D.A.I. SCIENTIFIC EQUIPMENT

University of Wisconsin

15 Questions to Ask Before Buying a Biological Safety Cabinet, Fume Hood or Laminar Flow Hood

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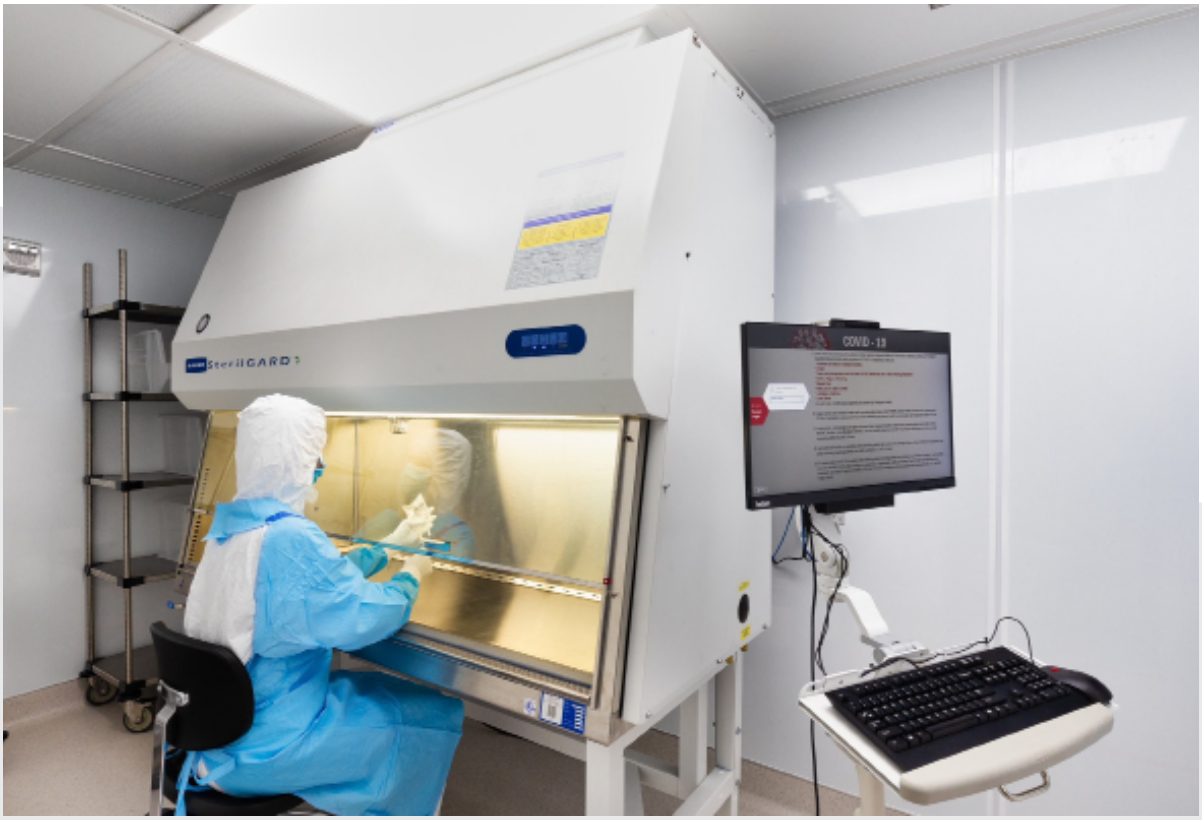
INTRODUCTION

If you're in the market for a biological safety cabinet, laminar flow hood (clean bench) or fume hood you've likely found an abundance of information.

It can be overwhelming and confusing, especially since there are different classes of BSCs, voltage requirements, exhaust connections, add-on options — and much more.

But good news — that's where this eBook comes in.

Here are 15 questions to ask before you click "order" on your next purchase.



INTRODUCTION

QUESTION 1

What type of protection do I need?

This is the first question you should ask if you're considering any type of containment equipment.

