

Colgate University Fume Hood Validation Program

1.0 PURPOSE

The purpose of this program is to ensure that the laboratory chemical fume hoods used at Colgate University are functioning in a manner capable of providing protection for faculty, staff, and students who use them. This program is part of the university's Chemical Hygiene Plan that conforms to the recommendations in OSHA's Laboratory Standard.

2.0 RESPONSIBILITIES

2.1 Environmental Health and Safety (EHS) Coordinator

- Ensure that hoods are evaluated at least annually
- Inspect sashes, lights, service fixtures, interior, baffles, telltale, and cabinets in conjunction with annual face velocity measurements
- Provide information to users on guidelines and operating procedures for safe use of hoods
- Label hoods with certification stickers, sash arrows, and work practices guide
- Coordinate with Buildings and Grounds for required maintenance items

2.2 Department Chemical Hygiene Officers (DCHOs)

- Provide reinforcement of operating procedures and safe use information to department users
- Establish department specific policies and procedures as necessary
- Conduct periodic spot checks to ensure proper hood configuration and usage
- Coordinate modifications, maintenance, repair, and new equipment needs with EHS and/or Buildings and Grounds

2.3 Buildings and Grounds (B&G)

- Coordinate for contractor to conduct annual face velocity measurements in accordance with this program
- Perform preventive maintenance on fans, ductwork, and hoods
- Perform repairs or maintenance identified by annual inspections or by users
- Notify EHS and coordinate with users when hoods must be turned off for repair, maintenance, or other operations

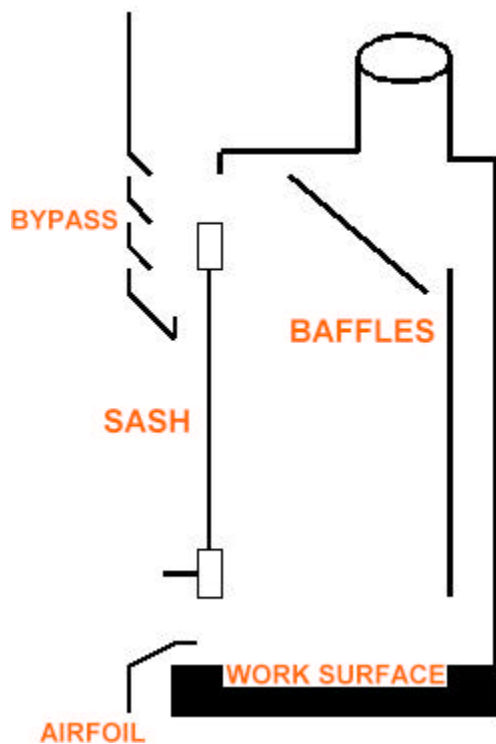
2.4 Hood Users

- Use hoods according to recommended guidelines for safe use
- Do not modify hoods (to include baffle adjustment) without prior approval from EHS or B&G
- Submit work orders for maintenance items or repair to B&G

Colgate University Fume Hood Validation Program

3.0 HOOD COMPONENTS

3.1 Airfoil - found along the bottom and sometimes side edges, airfoils streamline airflow into the hood preventing turbulent eddies at the face that can carry vapors out of the hood. Bottom airfoils also provide a space for room airflow when the sash is completely closed.



3.2 Baffles - moveable or adjustable partitions used to create slotted openings along the back of the hood body. Baffles help to keep a uniform airflow across the face of the hood, which eliminates dead spots and optimizes capture efficiency.

3.3 Sash - a moveable, see through barrier that closes or opens the face of the hood.

3.4 Work Surface - generally a laboratory bench top or floor in the case of a walk in hood. The area under the hood where apparatus and equipment is placed. Caution must be exercised if the work surface or hood body is made of transite, an asbestos containing material.

3.5 Bypass - grill opening above face of hood that helps to maintain a constant face velocity independent of the sash position. When the sash is

lowered air flows in through the bypass and the hood face. When the sash is raised it blocks the bypass.

4.0 BACKGROUND

Laboratory fume hoods are one of the most important components used to protect laboratory personnel from exposure to hazardous chemicals and agents used in the laboratory. When used properly, they can provide an effective backup safety device for the containment and exhaust of toxic, offensive, or flammable materials when the containment of an experiment or procedure fails and vapors or dusts escape from the apparatus being used. Chemical fume hoods may not provide protection from highly toxic ($LD_{50} < 5$ mg/kg) or highly reactive materials. Operations involving these materials must be carried out in a glove box or other closed system.

