Biological Safety Cabinets (BSCs)

This sheet is for general information

This is NOT a substitute for Reading & Following Owner's Manual

Biological safety cabinets (BSCs) are among the most effective primary containment devices used in laboratories working with infectious agents, as a primary barrier to prevent the escape of biological aerosols into the laboratory environment. Most laboratory techniques such as centrifuging, pipetting, vortexing, sonicating ……. produce inadvertent aerosols that can be readily inhaled by the laboratory technician.

HEPA & ULPA Filters

HEPA & ULPA filters are designed to trap particulate contaminants not vapors or gases from an air stream by forcing air through a fine fiberglass mesh. A combination of three primary methods are used to trap particulates. *Diffusion, interception, and inertial impaction.*

High Efficiency Particulate Air (HEPA) filters are present in all classes of BSCs. A HEPA filter removes only particulates (including microorganisms), not vapors or gases, from the air. Depending on its quality, a HEPA filter is able to trap up to 99.97% of particles with dimensions equal to or greater than 0.3 µm.

Ultra Low Particulate Air (ULPA) filters are the next level up. ULPA filters should remove 0.1 µm and up. ULPAs are rated at removing 99.995% of airborne contaminants. Not vapors or gases.

Filter Life Span or "How often should I change filters?"

Most manufacturers state life span of 5-7 years. This can vary greatly based on use & environment.

Low use, Clean environment = Long Life up to 15 years. High use, Dirty environment = as little as 6 months.

A good certification provider should be able to give you plenty of notice as to when and if a filter change is warranted (at least a year), to allow for budgeting. Parts & Labor to decontaminate properly and change out filters can run into the thousands of dollars and usual takes 2 days. Most common reason to change filters is lack of air flow due to filter loading from airborne particulates i.e., dust. Seconded, is physical filter damage. Filters with minor physical damage can be repaired. Up to 10% of surface area is allowable.

Visit our web site for more info on Certification & Decontamination - AdaptCert.com

Biological Safety Cabinets are classified into three classes

Class 1 - Biosafety levels: 1, 2 and 3

Provide personnel and environment protection. Used when working with low to moderate risk biological agents.

Class 2 - Biosafety Levels: 1, 2 and 3

Provide personnel, environment, and product protection. Used when working with low to moderate risk biological agents.

Class 3 - Biosafety Level: 4

Usually a highly specialized laboratory working with very high risk biological agents.

A Class 3 **"glovebox"** cabinet provides the same protection as a Class 2 but is designed as full containment when working with **Biosafety Level 4** highly infectious agents. They provide the highest level of protection for the environment and user.

Chemicals

BSCs should not be used as a chemical fume hood. Volatile or toxic chemicals should not be used in BSCs without proper ducting. Vapor build-up inside the cabinet can be a fire or explosion hazard. NON-Ducted units recirculate filtered air through the cabinet, venting waste air into the room potentially exposing the operator and other room occupants to toxic chemical vapors.

Flammable Gas Connections

Gas connections to a BSC are not permitted without a written justification for specialized, limited-duration work. Note that routine "flaming" is not considered adequate justification. Approved gas connections should have an additional shut-off valve installed outside of the BSC. Alternatives to continuous flame burners should be used.

Open flames in BSCs: Open flames SHOULD NOT be used.

Open Flame can create turbulence in the airflow, compromising protection of both the worker and the work, present a potential fire or explosion hazard especially when using a gas burner in conjunction with ethanol, cause excessive heat build-up which may damage HEPA filters and compromise the cabinet's integrity & may void the manufacturer's warranty.

Ultraviolet Lamp Usage

The primary method of decontamination should be to use an effective, EPA registered disinfectant such as 10% bleach for 10 minutes. For corrosive chemicals such as bleach, disinfection should be followed by rinsing with sterile water or 70% ethanol to remove chemical residue that may otherwise damage stainless steel surfaces.

Ultraviolet (UV) lamp usage is EXPLICITLY DISCOURAGED in all major international standards & recommendations. Due to improper use resulting in a false sense of safety.

UV sterilization is **Line Of Sight**. It is an atmospheric & surface treatment. When used, procedures below need to be fallowed to ensure effectiveness.

1. UV bulb should be cleaned with 70% ethanol/alcohol weekly or prior to performing work to remove residue that may reduce germicidal effectiveness.
2. Lamps should be checked regularly (every 2-4 months) with a UV meter placed on work surface. **5 minutes** after lamp has warmed up, the radiation output should be no less than **40 microwatts** per square centimeter at a wavelength of **254 nanometers** (nm).
3. Cabinets with a sliding sash should be CLOSED when operating the UV lamp. Most lamps will only run if sash is closed properly.
4. If BSC is not equipped with a UV Life Clock, A log of hourly use should be maintained. Most UV lamps have 4,000 to 10,000 hours of life. There effectiveness deteriorates with age.
5. UV lamps **must be turned off** when room is occupied to protect eyes, lungs, and skin from **UV & Ozone** exposure. UV can burn the cornea and cause skin irritation and cancer. Ozone can damage the lungs.

