Biosafety Cabinets

POLICY

It is imperative that biological safety cabinets (BSC, or biosafety cabinets) operate properly in order to promote safe and effective working environments. It is the responsibility of each user to ensure the cabinet works properly.

Biosafety cabinets in laboratories serve as containment devices for experiments in which biohazards are used, including infectious agents, recombinant or synthetic nucleic acid (r/sNA) molecules, oncogenic viruses, and, to some extent, chemical hazards.

The primary factors in attaining maximum containment of hazards when using a biosafety cabinet is the laboratory worker's strict adherence to administrative controls and recommended practices and annual certification of the biosafety cabinet.

Researchers and laboratory workers are to conform with procedures in this section (SPPM 4.22) when using biosafety cabinets.

CABINET DESCRIPTION AND PERFORMANCE CHARACTERISTICS

Descriptions of Classes I and II

Class I
A Class I biosafety cabinet is an open-fronted, negative-pressure, ventilated cabinet with a minimum inward face velocity at the work opening of at least 75 feet per minute. The cabinet filters exhaust air with a high efficiency particulate air (HEPA) filter with 99.99% efficiency for particulates 0.3 microns or greater in size.

Class II
A Class II vertical laminar-flow biosafety cabinet is an open-fronted, ventilated cabinet with an average inward face velocity at the work opening of at least 75 feet per minute, with newer models requiring a minimum face velocity of 100 feet per minute. The cabinet provides a HEPA-filtered, recirculated mass airflow within the laboratory work space, which also filters the exhaust air using HEPA filters.

The National Sanitation Foundation (NSF) at Ann Arbor, Michigan, designs, constructs, and establishes performance standards for Class II cabinets. Contact the Office of Research Assurances (ORA) for design information or performance standards related to the Class II cabinet.

A Class II cabinet in the laboratory offers the capability of protecting materials contained within it from extraneous airborne contaminants. However, laboratory workers must use correct microbiological procedures and techniques.
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Discussion of Classes I and II

When used in conjunction with good microbiological techniques, Class I and Class II biosafety cabinets provide an effective partial containment system for safe manipulation of microorganisms.

Personnel protection provided by Class I and II cabinets depends upon inward airflow.

The activities of a user may disrupt the inward directional airflow through the work opening of Class I and II cabinets and such actions may result in the accidental escape of aerosols through the front of the cabinet.

Demonstrated causes of escaping aerosol particles from within these cabinets include repeated insertion and withdrawal of the worker's arms in and from 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, or individuals briskly walking past the biosafety cabinet while in use.

Class III

The Class III cabinet provides the highest level of personnel and product protection. The Class III cabinet provides this protection with a physical isolation of the space in which the cabinet maintains the biohazardous (e.g., infectious) agent. (See SPPM 4.20 for definition of biohazardous agents.) When biohazardous agents indicate the use of Class III cabinets, laboratory workers must conduct all procedures involving the biohazardous agents within the Class III cabinet.

A Class III cabinet is a totally enclosed ventilated cabinet of gastight construction. Operations within the Class III cabinet are conducted through attached rubber gloves. When in use, the Class III cabinet maintains negative air pressure of at least 0.5 inches water gauge. The cabinet draws the air supply into the cabinet through HEPA filters. The cabinet filters the exhaust air with two HEPA filters, installed in series, before the cabinet discharges exhaust. The Class III cabinet exhaust fan is usually separate from the exhaust fans in the laboratory's ventilation system.

DISPOSAL OF HEPA FILTERS

Refer to SPPM 4.24 for HEPA filter disposal procedures.

TRAINING

Laboratory supervisors must provide training for individuals that utilize biosafety cabinets. Contact ORA for current available training resources.
### Biosafety Cabinets

#### INSTALLATION AND CERTIFICATION

Independent contractors certify Class I, II and III biosafety cabinets for a fee:

- At the time of installation;
- After the biosafety cabinet is moved or repaired; or
- Annually, as required by the Institutional Biosafety Committee (IBC).

The schedule for subsequent certification is shown below.

<table>
<thead>
<tr>
<th>Type of Cabinet</th>
<th>Laboratory Containment Biosafety Level (BSL)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BSL1</td>
</tr>
<tr>
<td>Class I</td>
<td>Not Required</td>
</tr>
<tr>
<td>Class II</td>
<td>Not Required*</td>
</tr>
<tr>
<td>Class III</td>
<td>Not Required*</td>
</tr>
</tbody>
</table>

* The responsible principal investigator is to report cabinets not being utilized for biohazardous materials to ORA. Biosafety cabinets that are not certified must display a warning placard in the lower left corner of the glass view screen with the following warning statement:

"**WARNING!** Biological safety cabinet is **NOT** certified for use with biohazardous agents."

<table>
<thead>
<tr>
<th>Certification Location</th>
<th>Cabinets must be certified in place at their operational location.</th>
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<tbody>
<tr>
<td>Assistance/Consultation</td>
<td>ORA provides assistance and consultation regarding installation and certification of biosafety cabinets.</td>
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</tbody>
</table>

### CLEAN BENCHES

A clean bench is an open-fronted cabinet with filtered air passing horizontally over or around the research materials and directed at the researcher and surrounding laboratory.

Horizontal laminar flow *clean benches*, present in a number of clinical, pharmacy, and laboratory facilities, are not a substitute for biological safety cabinets. Clean benches provide an air-filtered environment for manipulation of nonhazardous materials. Clean benches protect the product (research) but not the worker.

| Clean Bench Caution | Since the operator sits in the immediate horizontal exhaust from the clean bench, do not use clean benches with toxic, infectious, or sensitizing materials. |