There are three types of protection — environmental, personnel and product. Each piece of containment equipment offers varying levels of protection:

- **Environmental** — Protects the room (lab or pharmacy) from contaminants that may escape from the hood
- **Personnel** — Protects the operator from any contaminants exiting into the room
- **Product** — Protects the product or sample in the hood from contaminants in the room

Now let's review the types of equipment:

Biological Safety Cabinets

Biological safety cabinets (also known as BSCs) provide personnel, product and environmental protection from hazardous particulates that require Biosafety Level 1, 2 or 3 containment. The Centers for Disease Control and Prevention (CDC) defines BSCs as "the primary means of containment developed for working safely with infectious microorganisms."

Laminar Flow Hoods

Laminar flow hoods (also sometimes called laminar flow clean benches), protect products and samples for a variety of life sciences, industrial labs and process applications. But it's important to note that they don't provide protection for lab workers or the environment. Laminar flow hoods provide a sterile environment for the sample, but you aren't protected from airflow, which is why working with harmful or toxic materials or chemicals with this type of equipment is strongly discouraged.

Fume Hoods

Fume hoods provide personnel protection by keeping harmful vapors from the breathing zone of the users, but your samples are in unfiltered air, so there is no product protection.

Here is the breakdown of equipment and protection, so you know what to expect.

Product	Environmental Protection	Personnel Protection	Product Protection
Fume Hood		✓	
Laminar Flow Hood			✓
Biological Safety Cabinet	✓	✓	✓

QUESTION 2

What are the classes of BSCs?

There are three classifications of BSCs — with Class II being the most common.

Class I protects you and the environment but not the samples; it is essentially a fume hood with an exhaust HEPA filter.

Class II provides protection for you, those in your lab, your samples and the environment. This is the most common type of BSC.

Class III, also known as a glove box, provides the most protection since the enclosure is gas-tight. These models include the same protection as the Class II cabinets, in addition to a primary physical barrier that offers protection between you and the biological agent.

Classification	Biosafety Level	Application
Class I	**1, 2, 3**	**Low-to-moderate-risk biological agents**
Class II	**1, 2, 3**	**Low-to-moderate-risk biological agents**
Class III	**4**	**High-risk biological agents**

Biosafety levels are "used to identify the protective measures needed in a laboratory setting to protect workers, the environment, and the public," according to the U.S. Department of Health and Human Services. You can find the complete breakdown of biosafety levels here.

QUESTION 3

There are three different Class II BSCs. What are the differences?

There are three types of Class II biological safety cabinets. All three provide the same type of protection, and all three are typically used for biosafety levels 1 through 3.

One of the manufacturers we represent, Baker, breaks down the differences between all three:

Class II, Type A1 and Type A2 Cabinets

- Recirculating systems — 70% of the air recirculates within the cabinet and 30% exhausts through the HEPA filter into the room
- May be vented into the room or connected to the facility's HVAC system through a canopy exhaust connection
- Remaining air is recirculated to the work area through a HEPA supply filter
- HEPA-filtered downflow air is a mixture of recirculated and inflow air from a common plenum, and will vary in total volume based on the cabinet design
- Intake air velocity for a Type A1 is a minimum of 75 FPM and Type A2 is a minimum of 100 FPM
- All biologically contaminated ducts and plenums are under negative pressure or surrounded by negative pressure ducts and plenums

Class II, Type B1 Cabinet

- Recirculating system — 40% of the air recirculates within the cabinet and 60% exhausts through the HEPA filter
- Exhausted air is pulled through a dedicated duct and through a HEPA filter (location of the filter varies by manufacturer) before entering a facility's HVAC system
- Must be hard-connected to an exhaust system

- Remaining air is mixed with the inflow air and recirculated to the work area through a HEPA supply filter; in some designs this recirculated air is HEPA filtered to prevent contamination of the cabinet plenums
- Intake air velocity is a minimum of 100 FPM

Class II, Type B2

- Provide no air recirculation within the work area
- Must be hard-connected to a facility's exhaust system
- HEPA filter air is immediately exhausted through a dedicated duct.
- Room air enters through a blower/motor located near the top of the cabinet (specific location varies by manufacturer) and pushed through a HEPA supply filter into the work area
- Descending air is pulled through the base of the work area through the perforated front and rear grilles
- Simultaneously, air entering through the front opening is pulled through the perforated front grille
- Intake air velocity is a minimum of 100 FPM

QUESTION 4

If all three types of Class II BSCs provide the same protection, why should I use a B1 or B2 versus the A2?