Planning

Thoroughly understand procedures and equipment before beginning work. Minimize disruptions, such as room traffic or room entry while cabinet is in use. Reduce in & out motions from BSC as much as possible. Practice penetrating arm movements AVOIDING sweeping motions in or out of cabinet.

Startup Procedure

Turn off UV light if in use. Check the return air grilles, especially in back of the workspace for obstructions, note the pressure gauge reading if applicable. A daily or weekly log will help determine if unit is failing. Raise sash to proper operating height. Commonly 8, 10, or 12 inches. Look for height indicators to the left or right. Align bottom of sash to mark. **DO NOT** set sash lower or higher. This will cause improper Air Balance and usually result in unit alarming.

Surface Decontamination

Wipe down surfaces with an EPA registered disinfectant such as 10% bleach for 10 minutes, followed by 70% ethanol. This is to prevent pitting of the stainless steel and allow to dry.

AFTER DECON - Allow the cabinet to operate unobstructed for at least 5-10 minutes.

Loading Materials and Equipment

Load only the materials required for the procedure with **PENITRATIVE** movements.

Do not overload the cabinet. Do not obstruct the front, side, or rear return air grilles!

Large objects should not be placed close together. After loading the cabinet, wait 2-3 minutes to purge airborne contaminants from the work area.

Work Techniques

Do not cover the front or rear air grilles with arm, paper, absorbent pads, or any other materials.

Covering the air grilles creates dead zones and may allow inflow or outflow of airborne particulates.

Keep all materials at least 4-5 inches inside the sash, and perform all operations with contaminate material as far to the rear of the work area as comfortably possible. Segregate all clean and contaminated materials in the work area and arrange materials to minimize the movement of contaminated materials into clean areas. Keep all discarded, contaminated material to the rear of the cabinet. Avoid moving materials or excessive motion of the operator's hands and arms through the front access opening during use.

Use proper aseptic technique.

Avoid using techniques or procedures that disrupt the air flow pattern of the cabinet.

If there is a spill or splatter during use, all objects in the cabinet should be surface decontaminated before removal. Thoroughly disinfect the work surfaces of the cabinet while it is still on. This will prevent the release of contaminants from the cabinet.

Final Purging

When work is completed, the cabinet should be allowed to operate for **5 minutes** undisturbed to purge airborne contaminants from the work area.

Unloading Materials and Equipment

Disposable contaminated objects, including gloves, should be placed in disposal pans or autoclave bags inside the BSC after use. Reusable objects in contact with contaminated material should be surface decontaminated before removal from the cabinet. All open trays or containers should be covered before being removed from the cabinet.

Surface Decontamination After Work

SLOWLY wipe down the interior surfaces of the cabinet with 10% bleach or an EPA-registered disinfectant. After 10 minutes wipe down with 70% ethanol to prevent pitting of the stainless steel then allow to dry.

BSCs are designed to run 24/7

To achieve optimal containment & cleanliness, it is BEST if unit is left running with sash at proper height. Turning unit On & Off will **INCREASE risk of contamination** & can shorten the life of the blower motor.

If unit is equipped with **Power Save or Sleep Mode**, this is best utilized during nonpeak hours i.e., at night or weekends. **REMEMBER to allow proper wakeup of unit to fully reinstate safe air flow, 5-7 minutes.**

Shutdown (Optional)

For longer periods (one week) close sash, turn off lights and cabinet blower.

Remember to go through all PROPER START UP procedures when turning unit on.

Unit should be considered as **POTENTALY CONTAMINATED** when restarting after long shut down.

LAST PAGE IS AN AIRFLOW DIAGRAM

IT DEPICTS HOW AIR IS DIRECTED TO PRODUCE AND MAINTAIN A STERILE WORK ZONE.

BY DIRECTING 70% OF FILTERED AIR DOWN INTO WORK ZONE CAPTURING & DIRECTING PARTICULATES INTO UPPER SEALED CHAMBER FOR CONTAINMENT.

THE "AIR CURTAIN" AT THE SASH FACE THE OPERATOR WORKS THROUGH IS THE MOST FRAGILE & CRITICAL ZONE.

Air In-flow 70% Recirculated vs. 30% Exhausted