Fume Hood & Biosafety Cabinet Program

San Bernardino Valley College
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San Bernardino, California 92410
&
Crafton Hills College
11711 Sand Canyon Road
Yucaipa, California 92399

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Policy Statement

It is the policy of the San Bernardino Community College District (SBCCD) that all employees and students will be protected from exposure to fumes when working in a laboratory by implementing laboratory type engineering controls such as Fume Hoods or Biological Safety Cabinets (BSCs). Fume hoods and BSCs will be evaluated for proper functioning and employees and students will be trained on proper handling procedures.

Purpose

SBCCD has determined that certain employees and students may be exposed to hazardous substances during routine laboratory operations. These hazards include chemical vapors, aerosols from the work area, and other particulates. The purpose of this program is to ensure that all SBCCD employees and students are protected from exposure to these laboratory hazardous substances.

Scope and Application

When laboratory fume hoods are used to prevent harmful exposure to hazardous substances, such fume hoods shall conform to all applicable provisions the Cal-OSHA Title 8, Section 5154.1, and other applicable provisions in the SBCCD fume hood and BSC Testing Protocol's. When biological safety cabinets, as defined below, are used to prevent harmful exposure from biohazard agents or biohazardous materials or hazardous substances they shall conform to the provisions of this Section and Cal-OSHA Title 8, Section 5143.

Engineering controls are often the primary control device for protecting laboratory workers when working with flammable and/or toxic chemicals. OSHA's laboratory standard (29 CFR 1910.1450) requires that fume hoods and other protective equipment be maintained and function properly when used. Fume hoods provide protection from hazardous fumes and vapors by capturing, diluting, and removing these materials. Fume hoods also provide physical protection against fire, spills, and explosions.

Responsibilities

Program Administrator

The College President is the program administrator, the Vice President of Administrative Services is the designee, and both have the authority and responsibility for implementing and maintaining this program for their respective campuses.
Assigned campus designees are as follows:

Vice President of Administrative Services/SBVC, Site Safety Officer
San Bernardino Valley College
Tel: (909) 384-8958
&
Vice President of Administrative Services/CHC, Site Safety Officer
Crafton Hills College
Tel: (909) 389-3210

The program administrators and designees may be assisted in their duties by the SBCCD Environmental Health & Safety Administrator. The EH&S Administrator can be reached at (909) 388-6935 during regular business hours or EHS@SBCCD.edu.

The duties of the program administrator include, but are not limited to the following:

- Facilitate and coordinate testing of fume hoods and BSC.
- Report deficiencies found during the EH&S-facilitated survey and produce repair requests.
- Develop and provide training for fume hood users.
- Review fume hood commissioning reports.
- Identifying work areas, processes, or tasks that require employees and students to use a fume hood.
- Evaluating the various components of a fume hood.
- Arranging for and/or conducting training.
- Ensuring proper storage and maintenance of fume hood equipment.
- Maintaining records required by the program.
- Evaluating the program.
- In collaboration with Environmental Health & Safety Administrator update written program, as needed.

Supervisors

Supervisors are responsible for ensuring that the Fume Hood and Biosafety Cabinet Program is implemented in their particular areas by following the Chemical Hygiene Plan and observing laboratory safe practices. These measures are intended to minimize, reduce, or eliminate SBCCD personnel exposures and may include administrative controls, or the use of personal protective equipment. In addition to being knowledgeable about the program requirements for their own protection, supervisors must also ensure that the program is understood and followed by the employee under their charge. Duties of the supervisor include:

- Ensuring that employees under their supervision (including new hires) have received appropriate training.
- Ensuring the availability of appropriate fume hoods or Biosafety Cabinet and accessories.
- Enforcing the proper use of a fume hood or Biosafety Cabinet when necessary.
- Reporting any fume hood or Biosafety Cabinet in need of repair found during daily use.
- Implementing worksite-specific procedures.
- Ensuring that fume hoods and Biosafety Cabinet are properly cleaned, maintained, and stored according to the fume hood & Biosafety cabinet protection plan.
- Continually monitoring work areas and operations to identify hazards.
- Coordinating with the Program Administrator on how to address hazards or other concerns regarding the program.

