UCONN

FUME HOOD INSPECTION PROGRAM

Environmental Health and Safety
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Fume Hood Inspection Program	
Last Reviewed Date:	05-14-2024
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Applies To:	Faculty, staff, students, and visitors working in laboratories with hazardous chemicals at the Storrs and regional campuses, except for UConn Health.
Contact:	**EHS Chemical Health and Safety Manager**

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Fume Hood Inspection Program

I. Purpose

The purpose of the Fume Hood Inspection Program is to ensure that chemical fume hoods function properly, are used and maintained to protect the health and safety of lab personnel, and comply with the Occupational Safety and Health Administration (OSHA) regulation *Occupational exposure to hazardous Chemicals in laboratories* (29 CFR 1910.1450).

II. Scope

The Fume Hood Inspection Program applies to faculty, staff, students, and visitors working in laboratories with hazardous chemicals in fume hoods at the Storrs and regional campuses, except UConn Health.

III. Policy Statement

The University of Connecticut is committed to providing a healthy and safe work environment for all activities under its authority and complying with all applicable federal, state, and local safety regulations and standards. Department heads, principal investigators, laboratory managers, lab workers, and other authorized individuals all share the responsibility for minimizing personnel exposure to laboratory hazards.

IV. Enforcement

Violations of this program may result in appropriate disciplinary measures in accordance with University Laws and By-Laws, **General Rules of Conduct for All University Employees**, applicable collective bargaining agreements, and the **Responsibilities of Community Life: The Student Code**.

V. Responsibilities

Individuals overseeing or working in laboratories with fume hoods where hazardous chemicals are used or stored are responsible for following the guidelines listed in the Fume Hood Inspection Program. The responsibilities of each role are outlined below:

A. University Chemical Hygiene Officer (CHO)

- Develops, reviews, and updates the Fume Hood Inspection Program.
- Provides technical assistance to lab personnel regarding adherence to the Fume Hood Inspection Program.

B. Principal Investigator (PI)/Laboratory Manager

- Follows the guidelines of the Fume Hood Inspection Program and ensures compliance with all EHS policies and programs applicable to their labs.
- Ensures the safe operation of chemical fume hoods through proper training, inspection, maintenance, and repair.
- Ensures chemical fume hoods remain clean, orderly, and in a sanitary condition.
- Ensures staff wear appropriate personal protective equipment as specified in the **Workplace Hazard Assessment**, safety data sheets (SDSs), or other applicable documentation when working in fume hoods.
- Contacts **Facilities Operations** or **EHS** when fume hoods are not working properly.

C. Lab Worker

- Reviews and follows the procedures and work practices outlined in the Fume Hood Inspection Program and all EHS policies and programs applicable to their labs.
- Works in a chemical fume hood when using chemicals that produce hazardous or irritating gases, particulates, and/or vapors.
- Uses administrative and work practice controls to minimize exposure to the hazards present in fume hoods.
- Wears appropriate personal protective equipment as specified in the **Workplace Hazard Assessment**, safety data sheets (SDSs), or other applicable documentation when working in fume hoods.
- Notifies and consults with the principal investigator or laboratory manager when fume hoods are not working properly or in need of repair.
- Ensure fume hoods remain clean, orderly, and in a sanitary condition.

D. Environmental Health and Safety

- Reviews, edits, and evaluates the Fume Hood Inspection Program as needed.
- Conducts quantitative and qualitative fume hood inspections at least annually to certify that hoods are running within University standards.
- Provides technical guidance and consultation to lab personnel regarding safe work practices for chemical fume hoods.
- Reinspects and recertifies fume hoods that have been repaired.

VI. Overview

A fume hood is a ventilated enclosure used to capture, contain, and exhaust gases, particulates, and vapors. It is one of the most effective devices used to protect lab personnel from air contaminants associated with irritating and/or hazardous chemicals. Supply fans provide conditioned air from a heating, ventilation, and air conditioning system (HVAC) into the laboratory while an exhaust fan pulls air through the fume hood and out of the building. Users work behind an adjustable window, called a sash, to manipulate chemicals inside the hood while air is pulled away from their breathing zone at a specified flow rate. To receive adequate protection, lab personnel must also follow standard operating procedures and understand the limitations of fume hoods. Improper usage can lead to worker exposures and accidents. EHS conducts inspections at least annually to certify that fume hoods provide adequate ventilation to comply with University standards.

VII. Fume Hoods

A. Types

1. Constant Air Volume (CAV) Fume Hoods

- Exhaust a constant volume of air which results in the face velocity being inversely proportional to the sash height.
- The lower the sash the greater the face velocity.
- Decreased energy savings since airflow is increased when the sash is lowered.

2. **Bypass Fume Hoods**

   - Use a bypass area positioned above the sash to direct airflow and minimize face velocity fluctuations and air turbulence.
   - The bypass limits change the face velocity as the sash is lowered.
   - Decreased energy savings since airflow is increased when the sash is lowered.

