

Biological safety cabinets:

The terms biological safety cabinet and biosafety cabinet have been widely used to describe a variety of containment devices equipped with HEPA filter(s), designed to provide personnel or both personnel and product protection from biohazardous materials. The terms should only be applied to those devices that meet the requirements of Class I, II, or III specifications, based on their construction, airflow velocities and patterns, and their exhaust systems.

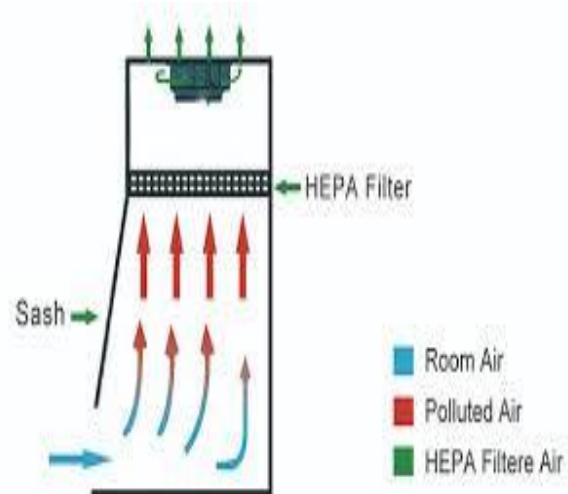
Major International Standards for Biological Safety Cabinets:

- American Standard NSF 49
- European Standard EN 12469
- Australian Standard AS 2252
- Japanese Standard JIS K 3800

Biological safety cabinet classes::**class I Biological safety cabinets:**

The Class I cabinet has the most basic and rudimentary design of all biological safety cabinetry available today. A stream of inward air moving into the cabinet contains aerosols generated during microbiological manipulations. It then passes through a filtration system that traps all airborne particles and contaminants. Finally, clean, decontaminated air is exhausted from the cabinet. The filtration system usually consists of a pre-filter and a HEPA (High Efficiency Particulate Air) filter.

Although the Class I cabinet protects the operator and the environment from exposure to biohazards, it does not prevent samples being handled in the cabinet from coming into contact with airborne contaminants that may be present in room air. Naturally, there is a possibility of cross-contamination that may affect experimental consistency. Consequently the scope and application of Class I cabinets is limited and it is largely considered obsolete.



class II Biological safety cabinets:

Like Class I safety cabinets, Class II cabinets have a stream of inward air moving into the cabinet. This is known as the inflow and it prevents the aerosol generated during microbiological manipulations to escape through the front opening. However, unlike Class I cabinets, the inflow on Class II cabinets flows through the front inlet grille, near the operator. None of the unfiltered inflow air enters the work zone of the cabinet, so the product inside the work zone is not contaminated by the outside air.

The differences between the various Class II cabinets available lie primarily with the percentage of air exhausted to that of air re-circulated from the common air plenum. In addition, different Class II cabinets have different means of cabinet exhaust. Some cabinets may exhaust air directly back to the laboratory, while others may exhaust air through a dedicated ductwork system to the external environment.

Despite these differences, all Class II cabinets, like Class I cabinets, protect both the operator and environment from exposure to biohazards. In addition, Class II cabinets also protect product samples from contamination during microbiological manipulations within the cabinet interior.



class II type A (A1/A2) Biological safety cabinets:

The Class II Type A biological safety cabinet is the most common Class II cabinet. It is also the most common safety cabinet of all the different types available. It has a common plenum from which 30% of air is exhausted, and 70% re-circulated to the work area as the downflow.

Type A cabinets exhaust air directly back to the laboratory, and they may contain positive pressure contaminated plenums. When toxic chemicals must be employed as an adjunct to microbiological processes, these cabinets should not be used. Exhaust HEPA filtration only removes airborne aerosols including biohazards, and not chemical fumes.

class II type B Biological safety cabinets:

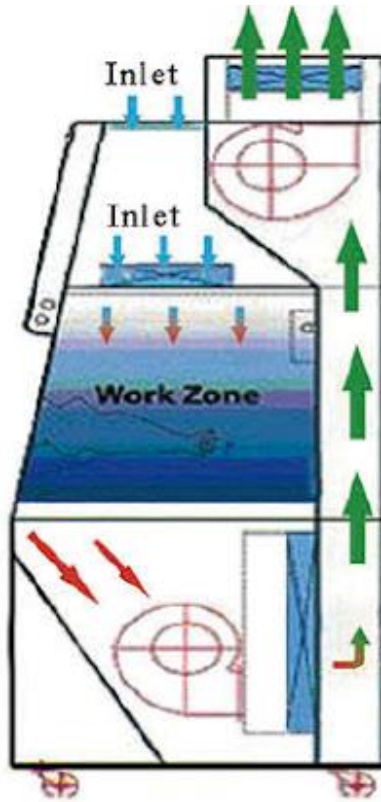
The main difference between Type A and Type B cabinet is: Type B cabinets must be operated with an external blower and it exhausts air to the external environment via a dedicated ductwork system. Without the external blower, the cabinets internal blower will blow the air (and microbiological agents) inside the work zone through the front opening, towards the operators' face, creating a dangerous situation. This cabinet is not self-balancing, in the sense

that its own blower can only create downflow, and the cabinet relies on the external blower to create inflow.

class III Biological safety cabinets:

The Class III biological safety cabinet provides an absolute level of safety, which cannot be attained with Class I and Class II cabinets. All Class III cabinets are usually of welded metal construction and are designed to be gas tight. Work is performed through glove ports in the front of the cabinet. During routine operation, negative pressure relative to the ambient environment is maintained within the cabinet. This provides an additional fail-safe mechanism in case physical containment is compromised.

On all Class III cabinets, a supply of HEPA filtered air provides product protection and prevents cross contamination of samples. Exhaust air is usually HEPA filtered and incinerated. Alternatively, double HEPA filtration with two filters in series may be utilized. Materials are transferred into the cabinet using a pass-through unit installed at the side of the work area. Class III cabinets usually exhaust air back to the laboratory; however, air may also be exhausted via a dedicated ductwork system to the external environment. When a dedicated ductwork system is employed, they are also suitable for work employing toxic chemicals as an adjunct to microbiological processes.



Biological Safety Cabinets (BSCs)



Class I



Class II



Class III