Appendix P

Laboratory Fume Hoods

Fume Hood Training

As a user of laboratory fume hoods, you are required to be trained:

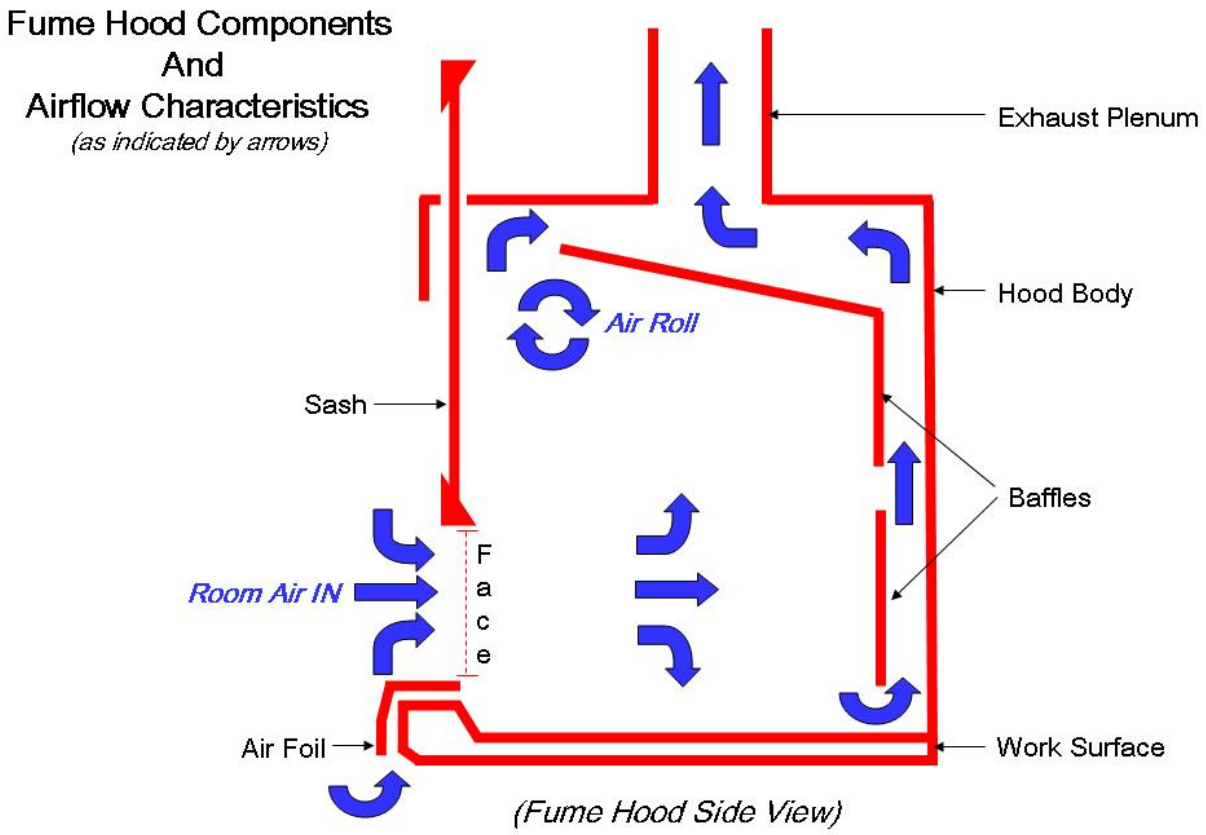
- To understand the general hood purpose, airflow characteristics, and potential for turbulent airflow and escape of hazardous substances from the hood;
- To use the hood and its features safely;
- To determine, if applicable, the date of the last performance testing and if the hood performance met the requirements of the test;
- To know where the quantitative airflow monitor or alarm system is located on the hood and how it is used to indicate an inward flow during hood operation.

The purpose of the laboratory fume hoods is to serve as the primary engineering control method for protection against the inhalation of hazardous vapors and gases. When used correctly, a fume hood minimizes a user's potential for exposure to airborne contaminants and prevents the contaminants from reaching the user's breathing zone. A fume hood can also provide protection from unanticipated fires, explosions, and chemical splashes.

The typical fume hood is comprised of the following components:

- **Hood body**- The "box" part of the chemical fume hood that encloses the hazardous vapors & gases
- **Sash** – A sliding glass door or panel on the front of the hood
- **Airfoil** – Generally found along the bottom "lip" of the hood (some fume hoods also have airfoils along the side). The airfoil affects air flowing into the hood to minimize turbulence. When the sash is completely closed, the airfoil also provides a path for makeup air from the room to enter the exhaust system. Removing the airfoil can cause turbulence and loss of containment
- **Work Surface** – The bench top within the fume hood where experiments take place. It can also be the floor for floor-mounted fume hoods.
- **Baffles** – The adjustable panels along the back of the hood body. Baffles keep the airflow uniform across the hood opening to eliminate dead spots and optimize capture efficiency

- **Exhaust plenum/duct** – The pathway for air leaving the fume hood. It also helps to distribute airflow evenly across the face of the hood.
- **Face** – The imaginary plane that runs from the bottom of the sash to the work surface. This plane is where the face velocity of the hood is measured.



