

Just the Facts...

Biological Safety Cabinets: Types

The Biological Safety Cabinet (BSC) is the principal primary containment device used to minimize exposure of laboratory personnel to aerosols or droplets when working with biological materials or pharmaceutical products. Secondary containment measures include facility design features such as negative pressure airflow and BSC location within the laboratory. Biological Safety Cabinets are divided into three classifications (Class I, II, III). The classifications are based on what type of biological agents that may be used in the laboratory and the degree of risk they pose to personnel working directly with the biological agents or visitors who may only be in the laboratory for a short time.

Class I Biological Safety Cabinets – The Class I BSC provides personal and environmental protection, but does not protect the material within the cabinet (product) from contamination. Unfiltered room air is drawn through the front opening and across the work surface. The exhaust air is passed through a HEPA filter before being vented to the outside. The Class I BSC is designed for general microbiological research with low and moderate risk agents. However, since product protection is not provided it is mainly used to enclose equipment. It may also be used for radioisotopes and some volatile toxic chemicals if the exhaust is ducted to the outside.

Class II Biological Safety Cabinets – The Class II cabinets are designed for personal, environmental and product protection. They are divided into two types (A and B) based on construction type, airflow velocities, patterns and exhaust systems. Type A BSCs are classified as A1 (formerly type A) and A2 (formerly B3). Type B BSCs are classified as B1 and B2.

1. *Class II Type A1 Cabinets*

- Maintain a minimum average face velocity of 75 fpm.
- May re-circulate air back into the laboratory or duct it to the outside by means of a “thimble” connection (i.e., small opening around the cabinet exhaust filter housing) whereby the balance of the cabinet is not disturbed by fluctuations in the building exhaust system.
- Exhaust 70% of the air and re-circulates 30%.
- May have positive pressure contaminated ducts and plenums.
- Are not suitable for work with low levels of volatile toxic chemicals and radionuclides.

2. *Class II Type A2 Cabinets*

- Maintain a minimum average face velocity of 100 fpm.
- May re-circulate air back into the laboratory or duct it to the outside by means of a thimble connection.
- Exhaust 70% of the air and re-circulates 30%.
- Have ducts and plenums under negative pressure.
- Are suitable for work with minute quantities of volatile toxic chemicals and trace amounts of radionuclides.

3. *Class II Type B1 Cabinets*

- Maintain a minimum average face velocity of 100 fpm.
- Are hard ducted through a dedicated duct exhausted to the atmosphere after HEPA filtration, contain negative pressure plenums.
- Exhaust 70% of the air and re-circulates 30%.
- Are suitable for work with minute quantities of volatile toxic chemicals and trace amounts of radionuclides.

4. *Class II Type B2 Cabinets*

- Maintain a minimum average face velocity of 100 fpm.
- Are hard ducted through a dedicated duct exhausted to the outside after passage through a HEPA filter, contain negative pressure plenums.
- Does not re-circulate air within the cabinet (100% exhaust).
- Are suitable for work with volatile toxic chemicals and radionuclides.

Class II cabinets are designed for use with Bio-safety level (BSL) 1, 2 or 3 organisms. For a description of bio-safety levels see Bio-safety in Microbiological and Biomedical Laboratories 5th Edition. [<http://www.cdc.gov/OD/ohs/biosfty/bmb15/bmb15toc.htm>] BSL-4 level organisms may be handled in these cabinets provided it is done within a BSL-4 suit laboratory using positive pressure suits. The product protection feature allows work with cell cultures as well and antineoplastic drugs.

Class III Biological Safety Cabinets - are totally enclosed, gas tight, ventilated work space. Exhaust air must pass through two HEPA filters or a HEPA filter and an air incinerator before being discharged to the outside. The airflow is maintained by a dedicated independent exhaust system that maintains a negative pressure within the cabinet of at least 0.5 inches of water. The Class III BSC was designed for work with BSL-4 agents and provides the highest degree of protection for the worker, the environment and the product. Arm-length heavy duty gloves that allow for manipulation of materials inside are attached to ports in the cabinet.