Instructors: Directly responsible for chemical hygiene in the laboratory. All instructors are required to ensure that provisions of the Fume Hood & Biosafety Cabinet Program are being followed in the laboratory for the safety of the students and themselves. Provide information on safety, guidelines on lab behavior and techniques, and instructions on chemicals used in the lab to support student safety.

Operators

Employees and students have the responsibility to operate and maintain a fume hood or biosafety cabinet and in the manner in which the manufacturer intended. They must also:

- Use the fume hood or biosafety cabinet correctly.
- Follow the Chemical Hygiene Plan, laboratory safe practices, and worksite-specific procedures.
- Report any fume hood or biosafety cabinet in need of repair found during daily use.
- Care for and maintain their fume hoods or biosafety cabinet as instructed.

- Inform their supervisor immediately if the fume hood or biosafety cabinet no longer functions properly.
- Inform their supervisor of any fume hood or biosafety cabinet hazards that they feel are not adequately addressed in the workplace and of any other concerns that they have regarding the program.

Definitions

- **Biohazard Agent:** A replication capable pathogen which is a disease-causing microorganism and is capable of causing diseases in humans including viruses, microbes and sub viral agents. The agent includes the agent, products of infectious agents, or the components of infectious agents presenting a risk of illness or injury.
- **Biohazardous Materials:** Any materials that would harbor biohazardous agents such as human blood, body fluids, or tissues that may be contaminated with biohazardous agents.
- **Biological Safety Cabinet (BSC):** A ventilated cabinet which serves as a primary containment device for operations involving biohazard agents or biohazardous materials.
- **Hazardous Substance:** One which by reason of being explosive, flammable, poisonous, an irritant, or otherwise harmful is likely to cause injury or illness if not used with effective control methods.
- **Laboratory-Type Hood:** A device enclosed except for necessary exhaust purposes on three sides, top and bottom, designed to draw air inward by means of mechanical ventilation, operated with insertion of only the hands and arms of the user. Used to control exposure to hazardous substances.

Program Elements

Fume Hood Testing Protocol

Testing of all fume hoods on campus shall be performed annually by a certified technician. The face velocity shall be measured with the sash placed at the designated, proper working height (typically no higher than 18 inches or less as indicated by a sash stop and/or an affixed sticker that indicates the proper working height) using a calibrated, NIST traceable hot wire anemometer. Smoke visualization test shall also be performed to evaluate containment capability and turbulence. The fume hood shall be tested as is.

The “pass” criteria shall comply with Title 8 CCR 5154.1 (c)(1), and other applicable standards, as appropriate.

The following information shall also be collected and reported:

- fume hood make and model;
- sash height as found;
- is the light working;
- is the sash stop present;
- is the sash in working order/good condition/glass cracked;
- is the airflow alarm present and functioning;
- smoke test result;
- cross draft testing result;
- principal Investigator and contact number.

All tested fume hoods shall bear a “fume hood sticker” (Appendix A) that contains the following information:

- Proper working height
- Result of the qualitative smoke visualization test
- Face velocity (the text “FAIL” shall be written in this field if the tested fume hood does not meet the “pass criteria”)
- Inspector
- Date of inspection
- Re-inspection date

Reporting Deficiencies and Repair Requests:

Fume hoods that do not meet the “pass” criteria are marked “FAIL” and are addressed immediately through issuance of a work order to the Facilities Department. The fume hood shall not be used until deficiencies are corrected.

Biosafety Cabinet Testing Protocol

Testing of all biosafety cabinets (BSCs) on campus shall be performed annually by a certified technician as per 29 CFR 1910.1030 (e)(2) and in accordance with NCF/ANSI Standard 49.

The “pass criteria” shall comply with Title 8 CCR 5154.2, and other applicable standards, as appropriate.

All tested BSCs shall bear an inspection sticker that contains the following information:

- Result of the qualitative aerosol challenge test;
- Airflow (the text “FAIL” shall be written in this field if the tested BSC does not meet the “pass criteria”);
- Inspector;
- Date of inspection;
- Re-inspection date.

Reporting Deficiencies and Repair Requests:

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BSCs that do not meet the “pass” criteria are marked “FAIL” and are addressed immediately through issuance of a work order to Facilities Management. The BSC shall not be used until deficiencies are corrected.