3. **Variable Air Volume (VAV) Fume Hoods**

   - Maintain a constant face velocity by varying exhaust volumes in response to changes in the sash position.
   - When the sash is lowered and the cross-sectional area of the hood opening decreases, the face velocity through the hood remains constant, reducing the total air volume exhausted.
   - Energy savings are possible when the sash is closed since only the amount of air needed to maintain the specified face velocity is exhausted from the room.

4. **Ductless Fume Hoods**

   - Exhausts air through a filter system to trap vapors and fumes before air is recirculated back to the lab.
   - Not connected to an exhaust system.
   - May put lab workers at a higher risk of exposure since hazardous vapors may be recirculated back into the lab.
   - Easy to install, mobile, and use less energy.
   - Regular monitoring of the hood as well as frequent replacement of filters is essential to safe operation.
   - Restricted item that requires EHS approval prior to purchase.

B. Parts

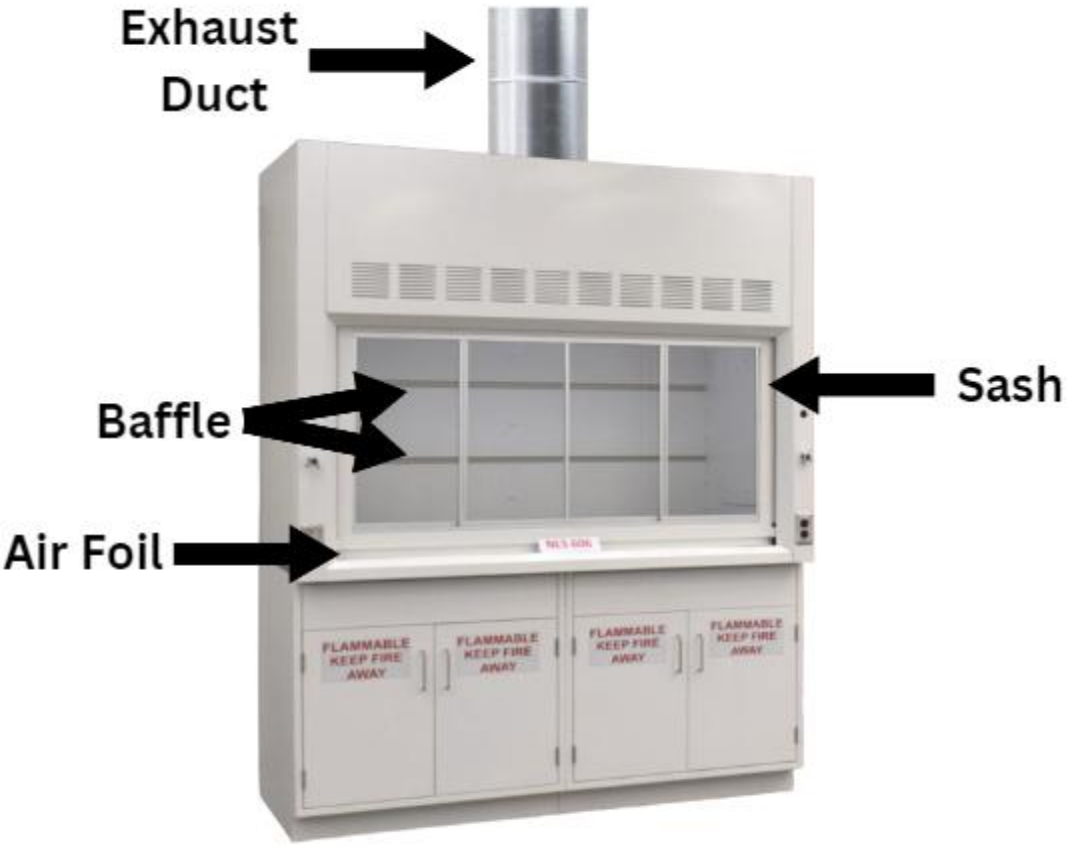
- **Airfoil:** Fixed to the bottom front edge of the hood and is a vent that keeps a minimum gap that is always open; but more importantly gives aerodynamic properties that allow better, less turbulent, air flow and better capture.

- **Baffles:** 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).

- **Exhaust Duct:** Connects the hood to the ventilation system and exhausts contaminated air to the outside of the building. The most often used material for exhaust ducting is stainless steel. It has good chemical resistance and is noncombustible. For highly corrosive applications, polyvinyl chloride (PVC) ducts may be used, but PVC is also combustible and should be used in such a manner that does not compromise the fire protection in the lab. Galvanized steel may be appropriate for some applications if no corrosive materials are used in the hood.

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

C. Diagram



VIII. Inspections

Environmental Health and Safety (EHS) conducts annual quantitative and qualitative tests on all chemical fume hoods to ensure proper air flow rates. The following procedures are carried out for each fume hood test.

A. Quantitative Test Procedure

1. Ensure that all laboratory doors are closed.
2. Ensure that movement in front of the hood by lab personnel is minimized during the test.
3. Raise the hood sash to eighteen inches.
4. Use an electronic micromanometer with a velgrid attachment to measure the face velocity at three locations across the face of the fume hood in linear feet per minute (LFPM).
5. Record the average flow rate from the three readings.
6. Use the parameters in the table below to assess proper flow rates and place a sticker on the face of the hood.

