NSF/ANSI 49
Biosafety Cabinetry: Design, Construction, Performance, and Field Certification

Annex E
(informative)

Biosafety Cabinet Selection, Installation, Lifespan and Decommissioning

E.1 Biosafety Consultation Prior to BSC Purchase

A biosafety officer or qualified safety professional should be consulted prior to a BSC purchase. Some institutions have biosafety cabinet purchases approved by the biosafety officer or qualified safety professional after consultation with the user, architect and engineer. Biosafety officers or qualified safety professionals that perform this function should have training and field experience that includes methods used to control biohazards and knowledge of the design, application, and testing of biosafety cabinets.

Issues that may be considered include:
- Risk assessment,
- Selecting which kind of is BSC required and if it should be exhausted,
- Assessment of the laboratory environment and the proper location of BSCs within it

E.2 Risk Assessment Procedure

E.2.1 Risk assessments encompass four main elements:
- Hazard identification,
- Exposure assessment,
- Dose-response assessment,
- Risk characterization, and Risk management (job analysis)².

E.2.2 Risk assessment team members may include:
- Investigator/Scientist,
- Laboratory staff,
- Animal care staff when appropriate,
- Animal veterinarian when appropriate, and
- Occupational health & biosafety professionals.

E.2.3 Risk assessment hazards considered:
- Animal hazards,
- Agent/pathogen/recombinant hazards,
- Chemical hazards, and
- Radiological hazards.

¹ The information contained in this Annex is not part of this American National Standard (ANS) and has not been processed in accordance with ANSI’s requirements for an ANS. Therefore, this Annex may contain material that has not been subjected to public review or a consensus process. In addition, it does not contain requirements necessary for conformance to the Standard.

E.2.4 Agent/pathogen/recombinant’s factors associated with risk of disease or injury:
- Virulence,
- Infectious dose,
- Route of infection (portal of entry),
- Toxigenicity,
- Agent’s host range,
- Availability of effective preventive measures, and
- Availability of effective treatment.

E.2.5 Factors associated with worker’s risk of exposure:
- Worker’s work activity; diagnostic, research or production scale,
- Worker’s proficiency, attitude and safety awareness, and
- Worker’s age, sex, pregnancy, race, immune status and medications.

E.2.6 Risk management plan includes:
- Biosafety containment level assignment to the facility and microbiological practices,
- Safety equipment,
- Engineering controls,
- Personal protective equipment,
- Work practices – Standard Operating Procedures (SOPs),
- Emergency procedures,
- Work schedule – calendar, and
- Investigation protocols that include all risk management plans.

E.2.7 Investigation protocol review includes:
- Committee (IBC/IRB/IACUC) review, as appropriate,
- Meetings with workers to discuss approved protocols,
- Training,
- Dry runs without agent/pathogen/recombinant, and
- Regular audits.
E.2.8 Risk Management Analysis Table:

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<tr>
<th>Risk Factor</th>
<th>Data</th>
<th>Assessment</th>
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<td>Decrease/Increase</td>
<td></td>
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<tr>
<td></td>
<td>Collection</td>
<td></td>
</tr>
</tbody>
</table>

Agent Identity

- Known, classified
  - Agent summary statement
  - Known, classified
  - Disease Information

- Suspected, classified
  - Agent summary statement
  - Suspected, classified
  - Disease Information

- Known, unclassified
  - Disease Information

- Unknown
  - Disease Information

Agent Transmission

Aerosol potential
- (Sample/activity)
  - Tissue procedure
  - Concentration procedure
  - Animal/non-shedder
  - Animal/shedder

Infectious route
- Respiratory
- Mucous membrane
- Parenteral
- Other

Disease Severity
- Severe
- Moderate
- Other

Prophylaxis
- None
- Vaccine
- Immune globulin
- Antibiotics
- Antivirals

Treatment
- None
- Other

Other Factors

- Livestock pathogen
  - USDA regulations

- Poultry pathogen
  - USDA regulations

E.3 Biosafety Cabinet Selection

E.3.1 Selecting the proper BSC should be done in two stages; first, select the proper class and type of unit required, then decide on the size of the unit and options that are needed. Deciding which class and type is appropriate can be accomplished by answering the following four questions:

E.3.1.1. What needs to be protected?

- Only the material being worked on (product protection)?
- Only the technician and the laboratory (personnel and environmental protection)?
- Or to protect all three (personnel, product, and environmental protection)?

