LABORATORY HOODS
User Guide

UHCL Environmental Health & Safety
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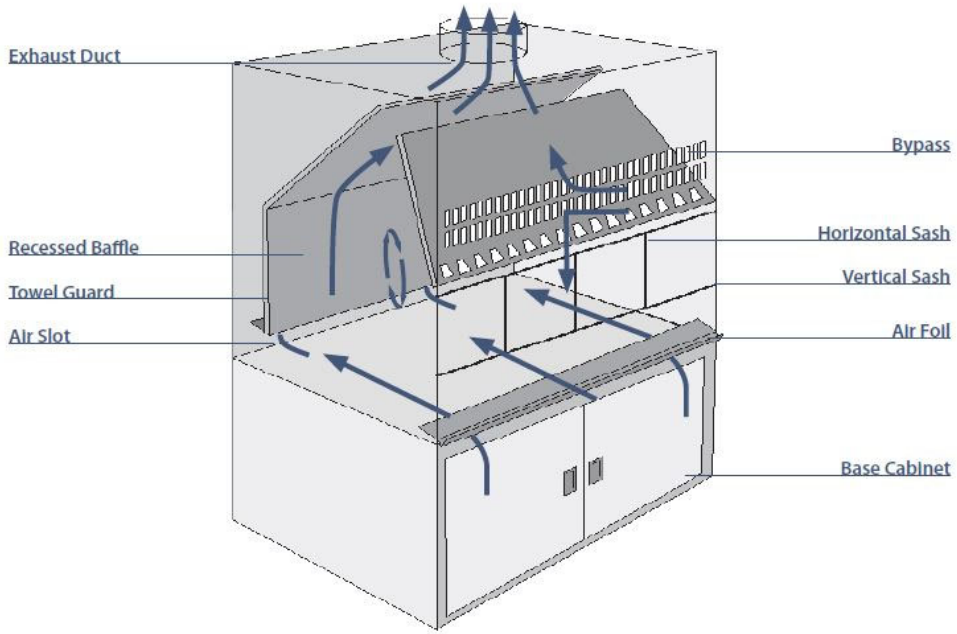
Contents

Introduction

- Laboratory workers are exposed to numerous potential hazards including chemical, biological, physical and radioactive hazards. Hazard control is a vital part of laboratory worker protection
- Engineering controls are most effective form of control and is the first step in the Hierarchy of Controls.
- Chemical fume hoods are a type of engineering control to protect laboratory workers when working with chemicals.



Overview of Fume Hoods At UHCL (informational)

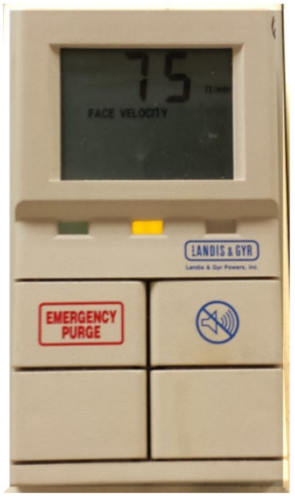
- Two conventional lab fume hood types at UHCL:
  - Constant Air Volume (CAV) – target face velocity is at 18” sash operation height.
  - Variable Air Volume (VAV) - hoods whose airflow is adjusted when the sash is opened and closed, so that the opening target face velocity stays the same regardless of glass sash position, but the total (duct) velocity and volume of air exhausted is reduced as the sash is closed and the opening area gets reduced (less air is needed with a smaller opening).