There are several types of laboratory fume hoods found on the UCI campus. Regardless of type, the optimum airflow (or face velocity) of a fume hood is 80-120 feet per minute (fpm). This range allows the hood to properly contain and exhaust contaminants, reduces the chance for escape of fumes due to turbulence and outside air movement. Face velocities below 80 fpm are likely to allow contaminants to escape from the hood and face velocities above 120 fpm can cause excessive turbulence and can also allow contaminants to escape. Ask your laboratory manager, facility manager, or EH&S for the specific type in your work area.

- **Constant Air Volume (CAV)/ Conventional Hood** –The volume of airflow within this type of fume hood remains constant and all air enters through the sash opening. Lowering or raising the sash increases or decreases the velocity of the airflow, respectively. Setting the sash too low will result in very high face velocities. Raising the sash too high lowers face velocity, allowing contaminants to escape from the hood. Proper sash position is important in maintaining the optimum face velocity.
- **Bypass Hoods** – Essentially the same as a conventional/CAV hood, this type of fume hood has an air bypass above the sash that provides an additional source of room air when the sash is closed. The bypass area becomes exposed as the sash is lowered, which

reduces the rate of increase in the face velocity and reduces the chance for turbulence and loss of containment. As with the conventional/CAV hoods, it is important to properly position the sash in order to maintain optimum face velocity.

- **Variable Air Volume (VAV)** – These sophisticated fume hoods have the ability to maintain a constant face velocity as the sash height is lowered or raised. The exhaust volume is adjusted when the sash is moved so that the average face velocity is maintained within set parameters. The sash of a VAV hood should be closed when not in use in order to conserve energy. Variable air volume (VAV) hoods are the most sophisticated of the hood types, requiring technically proficient design, installation and maintenance.

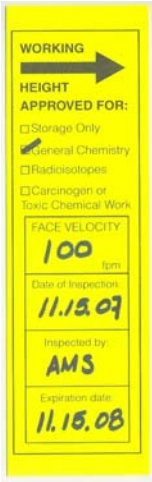
- **Perchloric Acid Hood** – Perchloric acid hoods are used when perchloric acid is to be used above ambient temperature or at concentrations above 72%. When heated above ambient temperature, perchloric acid will vaporize and may condense on hood, duct and fan components. The condensed vapors are highly corrosive and can react with hood gaskets, greases, and other collected materials to form explosive perchloric salts and esters. A perchloric acid hood is built with welded stainless steel hood surfaces, ductwork, and fan to minimize the corrosive and reactive effects. More importantly, perchloric acid hoods have a wash-down system of water fog nozzles dispersed throughout the hood and exhaust system. Washing down the hood following each use of heated perchloric acid removes any materials deposited within the system and prevents the buildup of hazardous perchlorates.

- **Ductless Hood** – These hoods filter air through HEPA or charcoal filters and then discharge the filtered air back into the laboratory. They may not be used without approval of the EH&S office.

While the laboratory fume hood is a very effective engineering control, it does not provide absolute containment or protection. The laboratory fume hood and its associated features must be used correctly in order to enhance the protection and safety of the user. The following work practices should be followed when using the fume hood:

- Conduct operations & experiments that generate air contaminants above the exposure limit inside a fume hood.

- Operate the hood at the proper sash height. This is indicated by an arrow on the yellow sticker affixed to the front side of the hood. When the sash is placed at the proper operating height, it will also provide a barrier against any unanticipated explosions, fires, spills, or splashes.



"Yellow Sticker"

- Place apparatus a minimum of six inches back from the face of the hood.
- Do not place your head inside the hood when contaminants are being generated.
- Do not store excessive amounts of chemicals or apparatus in the hood since these items can greatly impair fume hood performance.
- Ensure that the fume hood is operational prior to use (A simple way to make sure that the hood is pulling in air is to tape a Kimwipe® to the bottom of the sash. If it is not pulled back towards the inside of the hood, it may not be on or may be broken.)
- Do not obstruct the slots of the baffles along the back of the hood. No more than 25% of the bottom slot should be blocked.
- Do not remove the fume hood sashes or panels except when it is necessary to set-up apparatus. They must be replaced before any operations begin.
- If there is a chance of explosion or eruption, use an appropriate barricade or shield.
- All chemical hoods should have spill protection lips along the front of the hood. If your hood has a cup sink, it should have a lip as well.
- If the hood sash is supposed to be partially closed for operation, the hood should be labeled as so. The appropriate closure point should be clearly indicated.
- It is suggested that all large equipment be elevated 1-2 inches above the working surface of the hood. This reduces the amount of baffle blockage and maintains the hoods performance.

Information on performance testing on the laboratory fume hood is also found on the yellow sticker affixed to the front of the fume hood. The stickers contain information on average face velocity, the date of the inspection/performance testing, the name of the inspector, and the next retest due date. Recently, some UCI fume hoods were subjected to further performance testing by an outside consultant to comply with changes in the regulations. These fume hoods were tagged accordingly by the consultant. If you have further interest, ask your laboratory manager, facility manager, or EH&S for the details of this testing.

The laboratory fume hoods also come with monitors or devices whose function is to provide the user of the hood with important information concerning airflow & face velocity. Monitors will alarm and alert the user when there is a problem with the airflow. There are several varieties of monitors and alarms installed at UC Irvine. Ask your laboratory manager, facility manager, or EH&S for the specific type and operating procedures for the monitors on your laboratory fume hood.