If all that is needed is product protection, then a Clean Bench may be the unit of choice. Clean Benches use High Efficiency Particulate Air (HEPA) filter(s) to remove particulates from room air. This filtered, particulate-free air then flows through an enclosed work area, in a horizontal or vertical direction. These devices bathe the
materials inside in filtered air, and then the air is typically discharged into the laboratory. While these devices protect the product from airborne contaminants, any aerosol generated in the work area will be discharged into the laboratory. As such, they cannot be used with toxic or biohazardous materials.

For personnel and environmental protection only, the Class I enclosure offers a simple and economical solution. Room air sweeps around the operator and through the work area. This contaminated air is then HEPA filtered and discharged either into the laboratory or out via an exhaust system. The Class I will protect the operator and the lab, however, because room air constantly washes over the work area, the product is exposed to airborne contaminants.

Personnel, environmental, and product protection can be had most efficiently by a Class II Biohazard Cabinet. The inflow of air around the operator provides personnel protection. HEPA filtered air flowing downward through the work area provides product protection, and HEPA filtered exhaust protects the laboratory from biohazardous particulates.

**E.3.1.2. What are all of the different types of work to be done in the cabinet?**

One of the most difficult tasks in selecting a BSC is trying to foresee all the different types of work that will be taking place in it. It is critical to decide what things need protection, both now and in the future. All too often users purchase a Clean Bench or Class I device for current applications, only to find these devices are unsuitable as their work requirements change.

**E.3.1.3. What types and quantities of volatile toxic chemicals will be used in the BSC?**

As important as the preceding question, the user must also foresee the types and quantities of volatile toxic chemicals that will be used in the cabinet. Because volatile chemicals can freely pass through HEPA filters, both Class I and Class II BSCs must be exhausted out of the laboratory when used with these types of chemicals. For the Class II BSCs, Types B1 and B2 must be hard ducted to an external exhaust system in order to operate properly; Types A1 and A2 can be converted to operate in either a ducted or recirculating mode, depending on the users’ requirements.

**E.3.1.4. If the unit requires an exhaust system, is there an appropriate location for the cabinet and its ductwork?**

If a BSC is going to recirculate its HEPA-filtered air back into the laboratory, then the user has some freedom as to where the unit can be installed, provided it is out of major traffic areas, and there are no other air handling devices in the area.

When connected to a hard ducted exhaust system, however, the location of the cabinet becomes dependent on the location of the exhaust system. The exhaust duct must be placed so it can penetrate ceilings and floors without disturbing other ventilation or plumbing systems. The exhaust system must also be designed to minimize excessive lengths and elbows.
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<td><strong>Intended Purpose</strong></td>
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<tr>
<td><strong>Airflow Pattern</strong></td>
</tr>
<tr>
<td><strong>% Recirculation</strong></td>
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<td><strong>Inflow</strong></td>
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<td><strong>Biological Containment</strong></td>
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<td><strong>Exhaust System</strong></td>
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<td><strong>Exhaust System Negative Static Pressure at BSC</strong></td>
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<td><strong>Exhaust System Reserve Capacity</strong></td>
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<tr>
<td><strong>Cabinet Flexibility</strong></td>
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<td><strong>Cabinet Cost</strong></td>
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<tr>
<td><strong>Installation Cost</strong></td>
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<td><strong>Operation Cost</strong></td>
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<tr>
<td><strong>Electrical Cost</strong></td>
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<tr>
<td><strong>Tempered air loss</strong></td>
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</table>
Table E.3.1.6. Characteristics of Type B1 and Type B2 BSCs