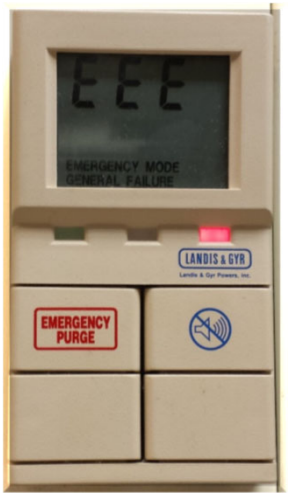
Fume Hood Components (informational)

- Fan motor, blades, belt and ball bearings (on roof)
- Ductwork to hoods, connections and seals
- Damper – in hood duct to adjust air to target hood flow
  - Simple manual damper for constant air volume hoods
  - Electronic damper or valve for Variable Air Volume (VAV) hoods, with sash level sensor (laser or ball bearing track) to adjust flow when the sash is opened and closed.
- Flow Display Monitor – on the front of the hood to indicate if hood is functioning properly

- Air flow controller - for VAV hood, signals damper/valve to adjust air when hood sash is opened or closed
- Bypass dampers - for VAV hood, allows relief for the motor when the sash is closed and hood flow decreases, the bypass damper opens to allow airflow to the motor outside of the hood so the motor doesn't burn out.
  - Can be on the roof or in the lab above the ceiling tile.
  - When the fume hood is the only source of negative pressure for the lab, the bypass damper is often in the lab above the hood

Visual Flow Indicator – Monitor Display





Fume hoods must have a Visual and Audible indicator that their air flow is within acceptable criteria, 80-120 fpm, with target flow of 100.

A Visual indicator should show when flow goes below 80 fpm, such as a yellow light; and a red light below 70 fpm along with an Audible alarm.

- Verify the flow monitoring device reads adequate hood air flow.
- Check hood test sticker date is within 1yr (and after repairs or modifications to lab hoods or ventilation)

Visual Flow Indicator – Monitor Display

- Hood motors may be sized to accommodate an emergency purge feature to increase flow in the event of a spill, such as 25-30% additional flow (EEE display).

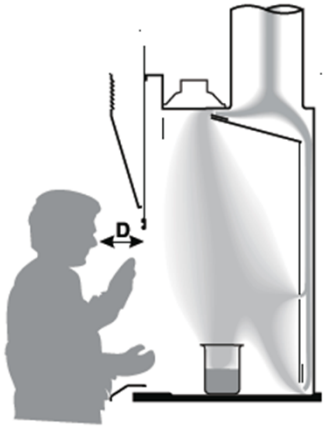
- Fume hood flow monitors are a good indicator of major changes in airflow, but they
  - do not show if there is even air distribution across the face of the hood,
  - may not detect surrounding airflow interferences,
  - And may get out of calibration over time.

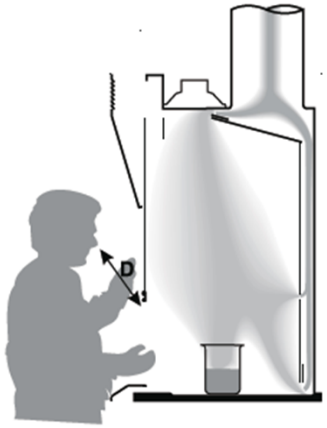
- Lifetime expectancy for flow monitors vary, but can be as short as 7-10 years.

Fume Hood Use

- Instructions
  - All procedures must be performed with the laboratory worker's head remaining outside the hood.
  - Glass sash is operated at the lowest possible height, 18 inches or less, and sash closed when you don't need continuous access.

