are primarily designed to remove steam, heat or odors from large or bulky apparatus such as ovens, steam baths or autoclaves. Vapor removal is most efficient when the canopy is mounted no more than 12" above the equipment being ventilated. Because it is inefficient and ineffective in containing fumes, the canopy hood is not recommended for ventilating hazardous substances.

3. ***Perchloric Acid hoods*** are dedicated for use with perchloric acid only. Organic materials should not be used in a perchloric acid hood because an explosion may occur when perchloric acid reacts with organic materials. Perchloric acid hoods must be constructed of relatively inert, impervious materials (e.g. Type 316 stainless steel) and require a dedicated exhaust system with wash-down capability. Wash-down features are critical to prevent the accumulation of potentially reactive perchloric acid salts.

4. ***Ductless fume hoods*** are not connected to an exhaust system and rely on filters to trap vapors and fumes before air is recirculated to back to the lab. The filters are usually made of specially treated or activated charcoal media that treat or adsorb chemical fumes including certain organic solvents, ammonia, acids and formaldehyde. ***Since these enclosures recirculate filtered air back into labs, they are often strongly discouraged.*** These hoods are mainly used for applications involving small quantities of chemicals. Regular monitoring of the hood as well as frequent replacement of filters is essential to safe operation.

5. ***Glove boxes*** consist of a sealed chamber with glove ports and gloves for handling materials inside, a viewing window for observing, and transfer chamber or door for loading and unloading. Because they provide a physical barrier between the operator and the substances inside, glove boxes are appropriate for applications that require the greatest protection against inhalation of substances used within them. Some glove boxes used for hazardous materials such as carcinogens filter the chamber air prior to exhausting it through a duct system to the outside. Other glove boxes used for containing atmosphere-sensitive materials may or may not be ducted to the outside.

Fume Hood Inspections

Environmental Health & Safety (EHS) surveys all constant velocity and variable air volume fume hoods annually to ensure proper flow rates. The parameters used to assess proper flow rates are listed in the table below.

Hood Sticker	Flow Rate (linear feet/minute)	Recommended Action
Green	**80-120**	**SAFE TO USE**
Yellow	**60-79 or 121-150**	**USE CAUTION**
Red	**<60 or >150**	**DO NOT USE**

EHS initiates work orders through Facilities & Operations for all fume hoods that receive yellow or red stickers. Facilities & Operations must contact EHS to recheck the hoods once repairs have

taken place. **Researchers must not use fume hoods until EHS re-inspects and assures proper function.**

Safe Work Practices

The following guidelines should be followed at all times when using chemical fume hoods:

- Conduct all operations that generate irritating or hazardous air contaminants inside a fume hood. Substitute less hazardous materials if possible.
- Keep all apparatus and chemicals at least **6 inches back** from the front face of the hood. Some labs place a piece of masking tape 6 inches back along the front face of the fume hood to denote a "Safe Work Zone."
- Keep the hood sash closed as much as possible when working in the fume hood. Hoods with multiple glass sliding panels should be aligned in such a way to provide a barrier between the chemicals and the researcher.
- Do not store chemicals or apparatus in the hood. Blocked vents can lower the face velocity and reduce the protection factor to researchers.
- Do not remove the hood sash or panels. Modifications can directly affect fume hood efficiency.
- Do not use the hood as a waste disposal method (e.g. to volatilize chemicals).
- Keep the slots in the hood baffle free of obstructions.
- Use equipment with legs to raise it off the work surface and allow even airflow under and around the equipment.
- Never use electrical outlets inside a fume hood. All equipment cords should be run to outlets outside of the hood.
- Minimize sources of turbulence at the hood face (e.g. foot traffic, equipment, fans, moving arms in and out).
- A conventional fume hood must not be used for perchloric acid.
- Use of secondary containment in fume hoods is recommended to minimize the spread of chemicals in the event of a leak or spill.
- Be aware that gases or vapors escaping from pressurized systems may move at sufficient velocities to escape from the fume hood.
- Fume hoods are not capable of containing explosions. If an explosion hazard exists, the user should provide anchored barriers, shields or enclosures of sufficient strength to deflect or contain it.

- Keep laboratory doors closed whenever possible.
- Work involving harmful microorganisms should be done in a biosafety cabinet, rather than a chemical fume hood.
- Never cut into a preexisting fume hood to add additional ducts. Adding additional ducts can reduce capture efficiency and create potentially dangerous situations.
- Be aware that fume hoods may not be able to adequately protect workers from chemicals with low exposure limits (part per billion ranges). In such cases, additional control measures may be necessary.

Fume Hood Sash Height

The continuous use of electricity to run fume hoods coupled with the drawing out of warmed air in the winter and cooled air in the summer can be costly to the University. Therefore when experiments are in progress requiring no further manipulation or when researchers are not using the fume hood, the sash should be lowered as much as possible. Shutting the sash reduces total energy consumption (even constant volume hoods draw less air when closed) and increases overall safety in the lab.

For further information on safe work practices or operations taking place in fume hoods, please contact EHS at 860-486-3613.