<table>
<thead>
<tr>
<th></th>
<th>Type B1</th>
<th>Type B2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intended Purpose</strong></td>
<td>Type B1 cabinets may be used for work treated with minute quantities of volatile toxic chemicals and tracer amounts of radionuclides required as an adjunct to microbiological studies if work is done in the direct exhausted portion of the cabinet, or if the chemicals or radionuclides will not interfere with the work when recirculated in the downflow air.</td>
<td>Routine work using volatile toxic chemicals or radionuclides required as an adjunct to microbiological research.</td>
</tr>
<tr>
<td><strong>Airflow Pattern</strong></td>
<td>Room air is drawn in through the sash opening, protecting the operator. HEPA-filtered air flows down through the work area, protecting the product. The room air, and a portion of downflow air in the front of the work area is recirculated through a supply HEPA filter before flowing down through the work area. The air in the rear of the work area flows out of the cabinet via an Exhaust HEPA filter.</td>
<td>Room air is drawn in through the sash opening, protecting the operator. HEPA-filtered room air flows down through the work area, protecting the product. Both bodies of air are drawn out of the cabinet via an Exhaust HEPA filter.</td>
</tr>
<tr>
<td><strong>% Recirculation</strong></td>
<td>Varies by model; typically 30-50%</td>
<td>0%</td>
</tr>
<tr>
<td><strong>Inflow</strong></td>
<td>Minimum 100 FPM Average</td>
<td>Minimum 100 FPM Average</td>
</tr>
<tr>
<td><strong>Downflow</strong></td>
<td>Varies by model, typically 50-80 FPM average</td>
<td>Varies by model, typically 50-80 FPM average</td>
</tr>
<tr>
<td><strong>Biological Containment</strong></td>
<td>All NSF-Listed BSCs must pass the same Biological Containment Tests.</td>
<td>All NSF-Listed BSCs must pass the same Biological Containment Tests.</td>
</tr>
<tr>
<td><strong>Exhaust System</strong></td>
<td>Required.</td>
<td>Required.</td>
</tr>
<tr>
<td><strong>Exhaust System Type</strong></td>
<td>Should have dedicated ductwork and exhaust blower for each BSC.</td>
<td>Should have dedicated ductwork and exhaust blower for each BSC.</td>
</tr>
<tr>
<td><strong>Exhaust System Function</strong></td>
<td>Must pull exhaust air through the Cabinet’s Exhaust HEPA filter and then through ductwork.</td>
<td>Must pull exhaust air through the Cabinet’s Exhaust HEPA filter and then through ductwork.</td>
</tr>
<tr>
<td><strong>Exhaust System Volume</strong></td>
<td>B1 is approximately equal to a Type A.</td>
<td>B2 exhausts 30-50% more than a Type B1.</td>
</tr>
<tr>
<td><strong>Exhaust System Negative Static Pressure at BSC</strong></td>
<td>Typically 1.5 inches H2O minimum; Maximum may exceed 4.0 inches H2O.</td>
<td>Typically 1.5 inches H2O minimum; Maximum may exceed 4.0 inches H2O.</td>
</tr>
<tr>
<td><strong>Exhaust System Reserve Capacity</strong></td>
<td>Vacuum requirements may increase up to 2.0 inches H2O as exhaust HEPA filter loads.</td>
<td>Vacuum requirements may increase up to 2.0 inches H2O as exhaust HEPA filter loads.</td>
</tr>
<tr>
<td><strong>Cabinet Flexibility</strong></td>
<td>Must be permanently connected to an exhaust system to function properly.</td>
<td>Must be permanently connected to an exhaust system to function properly.</td>
</tr>
<tr>
<td><strong>Cabinet Cost</strong></td>
<td>More expensive than Type A</td>
<td>More expensive than Type A</td>
</tr>
<tr>
<td><strong>Installation Cost</strong></td>
<td>Similar to a canopy connected Type A.</td>
<td>More expensive than Type A or B1; higher exhaust volumes may require larger ductwork.</td>
</tr>
<tr>
<td><strong>Operation Cost</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Electrical Cost (BSC Only)</strong></td>
<td>Equal to Type A</td>
<td>Equal to Type A</td>
</tr>
<tr>
<td><strong>Tempered air loss</strong></td>
<td>May be less than a canopy connected Type A.</td>
<td>Typically 150 CFM/foot of BSC width.</td>
</tr>
</tbody>
</table>
E.3.2. BSC Size

Having decided which class and type of BSC is the best, the user should now decide on the size of the unit and its options. In deciding which size is best, the user should mark out an area of benchtop equal to the inside (work area) dimensions of the model they are interested in. The user(s) should perform several "dry runs" of their procedures in this area. If the user can work in this defined space, than the cabinet is the proper size, if not, the user may want to try working in the dimensions of the next larger model. If the user does decide on a larger model, however, be sure that the BSC can be transported to and installed in the laboratory through the existing freight elevators, hallways and doors. It is important to remember that BSC widths typically refer to the internal work area. The external width of the BSC may be significantly wider.