Sash raised too high



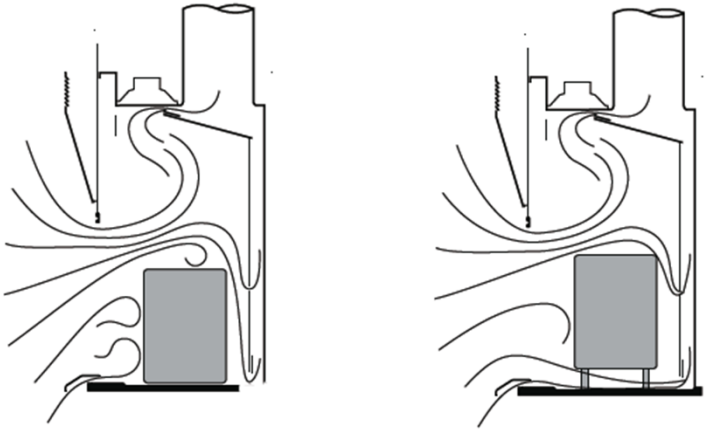


User protected with sash at 18" height

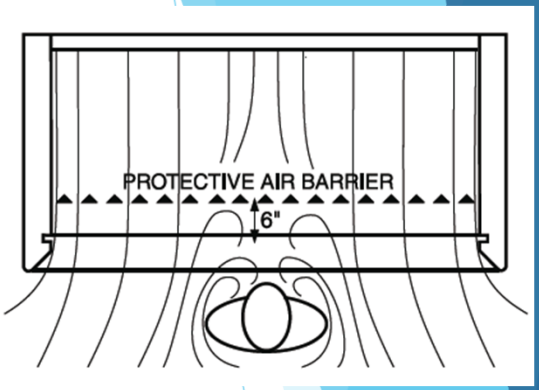
  - Move slowly in and out of the hood, when walking by and opening doors to avoid disturbing hood flow. And keep lab doors closed.

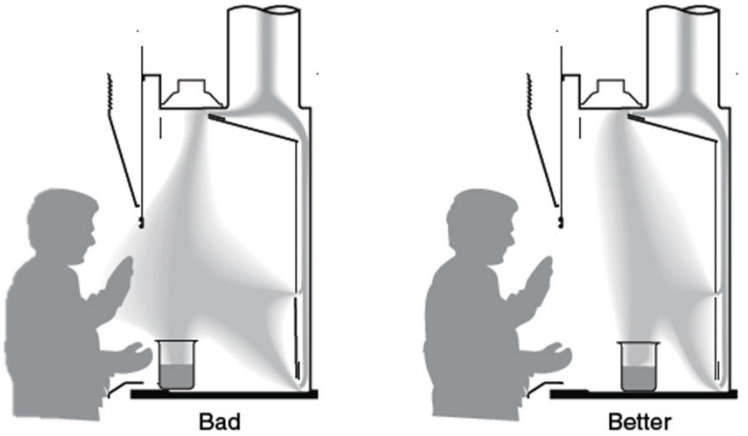
Fume Hood Use

- Instructions (continued)
  - Items should be set back 6 inches into the hood due to the air disturbance generated when going around your body.
  - Elevate larger items and equipment, and eliminate clutter to allow proper airflow. Remove unnecessary chemicals and equipment.



Effect of large equipment





Effect of placement of contaminate source

Fume Hood Use

- Instructions (continued)
  - No unnecessary chemicals (no storage) or clutter in hood. You should only have in the hood what you need for the work doing right now.
  - Do not work with flammable chemicals in a hood containing an open flame, hot plate, or equipment that generates electrical sparks.
  - Route electrical cords underneath air foil sash; do not otherwise block airflow under sash, as this helps direct flow into the hood
  - Know the hazards of the chemicals you are working with; refer to SDS.
  - Wear proper Personal Protective Equipment (PPE):
    - Safety glasses for dry chemicals,
    - goggles for liquids,
    - full length labcoat,
    - long pants and closed shoes.
  - Clean up experiments after use, and clean up spills promptly. Do not allow liquids to go down sink drains or evaporate in the fume hood.

Fume Hood Limitations

There are limitations of fume hood's use and containment capacity:

- Heavy drafts across the face of the hood, such as someone walking briskly by or a door being opened can interfere with hood flow. Keep doors closed while work is going on in hood.
- Air flow velocities too high or low can cause fumes to leak out of the hood
- Chemicals left to evaporate is improper disposal, and can cause crystals to grow on sensor tracks, interfering with hood function.
- Condensation or roof leaks can collect on hood wires and electrical components. Notify your lab instructor or supervisor if found.