Average face velocity is the main criterion that is used to determine if a hood is functioning satisfactorily as a safety device for the containment and elimination of airborne contaminants. The face of a hood is the plane of the opening into the hood. The velocity of air moving past the face is the face velocity, usually measured in feet per minute. The averaged value of the velocity of air moving into the hood at a set number of points across the face is the average face velocity.

Factors that can affect face velocity and thus hood performance include baffle position, cross drafts, air volume, hood features, hood location, foot traffic, and user work practices.

Colgate University Fume Hood Validation Program

Unfortunately, there is no one agreed upon standard for the optimum average face velocity or where the sash should be located when measuring the average face velocity. Recommended face velocities range from 60 fpm to 150 fpm. It is agreed that too high a face velocity can be detrimental to performance and user protection. Further compounding the situation is the fact that several different types, models, and sizes of hoods are in use at Colgate. Also, each building has an unique HVAC system that has been added to or otherwise modified over time. In light of this, Colgate University has established standards that are within the recommended range, are reasonably achievable, and should provide protection to users who employ the correct operating procedures. See the section on certification procedures for more details.

As a starting point for this program, a contractor was hired to improve overall building air balance and investigate suspected deficient or extreme fume hood face velocities in Lathrop, Olin, and Wynn Halls.

Initial fume hood inventory information was also compiled as part of this program. Information collected included room numbers, hood face area, hood manufacturer and model, hood features, type of hood, hood lining material, storage cabinet type and ventilation, and sash height and width. Each hood was then assigned an unique identification number.

5.0 CERTIFICATION PROCEDURES

5.1 Chemical Fume Hoods

Our chemical fume hoods will be evaluated annually according to the following:

Criterion	Standard
Instrument	Hot wire anemometer calibrated according to manufacturer's recommendations
Grids	At least six; no greater than "12 x 12" in size
Average Face Velocity	100 fpm +/-10 fpm
Sash Height	Sash at stop; 17" above airfoil if no stop; 16" above hood surface if no airfoil
Range	No measurement <10% of average; <15% variation point to point
Baffles	Hamilton hoods should be in position A; adjust for uniform flow if necessary
Maintenance	Inspect sash, light, fan belts, motor, ductwork, service fixtures, interior, baffles, cabinets, alarm or flow gauge (if applicable), telltale, guide sticker
Smoke	Use if necessary to troubleshoot hood that doesn't meet standard

Each fume hood will either pass or fail the annual certification. Hoods that pass will be labeled in the upper left hand corner with the hood number, average face velocity, and date of

Colgate University Fume Hood Validation Program

test. The hood may also be labeled with green arrows indicating the sash height that should not be exceeded. The EHS Coordinator, B&G personnel, DCHO, and user(s) will meet to determine actions to be taken on hoods that fail the annual certification.

5.2 Laminar Flow Hoods

Laminar flow hoods also called clean benches should not be confused with chemical fume hoods. Laminar flow hoods are designed to protect biological specimens and material by bathing the work area with particle free air. The clean benches are not designed to contain hazardous vapors and gasses. As such, flammable and toxic substances must be used in a chemical fume hood, not a laminar flow hood. Clean benches force air out the back of the unit, across the work surface and toward the researcher. The air is re-filtered (of particles only) before being exhausted back into the lab, not to the outside as with a fume hood. Laminar flow hoods will not be used for materials that would not be ordinarily be used on an open bench.

Our laminar flow hoods will be certified annually by an outside contractor according to the manufacturer's specifications. A certification label will be placed on the front of the hood.

5.3 Perchloric Acid Hood

A perchloric acid hood is a specialized independent hood with a built-in water wash down system. When perchloric acid is heated above ambient temperature, it will vaporize and condense on hood, duct, and fan components. In addition to being highly corrosive, condensed vapors can react with organic materials such as gaskets, greases, and chemical residues to form explosive perchlorate salts and esters. By washing down the hood following each use, materials deposited in the perchloric acid hood are removed, preventing the buildup of shock, heat, and friction sensitive perchlorates.

Perchloric acid will only be heated in the perchloric acid fume hood in Wynn Hall, room 319. The perchloric acid hood in Wynn 319 is dedicated to perchloric acid use only. Organic materials and those incompatible with perchloric acid will not be used in the perchloric acid hood. The user is responsible for ensuring that the perchloric acid hood is washed down after each use. The hood will be certified on an annual basis along with the rest of the chemical fume hoods.