E.3.3. BSC Options

E.3.3.1 Service Valves

Service valves allow inert gases, air or vacuum lines to be plumbed into the BSC. Although many users connect natural gas to a service valve in the cabinet, this practice should be avoided if possible, because open flames in a Class II BSC disrupts the airflow, and there is the possibility of a buildup of flammable gas in BSCs that recirculate their air. Many models allow for the easy installation of these valves in the field, however, it is generally less expensive and easier to have the required number of valves installed when the unit is ordered.

E.3.3.2 Electrical Outlets

Most BSCs have electrical outlets installed in the work area as standard equipment. Specialized fittings, such as Ground Fault Interrupter Circuits (GFICs) should be installed and tested by the cabinet manufacturer. Variations in line voltage may affect the cabinet airflows. A voltage regulator may need to be installed in order to reduce the potential of variations in airflows.

E.3.3.3 Ultraviolet Lighting

Germicidal (or UV) Lamps are often installed as an adjunct to surface disinfection. UV lighting is not recommended in Class II (laminar flow) Biosafety cabinetry. While their usefulness is a subject for debate among users and manufacturers, they should be installed and tested by the manufacturer during assembly of the unit.

E.3.3.4 IV Bar

Because intravenous (IV) bars or rods have a significant impact on the airflows in the work area, always use the IV bar recommended by the manufacturer.

E.3.3.5 Base Stands

Base Stands or supports should also be considered at the time of specification. Some models of cabinets can weigh up to 900 pounds (408 Kg). The BSC must be attached to a manufacturer recommended base stand or a structure rated to support the unit's weight.

E.3.3.6 Mobile Installations

Mobile Base Stands have been used when the BSC is operated in multiple locations in the same or adjoining laboratories. Proper cabinet operation should be confirmed by airflow smoke pattern tests at each site of use. If the cabinet is relocated to another facility, or subjected to excessive shock and/or vibration during moving, the BSC should be recertified to ensure it is functioning in a proper manner.
E.4 Prior to the Purchase

E.4.1 Consultation

Investigators should consult with a biosafety officer or qualified safety professional request a risk assessment of the proposed investigation to ensure that an appropriate BSC is used for the work. Purchase of NSF 49 listed Class II biosafety cabinets is recommended, but alternative containment equipment may be suggested for special tasks.

E.4.2 Site Assessment

The investigator should thoroughly examine the intended installation site to ensure it will meet the requirements for proper cabinet operation.

E.4.2.1 Location of the BSC

The cabinet should be located away from traffic patterns, doors, fans, ventilation registers, fume hoods and any other air-handling device that could disrupt its airflow patterns. All windows in the room should be closed. Figure E-2 shows the preferred location for the cabinet. The preferred location is perpendicular to the door, to minimize the effect of opening and closing the door on the performance of the cabinet.

E.4.2.2 Clearances

BSCs not connected to an exhaust system should have at least 6 inches (15 cm) clearance from any overhead obstructions when the cabinet is in its final operating position, to allow for testing of the Exhaust HEPA filter. A clearance of at least 6 inches (15 cm) should be maintained on both sides of the cabinet, as well as 12 inches (30 cm) behind the unit, to allow for service operations if necessary.

E.4.2.3 Exhaust Requirements

If the BSC is to be connected to an exhaust system, first examine the location to ensure that it is compatible with the cabinet’s exhaust outlet. The area directly above the cabinet’s exhaust outlet should be clear of structural elements, water and utility lines, or other fixed obstructions. There should be enough clearance to allow for the passage of a 10 inch (25 cm) diameter duct (or larger if required). Avoid cabinet locations that require either an elbow directly on top of the cabinet’s exhaust connection or an excessive number of elbows to clear other items.

E.4.2.4 Electrical Requirements

The electrical outlet that the BSC plugs into should have a dedicated circuit breaker. This will prevent the accidental shutdown of the cabinet, should another device overloading the circuit.

Some larger cabinet models, when operated at 115 Volts, will require a circuit rated for 20 Amp service. As the electrical plugs and sockets for 115 Volt, 15- and 20 Amp ratings are different configurations; the user should confirm that the site outlet socket matches the BSC plug.

Note - Some cabinets do not operate properly when plugged into ground fault interrupter circuits (GFIC). Consult with the BSC manufacturer about compatibility of their model with a GFIC outlet, if one is present.

