How To Select the Best Specialty Lab Cabinets, Including Fume Hoods, Laminar Flow Cabinets, and Biosafety Cabinets

Read more to find out how to choose the right Biosafety Cabinets, Laminar Flow Cabinets, and Fume Hoods for your laboratory needs.

AUSTIN, TEXAS, UNITED STATES, May 13, 2021 /EINPresswire.com/ -- In this article, we'll take a detailed look at the key principles in the design and specification of biosafety cabinets, laminar flow cabinets, and fume hoods with the goal of helping to establish a basic foundation in the understanding how each of these different types of equipment work and under which circumstances they are well suited for a particular set of operations in the lab.

Of course, it goes without saying that the final specifications for this type of equipment need to be made in partnership with your lab's Chief Safety Officer (CSO) as well as engineering or technical specialists familiar with the equipment manufacturer's products, the detailed specifications of the HVAC system in your lab, all applicable workplace health and safety regulations for the type of lab work you are undertaking, as well as the governing regulations covering exposures to chemicals or biohazards from agencies such as OSHA (or Cal OSHA in California), the FDA, NIOSH, the NSF, WHO, or other relevant bodies that govern your specific application. And while we're on the topic of disclaimers, this article will not cover specialty lab cabinet selection for use with radiological materials; we'll address that at a later time.

Understanding The Full Spectrum Of Biosafety Cabinet Solutions – From Laminar Flow Cabinets To Biosafety Cabinets To Fume Hoods.

You often hear these three terms used somewhat interchangeably: laminar flow cabinets,

biosafety cabinets (BSCs), and fume hoods.

The confusion is understandable – first, because they all look somewhat similar to the untrained eye, and second, they all rely on fast-moving air to get the job done.

The difference lies in the details.

While many cabinets look the same, their operation (as well as the objectives they are trying to achieve) can be quite different – thus, it can be dangerous to assume that, for example, a laminar flow cabinet can protect you from toxic fumes or biohazards. By design, it cannot.

Formaspace built the furniture for this lab at a prominent medical device research facility. It features a large fume hood that's integrated within the powder-coated gloss white steel casework with gray epoxy tops, as well as a secondary fume snorkel.

Let's start by taking a look at the role and function of laminar flow cabinets, then we will contrast that with an extreme example of the other end of the spectrum, glovebox-type biosafety cabinet (BSC) found in a high-security BSL level-4 laboratory. Then we'll come back to fume hoods, which are designed to protect users from exposure to toxic chemical fumes.

> Unlike laminar flow cabinets, the primary function of any class of biosafety cabinets is protect the human lab workers from exposure to biohazards, including bacteria, viruses, fungus, etc."
>
> *Formaspace*

Laminar Flow Cabinets: Protecting The Product/Sample From Contamination

Category And Class/Type: Laminar Flow Cabinets, Vertical Or Horizontal

Let's start by looking at laminar flow cabinets because they're the simplest category from a human safety requirements standpoint. Why? Laminar flow cabinets are designed to protect the product (whether it's a semiconductor chip, a non-toxic tissue sample, or a non-toxic pharma compound) from contamination. And by contamination, we usually mean human contamination, such as dust particles spread from clothing, dander from skin, stray human hairs, etc.

In other words, laminar flow cabinets DO NOT protect the human lab worker; thus, their use in a lab setting is limited to entirely working with non-toxic materials only.

There are a variety of Biosafety Cabinets (BSCs) designs available for handling biohazards, depending on your unique laboratory safety requirements.

You'll often find laminar flow cabinets located inside cleanroom environments, for example, in semiconductor manufacturing labs or in some USP 797 Non-Hazardous Drug Compounding operations.

· Human Health Protection: None
· Product/Sample Protection: Maintain A Particle-Free, Sterile Work Zone
· Lab Setting: Often Used Within A Larger Cleanroom Setting (With Positive Or Negative Air Pressure, Depending On Requirements).

