

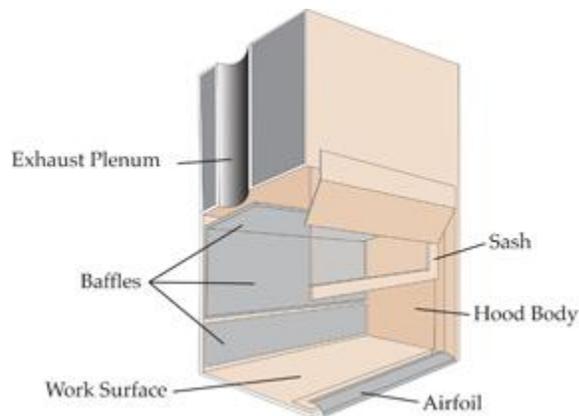
3.5 Exposure Control Measures

3.5.1 Chemical Fume Hoods

Chemical fume hoods are the most reliable and primary engineering control used in the laboratory to protect against the inhalation of hazardous vapors and gases. A fume hood is a partially enclosed workspace that is exhausted, in most cases, to the outside of the building. An efficiently working fume hood minimizes a person's exposure to airborne contaminants and prevents them from reaching the breathing zone. It also provides protection from unanticipated fires, explosions, and chemical splashes.

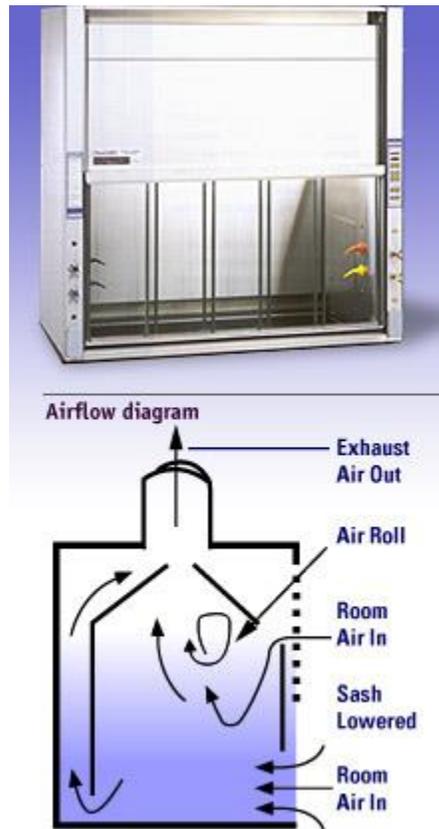
Optimum airflow, or face velocity, of a chemical fume hood is 80-120 feet per minute. This range allows the hood to properly contain and exhaust contaminants, reduces the chance for escape of fumes via turbulence and outside air movement. Face velocities below 80 fpm are likely to allow contaminants to escape from the hood and face velocities above 120 fpm can cause excessive turbulence and can also allow contaminants to escape.

The typical fume hood is made up of the following components:



- **Hood body**- The visible part of the chemical fume hood that serves to contain hazardous vapors & gases
- **Sash** –A sliding glass door or panel on the front of the hood that opens to allow access to the inside of the hood.
- **Airfoil** – located along the bottom “lip” of the hood, the airfoil streamlines airflow into the hood and helps prevent turbulence that could cause vapor or gases to escape. When the sash is completely closed, the airfoil provides a source of air from the room for the hood to exhaust. It is important to note that removing the airfoil can cause turbulence and loss of containment
- **Work Surface** – The bench top or floor area where apparatus and equipment needed for experiments are placed.
- **Baffles** – The adjustable slats along the back of the hood body. They create openings along the back of the hood that help keep the airflow uniform across the sash opening.
- **Exhaust plenum** –Helps to distribute airflow evenly across the face of the hood.

- **Face** – the 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.



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(Air is pulled in to the body of the hood through the opening of the sash and the airfoil. It travels back through the baffles and up through the top of the hood. The air is then exhausted out if the hood and building through ductwork.)

3.5.1.1 Types of fume hoods and their function

There are several types of fume hoods that are located within different types of laboratories. Each providing a unique function by design.

- **Constant Air Volume (CAV)/ Conventional Hood** –The volume of airflow within this type of hood remains constant. All air enters through the sash opening. As one lowers or raises the sash the velocity of the airflow increases and decreases respectively. It is very important to properly position the sash in order to maintain the optimum face velocity (80-120 feet per minute).
- **Bypass Hoods** – This type of hood is essentially the same as a conventional/CAV hood. The only difference is that it 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 a face velocity of 80-120fpm.
- Auxiliary Air Hood – This type of hood is similar to the bypass hood. The difference being that the source of the bypass air does not come from inside the lab but from a dedicated duct that brings in air from outside of the building. While this type of hood saves energy by reducing the amount of air-conditioned or heated room air exhausted through the hood, it can cause discomfort for those working in or around the hood. It is important to remember to close the sash when the hood is not in use. This will allow the unconditioned air to bypass through the hood and reduce the effect on the temperature and humidity in the lab
 - Variable Air Volume (VAV) – These hoods are very sophisticated and have the ability to maintain a constant face velocity as the height of the sash is lowered and 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.



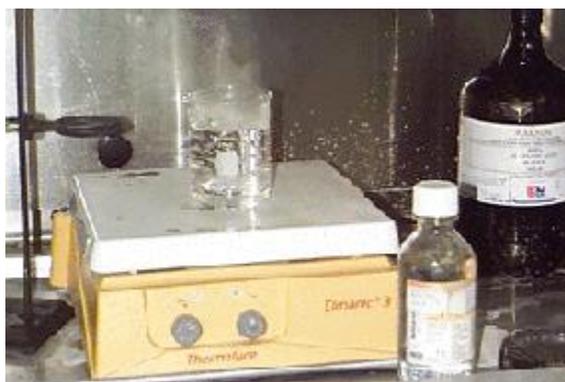
(Most hoods on campus are standard VAV hoods)

- Radioactive Hood – Any of the above listed hoods can also be used for radioactive materials. The only stipulation is that the interior work surface must be impervious (usually stainless steel). In some cases, the hood is also required to have a filter at the hood outlet that Radiation Safety is able to monitor.



(Radiation Safety will mark hoods with the above sticker if they are approved for radioactive materials use)

- Perchloric Acid Hood – Perchloric acid will vaporize when heated above ambient temperatures. Once vaporized, it may condense in the hood, ducting, and fan components. These condensed vapors are corrosive and can react with other collected materials to form explosive perchloric salts and esters. To minimize the corrosive and reactive effects of these compounds, perchloric acid hoods are built with welded stainless steel hood surfaces, ductwork, and fans and are equipped with a wash down system. This system should be used after each use of heated perchloric acid. Any materials that are deposited within the system are washed away which prevents the buildup of perchlorates. Perchloric hoods must be used if perchloric acid is to be used above ambient temperature or at concentrations above 72%.



(Always use a Perchloric acid hood when heating Perchloric acid.)

- Ductless/Recirculating 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 Occupational Health & Safety and Environmental Management.



(Ductless hood)

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