E.4.2.5 Service Line Requirements

All service lines to the BSC should meet local building codes, and be equipped with an easily accessible shut-off valve, should disconnection be required.

E.4.2.5.1 Connecting Service Valves to Flammable Materials

Note - The use of flammable gases or solvents should be avoided in a BSC. Open flames in the cabinet will disrupt the airflow in the cabinet and may damage the HEPA filters. Flammable gases or solvents may reach explosive concentrations in recirculating cabinets or ductwork. If the user feels that their procedure requires the use of an open flame or flammable materials they should contact their institution’s safety office.
E.4.2.5.2 Connecting Service Valves to High Pressure Service

The use of air or gases under high pressure should be avoided as they may seriously disrupt the airflow patterns in the cabinet.

E.4.2.5.3 Connecting Service Valves to a Central (House) Vacuum

If service valves are to be connected to a central (House) vacuum source, appropriate devices, such as disinfectant traps and/or in-line filters should be installed to prevent contamination of the vacuum system.

E.4.2.6 Roof Exhaust Systems

Roof exhaust systems serving biosafety cabinets should have a stack that extends straight upward at least 10 ft (3 m) above the roof surface to avoid re-entrainment by the building, and should be increased in elevation when necessary to avoid the influence of surrounding structures. Raincaps or any other structure that deflects the straight upward flow of the discharged air should be avoided. No precipitation can enter the stack when air is being exhausted at normal stack velocities. To take care of precipitation during periods when system is shut off, a 1 in (2.5 cm) hole can be drilled in the lowest point of the fan casing and the water allowed to drain onto the roof. It is recommended that roof exhaust fans be energized by direct-connected electric motors to avoid failures caused by slipping and breaking of belts. Another advantage of direct-connected fans is the ability to use the motor non-function to activate an alarm in the laboratory, whereas when a malfunctioning belted fan is employed, the motor can be operating when the fan is idle. A diagram illustrating a recommended roof exhaust facility is shown in annex E, figure E3.

E.4.3 Pre-Purchase Checklist

The investigator should notify building management to arrange for a feasibility assessment of laboratory alterations and BSC location. The investigator and biosafety officer or qualified safety professional should discuss the following points about the BSC and its delivery:

- Make sure all arrangements are planned in advance of the BSCs arrival,
- Get a written price quote for the entire package, including the BSC Model number, optional equipment, canopy exhaust connection, etc. Work out the details about shipping and delivery with the manufacturer's representative at the time of purchase,
- Determine the costs for shipping and delivery because there may be additional costs depending on the location and level of difficulty of delivery,
- Make sure that the sales representative clarifies in writing what "shipping and delivery" includes; does delivery include moving the BSC from the receiving dock of the building or to the laboratory, and does delivery also include BSC set-up in the work area?
- There are options for moving BSCs from a loading dock to a laboratory, such as hiring moving contractors to uncrate and move the BSC,
- Make sure the corridor pathways are clear for delivery to the laboratory,
- Will the BSC fit through door jams?
- Will the BSC travel around sharp, narrow corridors and corners?
- Will the elevators in the building accommodate the BSC?
- Does the BSC have to be brought up steps?
- The moving contractor should be advised that the BSC should be lifted onto its stand or leg extensions (working position), because a hydraulic lift may be needed.
- Responsibility for removal and proper disposal of all packing materials must be established.

E.5 Inspection

E.5.1 When the BSC arrives, inspect it carefully. Compare the invoice with the delivered equipment. Check for any damage or missing materials and report them immediately to the proper carrier and the BSC supplier regardless of how insignificant they may first appear. Be careful of sharp crating material and let the loading dock personnel help check for damage.
E.5.2 Arrange for certification after the BSC is installed. Building operations personnel may be needed to connect the BSC to laboratory plumbing, electrical, and supply/exhaust air ventilation systems.

E.6 Moving a Biosafety Cabinet

E.6.1 It is a common practice to move BSCs to other locations within a laboratory or to other laboratories. Despite the apparent simplicity of the job, there are certain conditions that must be met prior to moving this equipment. BSCs should not be moved without consultation with a biosafety officer or qualified safety professional.

E.6.2 Existing BSCs and ancillary equipment, such as canopy connection exhaust ducting, gas, electric and vacuum connections, should be cleared for maintenance by a biosafety officer or qualified safety professional prior to disassembly. Prior to a move, BSCs should be space decontaminated. After a BSC is moved, it should be certified according to applicable performance standards.

