

# BIOLOGICAL SAFETY CABINETS

## Policy

All biological safety cabinets operated at Central Washington University (CWU) shall be provided, used and maintained in accordance with this policy.

## Types

Biological Safety Cabinets (BSCs) are among the most effective and the most commonly used primary containment devices in laboratories working with infectious agents. The two general types available here at CWU (Class I, II) have performance characteristics and applications which are described in this policy.

Properly maintained Class I and II BSCs, when used in conjunction with good microbiological techniques, provide an effective containment system for safe manipulation of moderate and high-risk microorganisms (Biosafety Level 2 and 3 agents).

## Class I

**Note:** Class I BSCs are currently being manufactured on a limited basis; many have been replaced by Class II BSCs.

The Class I Biological Safety Cabinet is a negative-pressure, ventilated cabinet usually operated with an open front and a minimum face velocity at the work opening of at least 75 linear feet per minute (lfpm). All of the air from the cabinet is exhausted through a HEPA filter either into the laboratory or to the outside. The Class I BSC is designed for general microbiological research with low- and moderate-risk agents, and is useful for containment of mixers, blenders, and other equipment. These cabinets are not appropriate for handling research materials that are vulnerable to airborne contamination, since the inward flow of unfiltered air from the laboratory can carry microbial contaminants into the cabinet.



The Class I BSC can also be used with an installed front closure panel without gloves, which will increase the inward flow velocity to approximately 150 lfpm. If such equipped cabinets are ducted to the outside exhaust, they may be used for toxic or radiolabelled materials used as an adjunct to microbiological research. Additionally, arm-length rubber gloves may be attached to the front panel with an inlet air pressure release for further protection. In this configuration, it is necessary to install a make-up air inlet fitted with a HEPA filter in the cabinet.

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## Class II

The Class II Biological Safety Cabinet is designed with inward air flow at a velocity to protect personnel (75-100 lfpm), HEPA-filtered downward vertical laminar airflow for product protection, and HEPA-filtered exhaust air for environmental protection.

Class II BSCs are classified into two types (A and B) based on construction, air flow velocities and patterns, and exhaust systems. Basically, Type A cabinets are suitable for microbiological research in the absence of volatile or toxic chemicals and radionuclides, since air is recirculated within the cabinet. Type A cabinets are further sub-typed into types A1 and A2. Type A2 cabinets were previously called Type B3 cabinets. Type A cabinets may be exhausted into the laboratory or to the outdoors via a “thimble” or canopy connection to the building exhaust system.

Type B cabinets are further sub-typed into types B1 and B2. Type B cabinets are hard-ducted to the building exhaust system and contain negative pressure plenum. These features, plus a face velocity of 100 lfpm, allow work to be done with toxic chemicals or radionuclides.

### Class II Type A1/A2 Biological Safety Cabinet

- 75 lfpm inward airflow
- HEPA filtered downward airflow from a common plenum
- May exhaust HEPA-filtered air back into the laboratory or to the outside atmosphere
- May have positive pressure contaminated ducts and plenums
- 70% of air is recirculated within the hood



### Class II Type B1 Biological Safety Cabinet

- 100 lfpm inward and 50 lfpm downward airflow
- HEPA filtered downward airflow
- Exhausts all air to the outside atmosphere after HEPA filtration
- May have biologically contaminated ducts and plenums under negative pressure
- 30% of air is recirculated within the hood



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## **Class II Type B2 Biological Safety Cabinet**

- 100 lfpm inward and 80 lfpm downward airflow
- HEPA filtered downward airflow
- Exhausts all air to the outside atmosphere after HEPA filtration
- Does not recirculate air within the cabinet or work area
- All contaminated ducts and plenums are under negative pressure



It is imperative that Class I and II biological safety cabinets be tested and certified at the time of installation within the laboratory, at any time the BSC is moved, and at least annually thereafter. As with any other piece of laboratory equipment, personnel must be trained in the proper use of the biological safety cabinets. Of particular note are activities that may disrupt the inward directional airflow and have been demonstrated to cause aerosolized particles to escape from the cabinet:

- Repeated insertion and withdrawal of the workers' arms into and out of the work chamber;
- Opening and closing doors to the laboratory or isolation cubicle;
- Improper placement or operation of materials or equipment within the work chamber; and
- Brisk walking past the BSC while it is in use.

Class I and II cabinets should be located away from traffic patterns and doors. Air flow from fans, room air supply louvers and other air moving devices can disrupt the airflow pattern at the face of the cabinet. Strict adherence to recommended practices for the use of BSCs and their proper placement in the laboratory are as important in attaining the maximum containment capability of the equipment as is the mechanical performance of the equipment itself.

## **Certification**

Certification of biological safety cabinets shall be the responsibility of the user and shall be certified under the following circumstances:

- Annually;
- If a cabinet has been moved;
- If a cabinet is suspected of functioning improperly; and
- If a different class of research is initiated (e.g., non-infectious to infectious).

Contact Environmental Health and Safety at 509-963-2338 for recommended firms available to perform this certification.

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## Use Requirements

Biological Safety Cabinets shall be used in accordance with the following minimum requirements:

1. Do not use gas burners or alcohol flames in biosafety cabinets;
2. Keep rear exhaust and front air intake grilles unobstructed so as not to hamper proper airflow into and within the cabinet;
3. Do not store boxes or other materials on top of the cabinet;
4. Turn off the ultraviolet (UV) light while working in the laboratory;
5. Allow cabinet to run five minutes each day prior to use;
6. Segregate sterile and contaminated items;
7. Use horizontal pipette discard pans that contain an effective disinfectant solution inside the cabinet and not use vertical pipette canisters placed on the floor outside of the cabinet;
8. Waste bags shall be placed in the rear of the cabinet and not taped onto the front of the cabinet;
9. Place all equipment which may produce air turbulence (e.g., centrifuge) near the rear of the hood and stop all other work while this equipment is running;
10. Use vacuum filters on the intake end of all vacuum systems;
11. Minimize movement in and around the hood; and
12. Use proper personal hygiene to prevent product and user contamination.

## Spills

If a small spill occurs which is contained within the hood, immediately wipe down the working surface with 70% ethanol or similar solvent. Allow three minutes for saturation. If the spill occurs outside the hood, immediately evacuate the area and dial 911 for university campus police and/or emergency response.