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Fume Hood Training Guide

Contaminated air within a fume hood is diluted with room air and exhausted through the hood's duct system to the outside where it can be adequately dispersed at an acceptably low concentration.

The flow of protective air into a hood is created by an exhaust blower that "pulls" air from the laboratory room into and through the hood and exhaust system. The slots and baffles within the hood direct the air. The beveled frame around the hood face, called the airfoil, allows for even air flow into the hood by eliminating sharp curves to reduce turbulence. It is important to prevent the baffles from becoming blocked by excessive stored material/equipment or small pieces of paper such as Kimwipes, since this significantly affects the exhaust path within the hood. When airflow is blocked, the efficiency of hood capture is reduced and the hood may develop "dead zones"—areas where airflow is insufficient to provide adequate protection.

Airflow is measured as **face velocity**: the flow rate at the position where the fume hood user is standing. Optimal face velocity falls within a specified range (80-100 feet per minute) to provide effective protection from hazardous fumes.

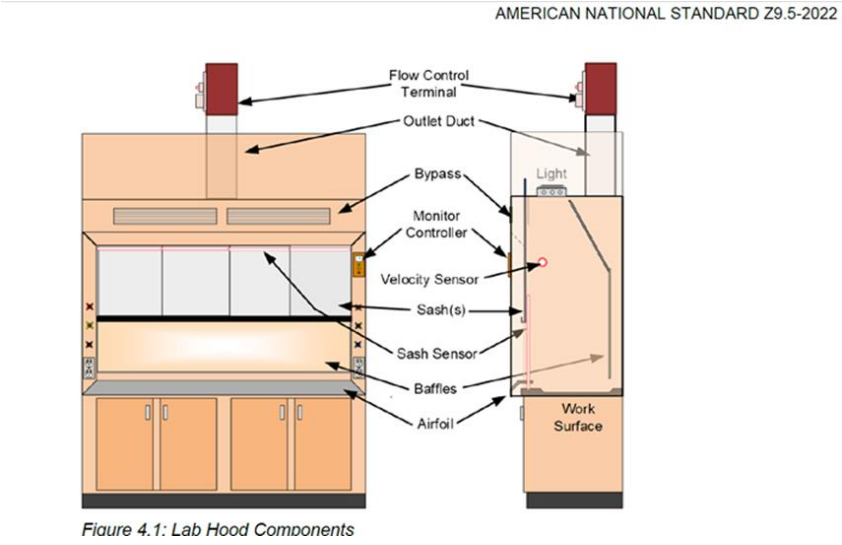

Figure 4.1: Lab Hood Components

How face velocity is controlled helps define the difference between two primary types of fume hoods, **Constant Air Velocity (CAV)** and **Variable Air Velocity (VAV)**. The main difference between these fume hood systems is in the types of devices used to increase or reduce air volume passing through the duct system. The CAV relies primarily on sash position, while the VAV uses sash position and a Venturi valve or a dampener.

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This button labelled "Emergency Max" initiates and terminates the purge function.

Sash open so that arrows match

Sash closed

The images above show the monitor of a VAV fume hood when the sash is opened to the height for optimal airflow, shown on the left, and when the sash is closed, shown on the right. When the sash is open, airflow is between 80-100 ft/min. When the sash is closed, airflow decreases to a minimum. Therefore it is important to avoid actively using a VAV fume hood when the sash is closed. A great way to determine whether a fume hood is VAV or CAV is to look at the monitor and see how airflow changes when you close and open the sash. If the hood is VAV, closing the sash will decrease airflow.

If you have a VAV system, keeping the sash closed when your hood is not in use saves energy. VAV systems also have a purge function. In the case of a spill, you can close the sash completely and initiate the purge function which increases the air volume moving through the hood and exhausts the excess vapors with a greater capture capacity. You will need to press the button again to turn the purge function off.

CAV fume hoods alway pull air from the facility at the same rate. Changing the face velocity is governed by the position of the sash and various other bypass openings (depending on hood make and model). When you close the sash, it is much like putting your thumb over a garden hose: the smaller you make the opening, the greater the pressure.

To open the sash to the position of optimal airflow, match the arrows on the sash with the arrows on the fume hood frame. The optimal sash height is typically 12"-18". **Do not** use the fume hood with the sash higher than the opposing arrow.

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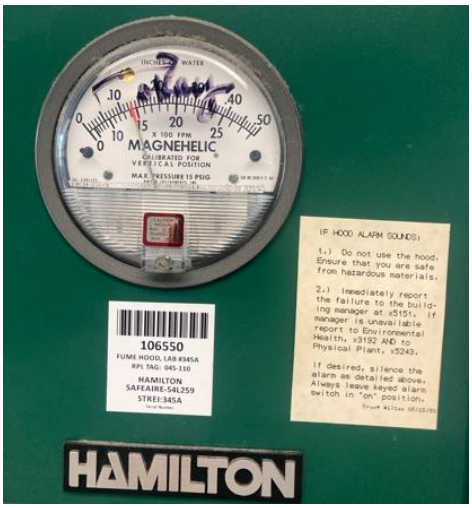
If a hood does not have a monitor, it is likely a CAV as most older models are.



