Fume Hood Questions and Answers

1. **When should I use a fume hood?**

Use a chemical fume hood anytime your work involves:

- Chemicals with a National Fire Protection Association (NFPA) Health rating of 3 or 4
- Toxic volatile materials (chloroform, formaldehyde)
- Flammable chemicals
- Carcinogens or particularly hazardous substances
- A procedure that may create an aerosol of a toxic substance
- Reactive or explosive materials or chemicals that may spatter
- Toxic gases (NH3, CO, F2, Cl2, H2S, NO2, etc.)
- Odorous materials, both hazardous and non-hazardous

2. **Why do I have to keep the fume hood sash closed?**

The sash is a blast shield, and provides primary containment in the event of fire. Your sash should be ***closed*** when you are not actively working at your hood. Moreover, you should be vigilant that your fellow lab occupants maintain closed sashes when *they* are not working at *their* hoods.

Just a few years ago, a violent explosion occurred in a fume hood in which the sash was not closed. Glass shards, debris, and chemicals were scattered throughout the laboratory. All occupants of the laboratory - not just the coworker performing the reaction - were at risk. Miraculously, only one person received minor injuries.

In cases where you are performing experiments that are suspected to present an explosion hazard, you should use a portable blast shield inside the hood in addition to a closed sash. You should also inform your fellow lab occupants when you are performing potentially hazardous procedures. *Again, from the perspective of personal self interest, you should strive to maintain the sash at the lowest possible position* ***at all times****.*

3. **Why do I have to keep the sash so low when working in the hood?**

The sash, in combination with the bypass grille located above the sash, determines the airflow characteristics of the fume hood. Although the sash position **does not** control the **volume** of air that passes through the fume hood, the sash position **does** control the **velocity** of air that passes through the fume hood. And air velocity is one of the factors influencing chemical vapor capture.

Raising the sash reduces this capture velocity allowing vapors to spill over the sill into the room air.

The hood works by capturing air borne chemicals and exhausting them to the atmosphere.

You can place dry ice in a hood and see how well it actually works. If the sash is all the way up, the vapor spills out of the hood easily, compromising protection.

When the sash is pulled down to the marked position, there is better control. The dry ice vapors are captured readily, increasing protection.

Sash up all the way

Sash lowered to proper position

The most important decision you will make in controlling hood performance is the sash height. You have seen how the hood's performance improves as the area of the sash opening decreases. Keeping the sash at or below the safe sash-opening marker is good practice. Placing the sash at the lowest level for convenient operation will provide the best protection.

4. **What can I store in the hood?**

In general only ongoing experiments should be in the hood. If you must store other equipment make sure that it does not block the slots in the back of the hood directly in front of where you will be working. Try to keep equipment along the side walls and away from contaminant generation. **Do not store anything that blocks the sash from closing.**

5. **Why must I keep work back from the front of the hood?**

Chemicals in the front of the hood are not captured efficiently and can escape into the room. You should keep chemicals at least 6 inches back from the edge of the air foil sill.

6. **What should I do if I have to keep large pieces of equipment in the hood?**

If the equipment blocks the rear air slots, raise it off the surface of the hood to allow air flow to the back of the hood.

7. **What is face velocity?**

The face of the hood is the opening where air capture takes place. Face velocity is the speed of the air across the face. It is used as an indicator of the hood's performance.

8. **Why is 100 fpm used as the ideal face velocity?**

As you work at the hood, air is drawn in a laminar (even) flow through the face of the hood. The air velocity is one of the factors determining how well vapors and particles are captured and carried out of the lab.

Vapor capture is also affected by air foils, hood shape, configuration, equipment inside the hood, and cross drafts (foot traffic, proximity to doors and room vents).

Optimum face velocity has been found to be 80-120 linear feet per minute. At lower velocities, the fume hood may not capture and remove vapors at a sufficient rate. At higher velocities, air flow may become turbulent, producing eddies and backflows that retard the rate of removal or cause vapors to escape.

Probably the best measurement of hood effectiveness is visualization, which can be done with dry ice or other visible fumes released in the hood.

9. **Is it safe to use flammable chemicals in the hood if there are lights inside?**

The lights installed inside fume hoods are sealed to keep flammable vapors away, these lights are called "intrinsically safe." All electrical components in new fume hoods are intrinsically safe so flammable vapors should not be a fire hazard.

However, if you use other electrical equipment or heating apparatus in the hood they may not be safe from fire risk. Check to see if they are intrinsically safe or use them outside of the hood. Care should be taken with all heating devices and flammable solvents don't use open flames and carefully monitor the temperature of other heating elements.

10. **Why shouldn't I use a stand alone or "ductless" fume hood that doesn't vent to the outside?**

Fume hoods that do not vent solvents outside of the building rely on filters inside the cabinet to remove vapors and toxins from the air inside the hood before discharging into the air in the lab. Some vapors are not completely captured by the filters and they end up in your breathing air in the lab. Also, contaminants build up on the filters which can become a hazard. A maintenance schedule for removing filters must be set up; this is usually done with a contractor. And of course the filters must be disposed of as hazardous waste.