You are allowed to use small amounts of chemicals within a BSC as long as the equipment is connected to a building exhaust system. But using chemicals within a BSC generates vapors, which are not trapped by the HEPA filter.

The concern with the A2 cabinet is that 70% of the air recirculates — staying within the cabinet — which could result in a potential buildup of vapor, thus creating unsafe conditions.

The A2 is a popular unit because it does not require ventilation. Most customers are not working with large amounts of chemical vapors so they don't have to worry about vapor build-up. The A2 has very low exhaust requirements, so it's the best option to vent.

Smell is another reason to vent an A2, especially if your lab is working with stool samples or other odorous materials. If you connect the A2 to duct work, you don't have to worry about any odors in your lab.

B2 or B1 cabinets should be used when you are working with larger volumes of chemicals.

QUESTION 5

If I opt for a type B (hard ducted) cabinet, do I choose a B1 or B2

A B2 cabinet is the most common choice since many customers like the fact that there is no recirculation of air within the unit. Because these models are more popular, they tend to be less expensive than the B1 cabinets.

The drawback of the B2 is that it does have higher exhaust requirements of cubic feet per minute (CFM) and static pressure than the B1. For example, a 6' Class II B2 cabinet requires 993 CFM and 1.7" of static pressure, whereas the same size B1 cabinet only requires 443 CFM and .83" of static pressure.

Sometimes an existing exhaust system may not be able to meet the higher requirements of the B2 cabinet. The cost to upgrade the facility exhaust system would be more than the additional cost of the B1 cabinet.

QUESTION 6

Does my BSC have to be connected to our facility exhaust system, and if so, what is the proper connection?

The B1 and B2 cabinets must have a hard connection to a facility's exhaust system.

The A2 cabinet can be vented to the room or connected to the facility exhaust system. No matter what class of cabinet you choose, you should always review the BSC manufacturer exhaust requirements. Also, you need to make sure your facility has the proper CFM (airflow defined by cubic feet per minute) and static pressure, or these cabinets will not work properly.

You have two choices of connection, depending on the class of BSC.

Option #1 — Canopy Connection

The A2 cabinet requires a canopy connection, also known as a thimble connection, which has gaps/openings that serve two purposes.

During normal operation, the room air flows into these openings. During a facility exhaust system failure, air will start to get backed up in the duct work. These openings allow for that backed up air to escape from the duct, circulating back into the room as filtered air.

This allows the BSC to still operate, but you should have a facilities person fix your exhaust system. Canopy connections should have a built-in air flow monitor alerting the user of the problem.

Option #2 — Hard Connection

The other choice is what is called a "hard connection." A hard connection is required for B1 and B2 cabinets.

Unlike the canopy connection, there are no gaps for air to escape. With this type of connection, if the facility exhaust system fails, the backed up air in the duct cannot escape and will continue to back up — potentially coming out of the front of the cabinet, which is often where you will sit if you are using the unit.

This is unfiltered air, which means it's a safety issue, but with that in mind, all B1 and B2 cabinets have an exhaust interlock system. If the facility exhaust system fails, an alarm alerts the user, and the BSC internal motor shuts off, rendering the unit inoperable.

QUESTION 7

What are some common BSC options?

This depends on the application. For example, pharmacies typically want an IV bar to support bags and solutions. A research lab may opt for a UV light, or a petcock for gas, air or a vacuum. Good manufacturing practice (GMP) applications may include a BSC with a stainless steel exterior. This is typically needed in a pharmaceutical/biotech environment in which the hoods are used for making a specific product.

If you are connecting the cabinet to the facility exhaust system, you will need exhaust transition pieces (canopy or hard connection).