Newly Installed Fume Hood (New Construction or Renovation) changes that may affect fume hood performance:
Commissioning testing is required for all newly installed fume hoods, as part of new construction or renovation, or when changes are made to the laboratory, its building, and/or the mechanical systems, or to the fume hood itself that may impact the fume hood’s performance. The testing shall include elements specified in the Fume Hood Testing Protocol of this program, as well as tracer gas test pursuant to Title 8 CCR 5154.1 (c)(2)(B).

Operation:

Mechanical ventilation shall always remain in operation when fume hoods are in use and for a sufficient time thereafter to clear fume hoods of airborne hazardous substances. When mechanical ventilation is not in operation, hazardous substances in the fume hood shall be covered or capped off.

Ventilation Rates

Laboratory-type hood face velocities shall be sufficient to maintain an inward flow of air at all openings into the hood under operating conditions. The hood shall provide confinement of the possible hazards and protection of the operator for the work that is performed. The exhaust system shall provide an average face velocity of at least 100 feet per minute with a minimum of 70 fpm at any point, except where more stringent special requirements are prescribed in other sections of the General Industry Safety Orders, such as Section 5209. The minimum velocity requirement excludes those measurements made within 1 inch of the perimeter of the work opening.

When a laboratory-type hood is in use to contain airborne hazardous substances and no one is in the immediate area of the hood opening, the ventilation rate may be reduced from the minimum average face velocity of at least 100 feet per minute to a minimum average face velocity of 60 feet per minute if the following conditions are met:

a) The reduction in face velocity is controlled by an automatic system which does not require manual intervention. The automatic system shall increase the airflow to the flow when the hood is accessed.
b) The laboratory-type hood has been tested at the reduced flow rate according to the tracer gas method, Method of Testing Performance of Laboratory Fume Hoods, which is hereby incorporated by reference, and has a hood performance rating of 4.0 AU 0.1 or less. The test may be performed with or without the mannequin described in the ANSI/ASHRAE 110-1995 tracer gas method.

The tracer gas test needs to only be performed once per hood. However, if the program administrator has chosen to perform the tracer gas test on subsequent occasions, it is the most recent record of test results and test configuration that shall be maintained.

The record of the most recent tracer gas test results and the “as used” test configuration shall be maintained as long as the automatic system is operable and thereafter for five years.

Training Requirements

Fume Hood User Training:

All fume hood users shall receive training in the following elements:

- General fume hood purpose
  - Primary engineering control method for potential exposures
  - Containment method for unanticipated fires/explosions/splashes
  - Fume hood components
- Airflow characteristics
  - Once-through system
  - Capture efficiency and optimum velocity
- Potential for turbulent airflow and escape of hazardous substances from the hood
  - Impact of high face velocity/low face velocity
  - Impact of blocking baffles
- Safe use of the fume hood and its features
  - Types of fume hoods
  - Work practices/correct use
    - “Do not operate fume hoods marked ‘FAIL’ until repaired”

- Performance testing
  - EH&S procedures (survey, tags, yellow sticker, repair requests)
  - Other performance tests
- Quantitative airflow monitors or alarm system
  - Location on the hood
  - Use as flow indicator
- Energy Conservation
  - Anecdotal statistical data
  - Keep sash closed when not in use

Biosafety Cabinet User Training:

All BSC users shall receive training in the following elements:

- Confirm BSC is appropriate for the BSL Level.
- Prepare a written checklist of materials necessary for a particular activity and place only necessary materials in the BSC before beginning work.
- Turn off any overhead room germicidal ultraviolet light (UV) and any BSC UV lights.
- Confirm that the BSC is currently certified for use.
- Confirm that the BSC is operating properly prior to beginning work by checking airflow gauges.
- Adjust the stool height so that armpits are level with the bottom of the view screen or sash.

Any individual using a laboratory type hood or BSC shall be trained, and this training will be enforced by the supervisors and program administrator. They will ensure that the fume hoods and BSCs including all the features are being handled safely. The training will ensure that users understand the general fume hood and BSC purpose, airflow characteristics, and potential for turbulent airflow and escape of hazardous substances from the hood or cabinet. Lastly, they must know where the quantitative airflow monitor or alarm system is located on the hood and how it is used to indicate an inward airflow during operation of the fume hood.

Supervisors/program administrators will be able to determine the date of the last performance test conducted and if the fume hood or BSC performance met the Cal OSHA requirements.