11. **Can I use flammable or toxic chemicals in a Biological Safety cabinet?**

Biosafety cabinets (BSC) are used to remove infectious agents such as microbes and spores. Air passes through a HEPA filter and back into the room. The filter removes small particles but not vapors and gases, so BSC should not be used with chemicals (a little ethanol or isopropanol for decontamination is OK).

Some BSCs are designed for flammable and toxin material use; they do not recirculate air into the room but exhaust directly outside of the building. Check with EH&S to make sure your biosafety hood is safe for chemical use.

12. **How are Radiation hoods different?**

Use of radioactive materials requires prior approval and licensing by EH&S Radiation Safety. Conventional fume hoods may be used for low level radioisotope applications. Some materials such as radioactive iodine require special filters, maintenance and scheduled filter replacement.

13. **Are cabinets under the hood safe for solvent storage?**

All hood cabinets are not vented to the exhaust system. Only exhaust vented cabinets should be used for the storage of flammable or volatile chemicals. Check to make sure exhaust is provided or contact EH&S for help.

14. **Will the glass in the sash protect me from explosions?**

The sash will protect you from some explosions and fires, for that reason you should keep it as low as possible. But if you are working with reactive substances or with pressurized equipment, you should keep your work behind a portable blast shield.

15. **How do I adjust the baffles in the back of the hood?**

Air is drawn around the baffles and up the duct like a chimney. The slots around the baffles can be adjusted to concentrate air flow at desired areas of the hood. For most operations keep the baffle in a middle position with an inch or two also open at the bottom. Other configurations can be explored if your work is mainly one application. You can test air flow performance with a dry ice bath that generates a visible vapor, or contact EH&S to perform a hood visualization test.

Moving baffles usually does not improve capture when working with high density (heavy) vapors like chloroform or low density vapors (light) like acetone. Baffles should be left in their normal or optimized position.

16. **Who do I contact with other questions?**

Call EH&S at 303-492-6025.

17. **Why is the fan on the roof and not on top of the hood or inside the building?**

With a fan on the roof, air is pulled through the ducting that is inside the building causing lower air pressure inside the duct than in the building. Any leaks in the duct system would draw air into the duct and carry it outdoors. If the fan is on top of the fume hood or any where else inside the building, it would blow air into the exhaust duct. This produces positive pressure inside the duct relative to the building; any leaks in the ducts would push contaminants out of the duct and into the building.

18. **How can I reduce eddy currents or otherwise improve hood capture efficiency?**

Keep lab doors and windows closed. These extra sources of inlet air can: affect the performance of the hood, cause turbulent air currents in the room or cause the room to loose its negative pressure.

Limit traffic near hoods when in use. Pedestrian traffic or fast movement in front of hoods can cause turbulence and can negatively affect the capture ability of the fume hood.

Work at least 6 inches into the hood from the plane of the sash. This will reduce the risk of eddy currents blowing vapors back at you and will maximize capture ability of the hood.

If hoses or cords must be inserted through the face of the hood, run them underneath the airfoil so the sash can close completely.

19. **What should I do if the power goes out while I am working in the hood?**

Lower the sash to within an inch or two so the chimney effect will keep some air flowing into the hood and contain any vapors.

20. **What should I do if I need to add exhaust ventilation to other equipment in the lab?**

If you do your own ventilation work, you will compromise the efficiency of your existing system. Exhaust systems are balanced to optimize capture efficiency, existing equipment in other labs and for energy efficiency. ALWAYS contact Facilities Management or EH&S if your ventilation needs change.

Other than sash height and baffle adjustment, never make changes to the hood without the advice of EH&S.

21. **How should I store gas cylinders?**

Toxic and flammable gases such as arsine, phosphine, silane, hydrogen chloride, ammonia, hydrogen phosgene, selenide and nickel carbonyl should be used in an approved gas storage cabinet. Check with EH&S for help installing the right cabinet.

22. **Should I do anything special with vacuum pumps?**

Hazardous materials could be collected by a vacuum system. If vacuum pump exhaust contains hazardous materials it should be properly vented to keep these fumes out of the lab.

23. **What should I do if the fume hood alarm keeps going off?**

1.) Stop all experiments
2.) Close hood sash completely
3.) Call the Service Desk at 492-5522 to let them know that the hood alarm is going into "Alarm". Make sure to tell them the building, room # and the hood #.
4.) Call EH&S at 492-6025. Make sure to tell them the building, room # and the hood #.

24. **Is it OK to have a sink in the hood?**

Small sinks (called cup sinks) can be in a hood, but this adds the risk of chemicals going done the drain. And you will probably be working with open chemical containers next to a drain that needs to be protected from chemical releases. To help keep your chemicals out of the environment, all cup sinks must have a raised edge lip that is at least 3/8” high.

25. **Is it OK to remove the service panels located on each side of the hood’s interior in order to run hoses, electrical cords, etc. into the fume hood?**

If the service panels are removed, the hoods capture efficiency is greatly compromised because the hood exhaust can now move through the service panel opening and out into the lab. Contact EH&S before making any penetrations through the hood sidewalls or service panels.