E.7 Lifespan of BSCs

The current lifespan of a Biosafety Cabinet is approximately 15 years. Use of modern day Biosafety cabinets (BSC’s) began in the early 1970’s with BSC’s that were manufactured to the NIH-03-112C Standard and subsequently the NSF Standard 49. BSC’s manufactured in the 70’s, 80’s and early 90’s have provided over 15 years of service. Several considerations should be made of BSCs in this age group:

- Will the BSC need extensive service? (i.e. HEPA filter replacement, blower/motor replacement, will the electrical wire harnesses need replacement? etc.);
- Can an older BSC be commissioned after it has been in storage or purchased as a resale?
- Will original test reports be available or will the BSC be commissioned to current NSF Standards?

After 15 years, replacement parts may or may not be available due to electrical or mechanical changes at the factory or industrial part suppliers. For example, magnetic ballasts and T12 fluorescent bulbs will no be available after the year 2010. In addition, today’s BSCs have evolved through the years with many improvements in containment, ergonomics, serviceability, and energy efficiency. That should be considered in a repair versus replacement decision.

E.8 Decommissioning process.

E.8.1 No biosafety cabinet should be sent to a landfill or a recycling facility as a BSC, it should be disassembled per requirements contained in this section.

E.8.2. Decontamination and PPE

E.8.2.1 After a review of the BSC hazard use, the cabinet may be considered chemically contaminated and requiring special decontamination procedures, not the standard gaseous sterilization. Follow paragraph E.10.2.3.

E.8.2.2 All decommissioned BSCs used with pathogens should be space decontaminated.

E.8.2.3 BSCs to be decommissioned that were used with chemical agents should have a hazard review made to determine whether special decontamination practices and PPE should be followed.
E.8.2.4 For those BSCs used with biological agents that may not be inactivated via formaldehyde, the filters should be incinerated and 10% bleach applied to all remaining contaminated surfaces. Obtain prior approval of the Facility Safety Officer.

E.8.2.5.1 PPE should be used as directed by the Facility Safety Officer or the biosafety safety officer at CDC.

E.8.3 Metal Parts

E.8.3.1 All metal parts of less than 30 pounds (13 Kg) per item should be removed from the lab and taken to an appropriate metal recycling container.

E.8.3.2 Metal parts in excess of 30 pounds (13 Kg), including the unit chassis, should be taken to a designated area in the facility to be picked up by a commercial recycling vendor.

E.8.4 Glass Windows

E.8.4.1 All glass safety windows should be taken to the designated glass container. Remove all parts that are not press fit or glued to the glass edges or surfaces.

E.8.5 Wiring

E.8.5.1 All accessible wiring should be taken to a wiring recycling container.

E.8.6 Electrical Ballasts

E.8.6.1 All lamp ballasts should be taken to the ballast collection center in the building.

E.8.7 Lamps

E.8.7.1 All fluorescent lamps should be taken to the lamp container area in the building.

E.8.7.2 All ultraviolet lamps should be handled as mercury-containing waste.

E.8.8 Labels

E.8.8.1 All warning, identification and certification labels should be removed and destroyed.

E.8.9 Used HEPA filters

E.8.9.1 HEPA filters that have been decontaminated are often burned in an incinerator. This disposal method is also effective for HEPA filters containing toxic chemicals. Factors to be considered when incinerating filters include, but are not limited to, composition of the waste, feed rate, combustion temperature and dwell time in the primary chamber.

E.8.9.2 HEPA filters may be placed in heavy plastic bags, such as those used to bag-out filters from contaminated filter housings. The bagged filters can be chemically decontaminated in situ by cutting small holes in the bag and delivering disinfectant by inserting a garden-type spray through the hole and spraying the filter media. The holes can be sealed with duct tape and shipped to an incinerator or sanitary landfill. This chemical method may be appropriate for filters containing agents (ie. toxic chemicals or prions) that can not be inactivated by the usual space decontamination procedures.

E.8.9.3 Decontaminated HEPA filters may be safely buried in a sanitary landfill because they no longer pose a hazard.
Figure E1 - Airflow Patterns for the Different Class II BSCs
Location “A” shows the preferred location. Location “B” is an alternate location. The air supply register(s) above or near the cabinet’s location should be blocked or redirected away from the cabinet face.
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Figure E3 - Exhaust Stack and Blower.