

Last Update: July 01, 2009

A. Lab Pressurization

1. All lab complexes should have a visual differential pressure monitor located close to the main entry door.
2. If a lab is to be at a negative pressure to the corridor, then maintain -0.01" to -0.05" w.g. differential pressure by an offset between room supply and room exhaust airflow. Flow tracking is recommended to maintain a differential flow between the supply and exhaust air flows.
3. If a laboratory is to be a neutral or positive differential pressure, then an air-lock entryway must be installed such that the laboratory can be kept positive pressure to the air lock, which can be kept negative to the hall. In this case the entryway is to have a differential pressure-monitoring device.
4. Each room in which fume hoods are located is to have an occupancy sensor that turns off the lights and reduces the air volume.

B. Lab Air Flow

1. Laboratory ventilation rates shall be at least 6 air changes per hour minimum for an occupied lab and at least 4 air changes per hour minimum for an unoccupied lab. Higher ventilation rates may be required depending on laboratory chemical hazards and fume hood exhaust requirements.
2. Temperature gradients and air currents in a laboratory must be kept to a minimum.
3. A 'low air flow zone' needs to be established in front of each hood or biological safety cabinet. This zone can be considered to be as wide and as tall as the hood or cabinet face and extending six feet horizontally out from the sash. Select and locate diffusers so that air does not enter the 'low air flow zone' at a velocity greater than 50 fpm when fume hood exhaust fan is off. Use 2' x 4' perforated supply diffusers. Avoid 2' x 2' diffusers near fume hoods. Provide no more than 400 cfm through the diffusers near the hoods. Discharge velocities shall not exceed 200 fpm at diffuser outlets.
4. All lab air flow, including exhaust, will be balanced by the T&B contractor.
5. Return air from a laboratory may be utilized only if the HVAC system services no other non-laboratory portion of the building. No laboratory HVAC system shall be designed so that return air from that system can be recirculated to any other HVAC system in the building.

C. Fume Hood Audit & Selection Guide

1. The last page of this section is a "Fume Hood Audit & Selection Guide". This sheet is to be copied as needed so that a separate Selection Guide can be filled out for each fume hood. All of the sheets are to be included in the Architectural Program Statement.

D. Fume Hood Styles and Considerations:

1. All fume hoods shall be "High Performance" type, designed to meet the ASHRAE 110 test with challenges at a minimum face velocity of less than or equal to 60 fpm with the sash in the fully open (set up) position. Challenge tests should demonstrate excellent containment with cross drafts of at least 50 fpm and sash movement effects.

2. "Make up air" (auxiliary air) type fume hoods will not be used under any circumstances.
3. By-pass and restricted bypass style fume hoods are allowed but carefully select with respect to constant or variable volume applications.
 - a) Constant air volume (CAV) fume hoods shall have bypass grilles/openings of adequate size to maintain an acceptable face velocity over the entire range of sash movement.
 - b) With a variable air volume (VAV) application, a restricted bypass should be selected to reduce the exhaust airflow as sash closes. Verify that the NFPA 45 minimum air flow can be met without causing loss of containment, such as when the sash is open 1".
4. Perchloric acid hoods and exhaust fans must be specifically designed for that use.
5. Radio-isotope hoods and exhaust fans must be specifically designed for that use.

E. Fume Hood Design

1. Fume hoods will have access ports for cords, tubes, wires, etc. to be run through the side sills to the interior of the hood.
2. All fume hoods are to have a visual face velocity indicator. Indicator and associated controls will be installed and calibrated by a representative of the manufacturer with calibration verification submitted to the superintendent. Training on the calibration, operation, and maintenance of the hoods and associated controls is to be provided by the manufacturer.
3. Acid and solvent base storage cabinets below the hoods can be vented through the back of the hood.

F. Fume Hood Operation

1. Working sash height is 18".
2. Working (occupied lab) face velocity is greater or equal to 80 FPM.
3. Idle (un-occupied lab) face velocity is greater or equal to 60 FPM.
4. Fume hoods shall be able to operate safely at the manufacturer's recommended minimum face velocity with the sash fully open.
5. Maximum airflow (CFM) is determined by assuming the greater of two conditions: a) fume hood sash is open to working height and operating at the working face velocity, or b) fume hood sash is fully open and operating at the manufacturers recommended minimum face velocity (less than or equal to 60 fpm for a high performance, low velocity fume hood).
6. Minimum airflow (CFM) is determined by the NFPA 45 standard of 25 CFM per square foot of hood deck area. Fume hoods shall be able to operate with the hood sash fully closed with this minimum air flow.
7. Fume hoods are intended to operate continuously with reduction to idle flow rate determined by either a hood proximity sensor or the general room lighting occupancy sensor, where appropriate.

G. Fume Hood Testing

1. All fume hood models must provide third party independent ASHRAE 110 (latest edition) "As Manufactured" testing. Include flow visualization testing, face velocity measurements, and

tracer gas containment testing. Demonstrate fume hood performance challenges with the sash fully open at the idle flow rate, including sash movement effects and cross draft conditions of greater or equal to 50 fpm.