Above are images of Magnehelic air flow monitors on CAV fume hoods found on campus. These fume hoods have a gauge and an alarm but they do not have a monitor that exhibits face velocity in feet per minute. The red pointer on the gauge indicates the pressure in the exhaust duct. If when the sashes are in the proper position, the pointer meets or is past the target region, it indicates sufficient exhaust pressure in the duct and inflow at the face of the fume hood. If the arrow is below the target there could be a mechanical problem, and the hood should not be used with hazardous materials; contact EHS at (541)346-3192.

Constant Air Volume (CAV)

-80-100 ft/min sash open (not past matching arrows)
-300 ft/min sash partly open
-same volume air flow 24/7 for decades
-airflow rate controlled by position of sash

Variable Air flow (VAV)

-80-100 ft/min sash open (not past matching arrows)
-<60 ft/min sash closed
-airflow rate controlled by valve/dampener in addition to sash position
-shutting the sash is an effective way to save energy

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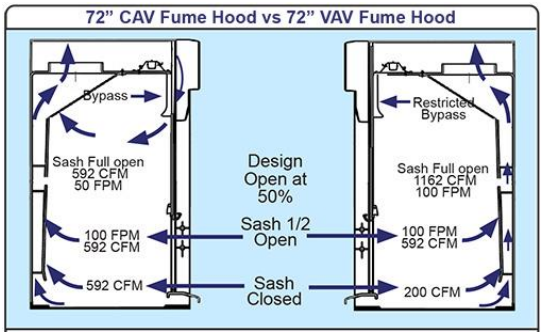

It is always recommended to use a visual indicator to verify that the hood airflow is inward. A piece of flagging tape, a tissue, or Kimwipe taped to the sash or inside the hood provides a qualitative indicator of direction of airflow.

The OSHA Laboratory Standard (29 CFR 1910.1450) requires that fume hoods be maintained and function properly when used. EHS tests each fume hood at least annually, at a minimum, and records the average face velocity and the sash height during testing. EHS will also test after repairs are made to the unit.

Before Initiating Work in the Fume Hood

- Look for visual confirmation that the fume hood is working
  - Is the fume hood tape fluttering?
  - Is the airflow meter (if present) showing a face velocity in the recommended range (**80-100 feet/ min)?**
- Check the fume hood certification date and confirm it is within one year of today's date. If the fume hood has not been checked in over one year, contact EHS at (541) 346-3192 and request a hood assessment.
- Have a written SOP for the protocol to be followed in the fume hood.
- Read the SDS for each of the hazardous chemicals to be used.
  - What specifically are the hazards of the chemicals and what is the lab's action plan in case of an emergency, such as a power failure or when a fume hood alarms?
  - What is the SOP for what to do in the case of a spill for each of the chemicals? Where are the supplies and materials that would be needed in the case of an emergency spill?
  - What are the signs of exposure to each chemical?
- If you're using bench protectors, make sure they are compatible with the chemicals being used.
- Confirm the bench protectors are not covering the front airfoils.
- Confirm all materials and equipment in the hood are at least 6 inches behind the front edge.
- Confirm all large equipment in the hood has been elevated on a riser at least two inches off the base of the surface.

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- Confirm the hood sash is not above the certification mark (matching arrows).
- Turn the light on in the hood to minimize eye strain.
- Make sure any wires or cords coming into the hood go through compartments made for that purpose.
    - Many hoods have airfoils that lift so that wires can be threaded through them and into the hood in a manner that allows for the sash to still be closed completely.

In Case of a Chemical Spill

- If anyone is injured, tend to the injured. Call 911 in the case of a medical emergency. Help is assistance is needed to operate the eyewash or safety shower.
- If you are clear on how to proceed, clean the spill yourself. Contact EHS Duty Phone at (541)954-3605 if you need help or in the case of a large spill.
- If you are working in a VAV hood, you can close the sash all the way and use the emergency purge mode.
- Wear PPE suitable for the hazardous properties of the materials spilled.
- Do not risk safe containment by raising the sash above the certification mark to clean the spill.
- If the spill reached the walls of the fume hood, wipe the side and back walls and the inside of the sash.
- Dispose of chemical waste cleanup materials in the appropriate chemical waste container and contact UO EHS Hazardous Materials Group for pickup at (541) 346-2348 or submit a pickup request in EHSA.
- Never stick your head under the sash and inside the fume hood to clean a spill.

If the Hood is Alarming

- Be certain you are operating the hood at or below the sash arrows. If the alarm persists, close the sash, wait a moment, then reopen the sash to the working height.
- If the alarm continues,
    - stop using the hood.
    - close all open containers in the hood, including compressed gas cylinders.
    - disengage and power down any heat sources in the hood.
    - Close the sash, communicate to other lab members that the fume hood is malfunctioning and leave a note on the fume hood stating that the hood is out of order.
    - Promptly report any hood that is not functioning properly to your supervisor or lab manager and contact EHS at (541) 346-3192.
- Do not use the fume hood until repairs have been completed and EHS has tested the fume hood.
- If there are multiple fume hoods in your lab, it is likely that some are connected to each other. In this case, multiple hoods may alarm at once.

Upon Completion of Work in the Fume Hood

- Cap or close the containers of all chemicals used, even those that appear empty.
- Return all chemicals to proper locations.
- Properly discard disposable supplies and waste.
- Wipe down the work surface and front airfoil sill.
- Store chemical waste in the designated waste storage area.