Prior to Fume Hood & Biosafety Cabinet Operation

Below is a list of items to be aware of before operating inside a fume hood or BSC:

- Make sure that you understand how the fume hood or BSC works.
- You should be trained to use it properly.
- Know the hazards of the chemical or organism you are working with; refer to the chemical's Safety Data Sheet if you are unsure.
- Ensure that the fume hood or BSC is on.
- Make sure that the sash is open to the proper operating level, which is usually indicated by arrows on the frame.
- Make sure that the air gauge indicates that the air flow is within the required range.

During Fume Hood Operation

Below is a list of items to be aware of when operating inside or near a fume hood.

- Never allow your head to enter the plane of the hood opening. For example, for vertical rising sashes, keep the sash below your face; for horizontal sliding sashes, keep the sash positioned in front of you and work around the side of the sash.
- Use appropriate eye protection.
- Be sure that nothing blocks the airflow through the baffles or through the baffle exhaust slots.
- Elevate large equipment (e.g., a centrifuge) at least two inches off the base of the hood interior.
- Keep all materials inside the hood at least six inches from the sash opening. When not working in the hood, close the sash.

Below is a list of items to be aware of when operating inside or near a Biosafety Cabinet.

- Store extra supplies outside the BSC. Only materials and equipment needed for the immediate work should be placed in the BSC.
- Do not use equipment or store supplies inside the BSC that may disrupt the protective BSC airflow pattern.
- If large equipment must be placed inside the BSC, place it as far back in the BSC as practical.
- Do not work with open containers of infectious or hazardous materials in front of the large equipment.
- Move arms in and out of the cabinet slowly, perpendicular to the face opening, to limit disruption of the air curtain.
- Wear appropriate personal protective equipment. Lab coats must be buttoned and back- closing laboratory gowns tied, if utilized, for greater protection. Gloves should be pulled over the wrists of lab coats, not worn inside the sleeve.
- Manipulation of materials inside the cabinet should be delayed for 1 minute after placing hands/arms inside the cabinet to allow the air to stabilize and to “air sweep” arms.
- Do not rest arms on front grille (unless the BSC is specifically equipped with features that permit this action) because doing so allows room air to flow directly into the work area rather than being drawn through the front grille. Instead, work with both arms raised slightly.
- Do not block the front grille with papers or other materials.
- Perform all operations on the work surface and at least 4 inches from the front grille.
- Allow cabinet blowers to operate for at least 3 to 5 minutes before beginning work to allow the BSC to “purge” particulates.
- If necessary, use plastic-backed absorbent toweling on the work surface (but not on the front grille) to aid in cleanup and spill containment.
- Make sure that active work flows from the clean to contaminated area across the work surface.
- To minimize frequent in/out arm movement and maintain the air barrier, do not tape autoclavable biohazard collection bags to the outside of the BSC; upright pipette collection containers should not be used in the BSC and/or placed on the floor outside the BSC. (Instead, horizontal discard trays containing an appropriate chemical disinfectant should be used).
- When work is finished, surface decontaminate all items that are to be brought out of the BSC prior to their removal.

Engineering Controls in Laboratories

The fume hood is often the primary control device for protecting laboratory workers when working with flammable and/or toxic chemicals. OSHA's Occupational Exposure to Hazardous Chemicals in Laboratories standard, 29 CFR 1910.1450, requires that fume hoods be maintained and function properly when used, 29 CFR 1910.1450(e)(3)(iii).

Do not permanently store any chemicals inside the hood.

- Promptly report any hood that is not functioning properly to your supervisor. The sash should be closed, and the hood "tagged" and taken out of service until repairs can be completed.
- When using extremely hazardous chemicals, understand your laboratory's action plan in case an emergency, such as a power failure, occurs.
- The biosafety cabinet (BSC) is designed to shield employees, students and the environment from potential hazards posed by infectious materials and human pathogens, the BSC comes in three distinct classes (Class I, II, and III). One common attribute across all BSCs is the incorporation of high efficiency particulate air (HEPA) filters. Renowned for their capacity to eliminate particles as tiny as 0.3 microns with an exceptional 99.97% efficiency, HEPA filters adeptly ensnare a vast majority of bacteria and viruses. Notably, these filters do not capture or eliminate vapors (such as those emanating from ethanol, formalin, etc.) and gases. Each class of BSC has different attributes and airflow rates.