Hood Sticker Color	Flow Rate (Linear feet per minute)	Status
Green	80-120	SAFE TO USE
Yellow	60-79 or 121-150	USE CAUTION
Red	<60 or >150	DO NOT USE

7. EHS will initiate a work order through **Facilities Operations** for all fume hoods that receive yellow or red stickers. Facilities Operations must contact EHS to retest the hoods once repairs have taken place.
8. Fume hoods that receive red stickers will not provide adequate ventilation to protect researchers and must not be used until EHS re-inspects and ensures a safe flow rate.

B. Qualitative Test Procedure

1. EHS will conduct a qualitative smoke test for a visual confirmation of the hood function.
2. EHS will use a smoke-emitting device and move it along the front edge of the fume hood to visually inspect the flow of air.
3. If smoke is pulled into the hood, through the baffles, and up the vent, the qualitative test confirms the hood's containment capabilities.
4. If smoke is not pulled into the hood, containment may be compromised. A retest will be administered. If smoke is not contained during the retest, EHS staff will evaluate the hood and place a work order with **Facilities Operations**.

IX. Standard Operating Procedures

The following practices must be followed before, during, and after use to ensure the fume hood is providing the maximum protection to lab personnel:

A. Before Use

- Do not work in a fume hood without proper training.
- Conduct all operations that generate irritating or hazardous air contaminants inside a fume hood.
- Substitute less hazardous materials if possible.
- Check that the hood is turned on and its airflow is within the required range.
- Place heat-generating equipment (e.g., hot plates) near the rear of the hood to prevent undesirable air currents that cause upward drafts.
- Never remove the hood sash or panels. Modifications can directly affect fume hood efficiency.
- Run all electrical cords to outlets outside of the hood. Electrical outlets and power strips can serve as ignition sources and are not allowed inside fume hoods.
- Elevate large equipment (e.g., a centrifuge) at least two inches off the base of the hood interior to balance airflow under and around the equipment.
- Minimize sources of turbulence at the hood face (e.g., foot traffic, equipment, fans, moving arms in and out, etc.).
- Never use a standard fume hood when heating perchloric acid. Heating perchloric acid in a standard fume hood can lead to accumulation of explosive perchlorate salts in the ductwork. Contact EHS if there are plans for perchloric acid use.

- Use perchloric acid or radionuclides in a hood designed and approved specifically for those applications.
- Position fans or air conditioners away from direct airflow across a hood's face. This can interfere with chemical containment.
- Be aware that gases or vapors escaping from pressurized systems may move at sufficient velocities to escape from the fume hood.
- Use anchored barriers, shields, or enclosures of sufficient strength to deflect or contain chemicals capable of exploding. Most fume hoods are not capable of containing explosions.
- Keep laboratory doors closed whenever possible to minimize air turbulence in the room.
- Never conduct work involving microorganisms in a chemical fume hood. Use a biosafety cabinet.
- 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.
- Keep the hood sash closed whenever experiments are in progress that require no further manipulation or when the hood is not in use.

B. During Use

- Keep the hood sash closed as much as possible when working in the fume hood. The sash must never exceed eighteen inches when chemicals are being used.
- Keep all apparatus and chemicals at least **six inches back** from the front face of the hood.
- Hoods with multiple glass sliding panels should be aligned in such a way to provide a barrier between the chemicals and the researcher. The sliding glass panels should only be opened for setting up apparatus in the hood but must be closed before chemical work is started.
- Never use hoods to volatilize chemicals or wastes.
- Use secondary containment trays in fume hoods to minimize the spread of chemicals in the event of a leak or spill.
- Wear proper personal protective equipment (PPE) indicated in the Workplace Hazard Assessment while working in the hood.
- Never place your head inside the hood.
- Do not block airflow through the baffles or baffle exhaust slots.

- Never block the airfoil. The airfoil must remain unobstructed to function properly.
- Close the sash even when not in use to improve safety and efficiency.
- Never use a fume hood with biohazardous agents.

C. After Use

- Remove chemicals and wastes from the hood.
- Do not store hazardous waste in fume hoods, unless venting is required to prevent pressure build-up (e.g., piranha solutions, aqua regia solutions, etc.).
- Clean the fume hood after each use.
- Close the fume hood sash after use.

For further information on safe work practices or operations taking place in fume hoods, please contact **EHS Chemical Health and Safety**.

X. Energy Consumption

Fume hoods use significant amounts of energy to operate and place significant pressure on HVAC systems since they are continuously exhausting conditioned air from the building. Due to the energy requirements, a single hood can use three and a half times more energy annually than the average U.S. house. To conserve energy, lab personnel must keep the hood sash closed whenever experiments are in progress that require no further manipulation or when the hood is not in use. Shutting the sash reduces total energy consumption and increases overall safety in the lab.

XI. References

- **Prudent Practices in the Laboratory**
- **OSHA Laboratory Safety Chemical Fume Hoods**
- **Fume Hood Performance Tests – Methods to Verify Proper Functioning**