2. Fume hoods must require no more exhaust than stated in the manufacturer's literature and used as the basis of design.
3. All fume hoods will be tested and must pass the ASHRAE 110 (latest edition) "as installed" test at the following conditions:
 - a) Determined per project requirements for the most challenging operating configuration

H. Fume Hood Exhaust Systems:

1. In general, VAV fume hood exhaust airflow control dampers / valves are preferred. CAV fume hoods are acceptable where applicable, such as where total fume hood exhaust requirements are less than or equal to minimum lab ventilation requirements.
2. Fume hood exhaust dampers /valves are to have an open pressure drop less than 0.3" water gauge at design flow.
3. In general new exhaust systems are to be a manifold system where feasible. Systems with few fume hoods can use individual fans for each hood.
4. Exhaust must discharge vertically at least 10' above the roof with no rain cap. Exhaust stack exit air velocity shall be at least 3,000 fpm.
5. Locate fans on the roof or in a penthouse that is at a negative pressure to the rest of the building and is well ventilated.
6. Heat reclaim that does not allow for re-entrainment of the exhaust flow will be included for most lab exhaust systems, where cost effective on a life cycle analysis.
7. Fume hood exhaust ducts should be designed with a velocity of greater than 1,000 fpm and less than 2,000 fpm. For VAV fume hood systems, an exhaust diversity factor may be used for the maximum duct velocity. However, assume no diversity factor when sizing exhaust fan capacity and total static pressure.
8. Fume hood exhaust duct shall be located in fire chases where required, and shall not have fire dampers.
9. General fume hood exhaust duct material
 - a) Galvanized Steel coated with an acid resistant coating is to be used from the hood discharge to the point of significant dilution (i.e. the manifold exhaust system main duct).
 - b) Galvanized Steel uncoated may be used on manifold exhaust systems where enough hoods have been accumulated to provide adequate dilution.
 - c) Stainless Steel is rarely used for general fume exhaust and will require justification. The exceptions to this are the welded systems as mentioned below.
 - d) PVC has excellent acid resistance but poor solvent resistance. **PVC may be used only when exhaust system is being specifically designed and marked for acid only use.**
 - e) Glass duct can be installed between a hood and a scrubber if recommended by the manufacturer. Otherwise use of glass must be justified.
10. Perchloric and Radio-Isotope hood exhausts

- a) Ducts may not be more than 45 degrees off vertical with no more than four offsets (two to get into a chase, and two to get out of the chase).
- b) Systems are to have a water wash down (see "Laboratories – Plumbing Guidelines").
- c) Perchloric acid hoods must be attached to a dedicated exhaust system using FRP, PVC or welded stainless steel ductwork.
- d) Radio-isotope hoods must be attached to a dedicated exhaust system welded stainless steel ductwork.
- e) Exhaust systems should be reviewed with the University REM department.

Comments:

G.2 *Pay close attention during design to using the total fume hood exhaust in sizing the exhaust fan. Verify that the fume hood manufacturer's published data includes fume hood bypass and sash clearance leakage. The quantity of air leaving the hood can be more than published data. When that happens, the exhaust system and make-up air systems may inadvertently be designed for less than actual flow.*

General Information			
Project Name			
Hood Location		Date	
A&E Firm		Preparer's Name	

Contact Information for Faculty & Staff Responsible For Hood Operation			
Faculty Name		Title	
Staff contact		Title	
Department		CHPID #	
Campus Address			
Phone #		E-mail	

Hood Use information	
Application (describe expected use of hood):	
Apparatus (describe anticipated equipment use):	
Hood usage (circle):	24/7 Continuous Occasional intermittent Occupied/unoccupied schedule
Utilities (circle):	Vac. Nat. Gas Nit. Air RO DI NPCW / HW Cup sink(s) Other:
Storage Cabinet:	Is vented storage required for toxic materials?

Chemicals Expected to be Used (Attach additional pages as needed)		
Name or Chemical Type	Concentration	Process Temperature Range*

(*example: room temperature, between #° C to #° C, liquid N2 boiling point, etc.)

Hood Type (Check all that apply. Physical Facilities may select based on above info.)							
Conventional	<input type="checkbox"/>	Perchloric Acid	<input type="checkbox"/>	Radio-isotope	<input type="checkbox"/>	Acid Resistant	<input type="checkbox"/>
	<input type="checkbox"/>	Walk-in	<input type="checkbox"/>	Other	<input type="checkbox"/>		<input type="checkbox"/>
Hood Size:	4 Foot	<input type="checkbox"/>	5 Foot	<input type="checkbox"/>	6 Foot	<input type="checkbox"/>	8 Foot
Sash Type:	Vertical only	<input type="checkbox"/>	Combination (vertical & horizontal)	<input type="checkbox"/>			