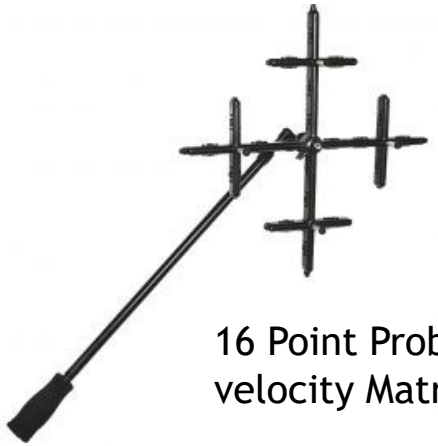
Fume Hood Inspections And Testing

- Fume hoods are tested annually following the American National standard for Laboratory Ventilation (ANSI/AIHA Z9.5), and ANSI/ASHRAE Standard 110 for Testing Performance of Laboratory Fume Hoods.
- Air flow is quantitatively measured and visually checked.
- Flow visualization test is done using a theatrical fog machine (large or small) to check the effectiveness of hood flow setup and see turbulence.

- Hood Flow Display Monitors are calibrated:
  - After any significant changes or repairs to the operational characteristics of the system.
  - When the measured flow varies by 10% or more of the hood flow monitor display.

Testing Continued

- Air velocity testing is done using a 16 point Velocity Matrix probe on TSI Micromanometer EDT730, similar to what professionals use.
- The instrument measures, displays and saves airflow, velocity, and pressure.
- During testing, fume hood sash is open at the operational height of 18 inches (at arrow sticker)
- The fume hood opening is tested in at least four locations, about every 12 inches.
- 20-30 consecutive second readings are measured per location to note if flow is constant or fluctuates.



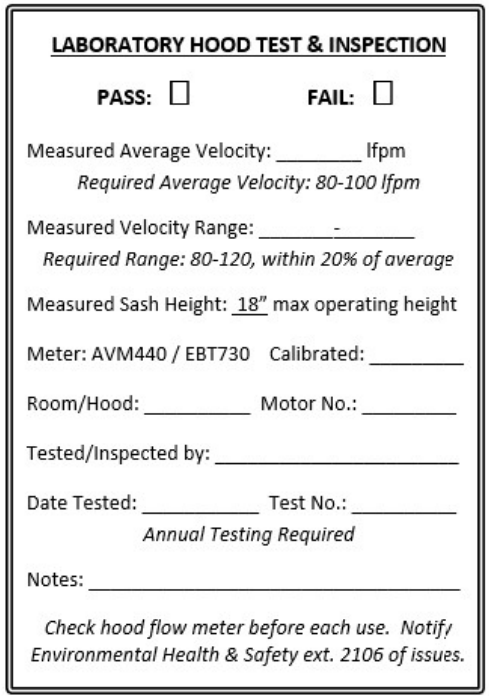
16 Point Probe velocity Matrix

Micro manometer EDT730 TSI

Testing Continued

- Results are posted on the hood with a sticker containing the information pictured on the right.
- Flow testing equipment is also calibrated annually.

- The hood fails and/or must be evaluated for issues if:
  - Flow values are less than 80
  - Individual measurements are more than 20% different than the average. This means there may be hood interferences by design, equipment, or HVAC.
  - Reductions in flow from previous years.



LABORATORY HOOD TEST & INSPECTION

PASS: ☐ **FAIL:** ☐

Measured Average Velocity: _____ lfpm

Required Average Velocity: 80-100 lfpm

Measured Velocity Range: _____-_____

Required Range: 80-120, within 20% of average

Measured Sash Height: 18" max operating height

Meter: AVM440 / EBT730 Calibrated: _____

Room/Hood: _____ Motor No.: _____

Tested/Inspected by: _____

Date Tested: _____ Test No.: _____

Annual Testing Required

Notes: _____

Check hood flow meter before each use. Notify Environmental Health & Safety ext. 2106 of issues.

Ensuring Fume Hood's Safety

- To promote and ensure safety, clear communication is required when there are issues with a fume hood's operation.
- Notify your instructor or lab supervisor so that a work order can be put in and the hood evaluated and repaired.
- Do not use the hood until it is back in order.
- The hood may get a new test sticker showing flow is back in repair.

Safety is a continuous process.

References, Standards & Regulations

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