6.0 NEW HOODS

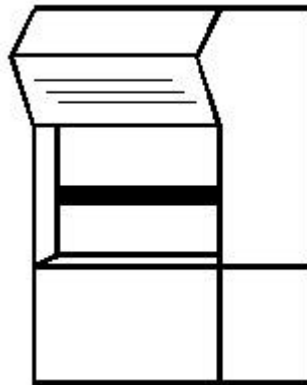
New chemical fume hoods will not be purchased and installed without with the approval of the EHS Coordinator in consultation with Buildings and Grounds Administrators. New hoods will be purchased that meet the design and operation requirements in ANSI Z9.5-1992 and will be tested in accordance with ANSI/ASHRAE 110 before use. New hoods will be added to this program after initial certification.

Colgate University Fume Hood Validation Program

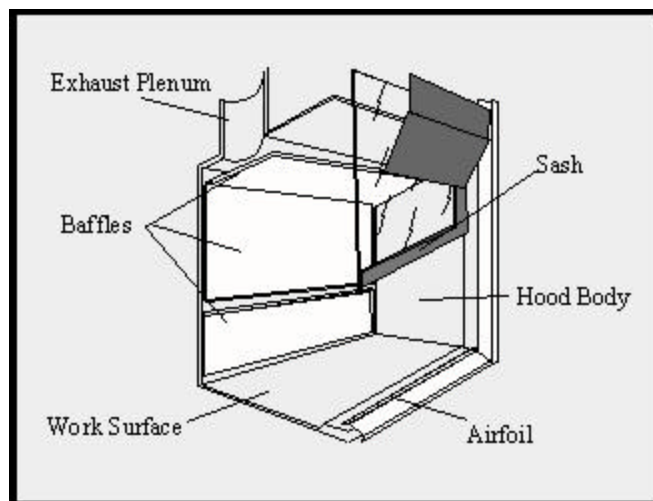
7.0 USER GUIDELINES (STANDARD OPERATING PROCEDURES)

1. **Confirm that hood is operational.** If hood is equipped with a local on/off switch, make sure switch is in the on position. Check the air flow gauge if so equipped. Check the telltale (a green, one inch by six inch piece of crepe paper attached to the bottom of the sash). The telltale should be noticeably pulled toward the back of the hood.
2. **Set up work at least six inches from the face opening.** This will avoid turbulence at the sash edge and provide greater protection.
3. **Separate and elevate each instrument.** Use blocks or racks to elevate equipment one to two inches off the hood deck surface so that air can easily flow around all apparatus with no disruption.
4. **Lower sash to the optimum height.** The sash will then act as a physical barrier in the event of an unplanned incident in the hood.
5. **Keep hood storage to an absolute minimum.** Keep only items needed for ongoing operation inside the hood. Excess materials in the hood disrupt airflow and can act as a barrier or cause airflow to bounce back across the face of the hood. Keep the back bottom slot clear at all times as it serves as an exhaust port for fumes and heat generated near the surface.
6. **Minimize foot traffic near and around the hood.** A person walking past the hood can create competing air currents. Other cross drafts should be eliminated such as open doors or fans.
7. **Use extreme caution with ignition sources inside a fume hood.** Ignition sources such as electrical connections and equipment, hot plates, controllers, and open flame will ignite flammable vapors or explosive particles from materials being used in the hood. All electrical equipment used inside a fume hood must be designed or certified as intrinsically safe unless it can be absolutely established (and enforced) that flammable or explosive materials will not be used in a particular hood.
8. **Never put your head inside a hood while operations are in progress.** The plane of the sash is the imaginary boundary that should not be crossed except to set up or dismantle equipment.
9. **Clean up spills as soon as possible.**
10. **Do not dismantle or modify the physical structure of the hood or exhaust system** in any way without first consulting Buildings and Grounds personnel at x7131. Any component removed to conduct maintenance, repair, or to set up an experiment must be replaced prior to using the hood.
11. **Report airflow problems and problems with the physical structure of the hood** to Buildings and Grounds as soon as possible.
12. **Lower the sash completely** when you are not physically working in the hood.

Chemical Fume Hood Validation Program



Colgate University



Draft - 11/12/97