

# FACT SHEET

## Biological Safety Cabinets (BSCs)

Biological Safety Cabinets or BSCs are designed to provide personnel, environmental or product protection when appropriate practices and procedures are followed handling biological materials. Three kinds of biological safety cabinets (designated as Class I, II and III) have been developed to meet varying research and clinical needs, and provide various levels of protection. A complete description of BSCs can be found in the 5th edition BMBL: <http://www.cdc.gov/biosafety/publications/bmb15/>. However, there are important differences between types with respect to their operation and the types of materials that can be safely handled in each.

### Class I Biological Safety Cabinets

The Class I BSC provides protection for personnel and the environment, but NO product protection. It is similar in air movement to a chemical fume hood, but has a HEPA filter in the exhaust system to protect the environment.

In the Class I BSC, unfiltered room air is drawn across the work surface. Personnel protection is provided by this inward airflow as long as a minimum velocity is maintained through the front opening. The use of the Class I BSC has declined due to lack of product protection but, in many cases, Class I BSCs are used specifically to enclose equipment (e.g., centrifuges, harvesting equipment or small fermenters), or procedures with potential to generate aerosols (e.g. cage dumping, culture aeration or tissue homogenization). Some Class I models used for animal cage changing are designed to allow recirculation of air into the room after HEPA filtration and may require more frequent filter replacement due to filter loading and odor from organic materials captured on the filter. The re-circulating Class I BSC should be annually certified for sufficient airflow and filter integrity.

### Class II Biological Safety Cabinets

The Class II BSC provides protection for personnel, the environment, AND the product. Class II BSCs are partial barrier systems that rely on a continuous unidirectional air movement at a fixed velocity along parallel lines ("laminar flow") to provide containment. If the air curtain is disrupted (e.g., movement of materials in and out of a cabinet, rapid or sweeping movement of the arms) the potential for contaminant release into the laboratory work environment is increased as is the risk of product contamination. All Class II cabinets are designed for work involving microorganisms assigned to Biosafety Levels 1, 2 and 3. Class II BSCs provide the microbe-free work environment necessary for cell culture propagation and also may be used for the formulation of nonvolatile anti-neoplastic or chemotherapeutic drugs.

There are 4 types of Class II BSC (Types A1, A2, B1 and B2) each with unique characteristics, however, in all four, the airflow is drawn into the front grille of the cabinet, providing personnel

protection. . In addition, the downward laminar flow of HEPA-filtered air provides product protection by minimizing the chance of cross-contamination across the work surface of the cabinet. Because cabinet exhaust air is passed through a certified HEPA filter, it is particulate-free (environmental protection), and may be recirculated to the laboratory or discharged from the building via a canopy connection (Type A1 and A2). Exhaust air from Types B1 and B2 BSC must be discharged to the outdoors via a fixed or canopy connection. HEPA filters are effective at trapping particulates and thus infectious agents but do not capture volatile chemicals or gases. Only Types A2, B1 and B2 BSCs exhausting to the outside should be used when working with volatile, toxic chemicals, but amounts must be limited and exposure limits must be considered.

### Class III Biological Safety Cabinets

The Class III BSC is designed for work with highly infectious microbiological agents and for the conduct of hazardous operations. It provides maximum protection from the environment and the worker. The Class III BSC is a gas tight enclosure with a non-opening view window. Long, heavy-duty rubber gloves are attached in a gas-tight manner to ports in the cabinet to allow direct manipulation of the materials isolated inside. Access for passage of materials into the cabinet is through a dunk tank, that is accessible through the cabinet floor, or double-door pass-through box (e.g., an autoclave) that can be decontaminated between uses. Both supply and exhaust are HEPA filtered on a Class III BSC. Exhaust air must pass through two HEPA filters, or a HEPA filter and an air incinerator, before discharge directly to the outdoors. Class III BSC are not exhausted through the general laboratory exhaust system.



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## **Whom do I contact if I have a problem with my BSC or it is due for certification?**

Contact OEHS to discuss options for repairs or certifications of BSCs (801-581-6590). All repairs and certifications must be performed by an NSF-certified technician and the University of Utah has a contract with ENV Services.

No work on the BSC may be performed by University of Utah Facilities staff, with the exception of work/servicing on the exterior of the cabinet, such as connection of the cabinet to the vacuum system.

## **Can I relocate my BSC within the lab or move it to another lab space?**

Cabinets must be fully decontaminated before they are moved, and then re-certified after they are in place. Please contact OEHS (801-581-6590) to assist with scheduling the decontamination and re-certification by our contracted vendor, ENV Services. Labs are also responsible for arranging the movement of cabinets with University Facilities Management. If the cabinet is destined for surplus, please remove biohazard stickers after the cabinet has been fully decontaminated by ENV Services and contact surplus for pick-up.

## **What is the difference between the surface decontamination and the decontamination service by ENV Services?**

Upon completion of work, lab staff should decontaminate the interior surfaces of the cabinet by wiping down all accessible surfaces with an appropriate disinfectant. Additionally, monthly or as needed, lab staff should remove the cabinet work surface to access and surface disinfect the lower plenum (a.k.a. drain pan). These surface decontaminations are needed for proper maintenance of your cabinet and are the responsibility of lab staff.

The decontamination service provided by ENV involves decontaminating the entire interior of the cabinet (including the blower/motor and HEPA filters) by fumigation with vaporized hydrogen peroxide. This decontamination service is required prior to repairs in which service personnel must access potentially contaminated areas of the cabinet (i.e. HEPA filter or motor/blower replacement). Additionally, this type of decontamination is required prior to cabinet relocation to ensure biohazardous material is not released during transportation. This service does not include cleaning of the cabinet interior surfaces. As indicated above, lab staff are responsible for routine surface cleaning/disinfection.

## **How can I hook up gas/vacuum lines to my cabinet?**

Facilities Management should be contacted to hook up gas or vacuum lines to your cabinet. Remember—Bunsen burners are **NOT ALLOWED** in BSCs. See the OEHS Fact Sheet “Open Flames (Bunsen Burners) in Biosafety Cabinets.”