How do laminar airflow cabinets work? Typically, air is drawn into the cabinet via a fan, where it passes through a HEPA filter to remove any particles. The particle-free air is blown across the work zone in a straight line, e.g. in a laminar air stream, at a rate of 80 – 100 fpm.

The direction of the airflow can come from above, blowing straight down onto the product/sample (this type is called a vertical laminar flow cabinet); or the laminar airflow can originate in the back of the unit blowing across the product/sample into the face of the operator (this type is called a horizontal laminar flow cabinet).

Vertical flow designs are more suitable for manipulating large objects in the work zone as the airflow does not get blocked as easily by the object; however, horizontal flow cabinets work well for small items (such as semiconductors), which can be positioned at the back of the work zone closest to the continuous flow of clean air.

· Input Air Source: Intake Of Ambient Room Air From A Grill In The Top Of The Unit
· Filtration Protection: Air Is Processed Through A HEPA Filter To Eliminate Particulates Landing On The Product/Sample; However, The Air Is Then Blown Out Of The Cabinet After Touching The Product/Sample, Providing No Additional Protection For The Worker
· Exhaust Air Output: Air Exits Via Front Of The Open Cabinet And Recirculates Back Into The Room
· Work Zone Protected Areas: Best Locations Are In The Center For Vertical Laminar Flow Cabinets, In The Back For Horizontal Laminar Flow Cabinets.

BSL Level 4 Glovebox Biosafety Cabinet (Class III BSC)

As mentioned earlier, we'll contrast the simplicity of the laminar flow cabinet with one of the most highly regulated units, a Glovebox Biosafety Cabinet (BSC) used in a Level 4 Biosafety Laboratory (BSL-4), which is built to handle extremely dangerous biohazards, such as the ebola virus.

Unlike laminar flow cabinets, whose primary function is to maintain a sterile environment for handling products or sample specimens, the primary function of any class of biosafety cabinets is protect the human lab workers from exposure to biohazards, including bacteria, viruses, fungus, etc.

You probably already have a good image in your mind of the glovebox biosafety cabinet design. A worker typically dons a white containment suit and enters a special BSL-4 cleanroom to work at a sealed, glass-fronted cabinet fitted with two armholes mounted with internal rubber gloves.

· Human Health Protection: Protect Lab Workers From Biohazards
· Product/Sample Protection: Maintain A Particle-Free, Sterile Work Zone
· Lab Setting: Used Within A Highly Regulated Cleanroom Setting, With Operators Wearing Full Protection Suits. Air Pressure Is Controlled To Ensure Contaminated Air Exits The Room.
The lab operator slides his hands into the gloves, allowing him or her to manipulate dangerous products or samples within the cabinet without having any direct contact with the air contained inside. The air entering the cabinet is HEPA-filtered on the way in. The contaminated exhaust air is HEPA-filtered twice on the way out then hard ducted directly through the roof to vent into the outdoors. (In some cases, an incinerator is used instead of the second HEPA exhaust filter.)

· Input Air Source: Intake Of Ambient Room Air From A Grill In The Top Of The Unit
· Filtration Protection: Air Is Processed Through A HEPA Filter To Eliminate Particulates On The Way Into The Cabinet
· Exhaust Air Output: Air Exits The Top Of The Unit And Passes Through Two HEPA Filters (Or One HEPA Filter And An Incinerator) And Is Exhausted To The Outside Via A Hard Ducted Connection
· Work Zone Protected Areas: Best Locations Are Directly Under The Air Source Flowing Into The Cabinet, Typically Toward The Front Of The Cabinet.

Class I BSC

Unlike Class III BSCs gloveboxes, where the user reaches into the work zone through sealed gloves built into the unit, Class I and Class II BSCs use an open front design, accessed through a transparent window-sash style opening that can be kept closed when not in use. The air pressure inside the cabinet is negative, so air flows away from the operator into the unit.

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