Regardless of what you need, it's best to talk to your sales rep when ordering as some of these options can't be added once the BSC is in your lab.

QUESTION 8

Are there any features that save energy?

BSCs that are more than 10 years old most likely have older motor technology that requires more energy. All of the new biological safety cabinets from Baker have variable frequency drive (VFD) motors. These VFD motors require less energy, reduce heat output and operate with less noise.

Also, all cabinets from Baker come with ReadySAFE, a feature that reduces the speed of the motor when the sash is closed. This ensures product protection and containment are maintained.

ReadySAFE can be used overnight and during meetings and work breaks. Cabinets with these features consume 70% less energy than older cabinets.

QUESTION 9

What are the utility requirements of a BSC?

The electrical requirement is 115V AC, 20A, 60 Hz.

If you are going to have the BSC exhausted out of the room, you will need to connect to the building's mechanical/HVAC system.

If you are going to use gas, air or vacuum systems, you will need to order petcocks from the BSC manufacturer and have a plumber make the final connections. It's important to keep in mind that the connection from the BSC to your facility piping takes up space. The most common connection comes right out of the side wall, but that takes up anywhere from 4"–6" of space. If you're tight on lab space, talk with your rep about alternatives, such as having the piping connect to the top or bottom of the hood.

QUESTION 10

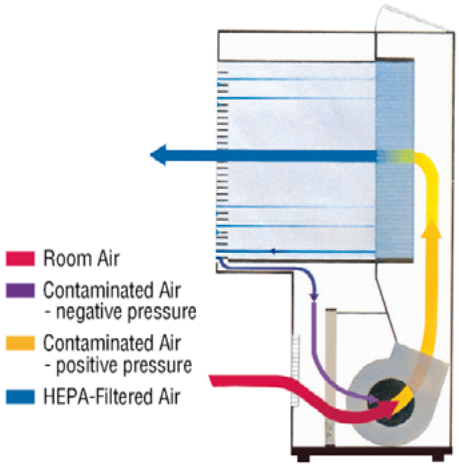
What are the different types of laminar flow hoods?

Laminar flow benches, also known as clean benches, provide uniform air moving in one direction — either horizontally or vertically.

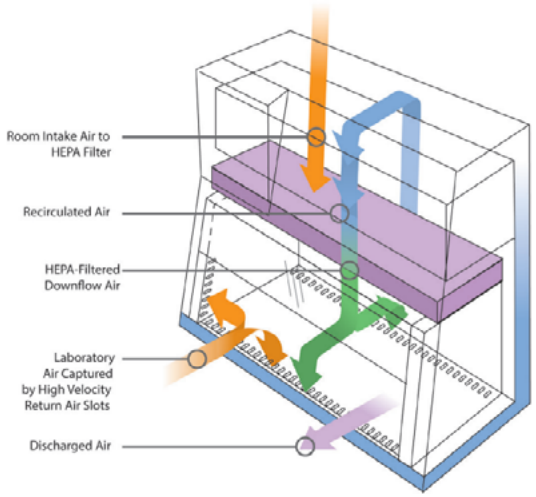
Both types of hoods provide product protection and should only be used for non-hazardous applications.

A horizontal hood will have the filter located on the back wall facing the user. Air flows through the filter toward the user, but keep in mind this hood is strictly for non-hazardous applications.

A vertical flow hood has the filter located above the work area, which means the air flows vertically over your work.



With the EdgeGARD® horizontal flow clean bench, the air flows through the HEPA filter towards the user.



Unlike typical horizontal flow clean benches, the EdgeGARD® vertical flow recirculating clean bench provides vertical controlled airflow in one direction over the entire work surface.

QUESTION 11

What are common laminar flow hood options?

The standard work surface height for horizontal hoods is 30" (sitting height). Some people, however, enjoy standing while working. If this applies to you, Baker provides three options that raise the hood to a higher work surface:

Casters: This is a popular option because not only does it raise the height of the unit, but it also makes it much easier to clean around the hood since you can move it. Baker provides three caster work surface height options — 36", 39" and 42".