Documentation and Recordkeeping

A written copy of this program and the related OSHA standard are kept in the Program Administrator's office and is available to all who wish to review it. Training and fume hood or biosafety cabinet certification records will be updated as new necessary employees are trained and existing ones receive refresher training and new certifications are completed.

- Fume hood & BSCs testing requests are made by contacting the SBCCD Program Administrator's Office.
- Fume hood & BSCs repair requests are made by contacting the Facilities Management Service Desk.

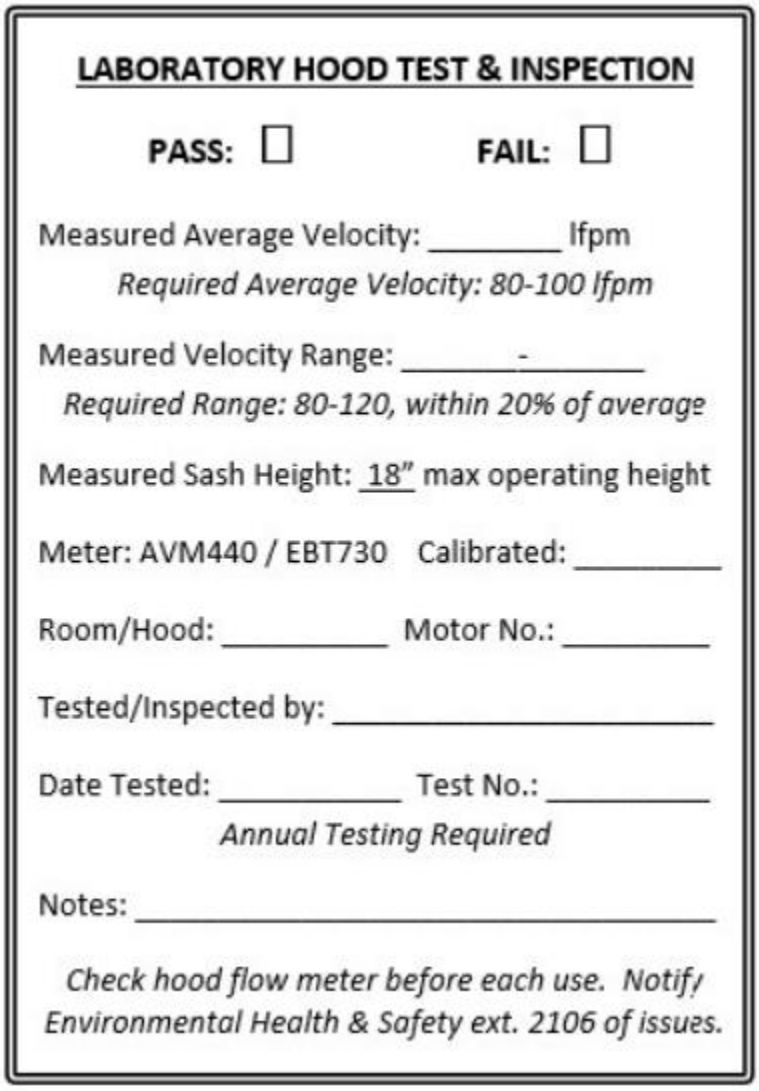
Program Evaluation

The SBCCD Fume Hood & Biosafety Cabinet program will undergo regular review and necessary revisions periodically by the Environmental Health and Safety Administrator in consultation with the Program Administrator.

References

- 29 CFR 1910.1030
- 29 CFR 1910.1450
- ANSI/ASHRAE 110-1995
- Cal-OSHA Title 8, Section 5143
- Cal-OSHA Title 8, Section 5154.1
- NCF/ANSI Standard 49

Appendix A: Sample Fume Hood Certification Decal



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.

Appendix B: SBVC Site Specific Information

College President	• (909) 384-4477
VP Administrative Services	• (909) 384-8958
Adminstrative Services	• (909) 384-8965
Safety & Risk Management	• (909) 388-6935
Web Links	• **https://sbccd.org/ehs**

Appendix C: CHC Site Specific Information

College President	• (909) 389-3200
VP Administrative Services	• (909) 389-3210
Administrative Services	• (909) 389-3211
Safety & Risk Management	• (909) 388-6935
Web Links	• **https://sbccd.org/ehs**