Risers: Choose from three options of risers:

- 6" leg = 36" work surface height
- 10" base to the bottom of the hood = 40" work surface height
- 12" base to the bottom of the hood = 42" work surface height

Lift: The hydraulic lift provides an adjustable work surface height allowing ergonomic accessibility to the hood. The lift features programmable stops and may be preset to upper and lower limits for users of different heights. Four locking casters provide mobility and lock in place for stability.

For either the horizontal or vertical flow, a pharmacy application will need an IV bar, and storage bins can also be added.

QUESTION 12

Does my fume hood have to be connected to our facility exhaust system?

A ducted fume hood is connected to the facility exhaust system. A ductless hood is used when it is not possible to connect to a facility exhaust system. These hoods use carbon filters to capture chemical vapors.

QUESTION 12

QUESTION 13

What are common fume hood options?

Common options include electrical outlets, petcocks, cupsinks, sinks and water (cold, hot or deionized). Specific required options will depend on the user and facility.

If you are going to have equipment in the fume hood, it's important to make sure you have outlets you can plug into within reach.

There are also two kinds of sinks. A cup sink is small and only used for pouring liquid down the drain. If you need to clean items, then you will need a larger sink.

Another common option with your fume hood is a base cabinet. Four types are available with this option — flammable or solvent storage, acid storage, vacuum pump storage cabinet and the standard base cabinet.

QUESTION 13

QUESTION 14

How often should my hood be tested/certified?

Typically, most of these types of hoods in a lab setting are tested once a year. For pharmacy applications, testing is recommended every 6 months.

Testing is completed by your NSF accredited UW certifying professional. (NSF-49 is the government standard that BSCs must meet.) To request certification https://wiscready.assetworks.cloud/ready/ click on the Bio-Safety Cabinet Service tab.

Fume hoods are tested for airflow. Laminar flow hoods and BSCs are tested for airflow and to ensure the HEPA filters do not contain any holes. Over time, these filters will become saturated, and the motors must be turned up to ensure proper airflow. If your laminar flow hood or BSC is not tested and certified, you will likely encounter reduced airflow because of the saturated filter — which will eventually lead to contamination or compromised personnel protection.

QUESTION 14

QUESTION 15

How will the equipment get into my building?

This is an important question to ask — no matter what type of equipment you're ready to purchase. Always consider how the unit will arrive at your facility and how it will get to your room. Here are some questions to keep in mind:

- Can the equipment fit through the hallways and doors?
- Can it fit into an elevator or up stairs?
- Are there any low ceiling points to keep in mind?
- Are there any spots where fixtures may stick out, such as door knobs, lights, etc.?

A trained sales specialist can help you through this process and will answer any questions you may have about space, dimensions and transporting equipment from the truck to your lab.

There are also two options available for equipment delivery.

In the first scenario, the equipment will be delivered to the freight dock. At that point, you are responsible for unpacking and moving the equipment to its final resting space in your lab or pharmacy.

The second option is inside delivery — otherwise known as the "white glove" scenario. This involves the equipment being shipped to a local moving company where it is unpacked and inspected for damage. The mover will then contact you to schedule the actual delivery time, and the movers will physically deliver the equipment to its final spot in your lab.

D.A.I. Is Your Trusted Choice for Lab Equipment

We work with market-leading manufacturers to deliver high-quality products and services to analytical laboratories

The last thing you want to do is order the wrong piece of lab equipment. There are a lot of types and models of BSCs, fume hoods and laminar flow hoods, and the last thing you want to do is order the wrong piece of lab equipment.

Great news — We can help!

The experts at D.A.I. Scientific are familiar with every type of analytical laboratory in the pharmaceutical, educational, clinical and biotech industries. What sets us apart is our commitment to understanding and supporting our products. Do you have questions about which BSC classification and level is right for your lab? Deciding between a BSC and laminar flow hood? Not sure which flow hood options would best support your research and budget?

Our highly qualified staff has the answers and will find the right equipment for you.

We have what you need to get started, and we'd be more than happy to answer your questions about which type of equipment is the best fit for your space. Contact us today to get started!

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