

Thermo Scientific Biological Safety Cabinets Product Selection Guide

New lab construction or renovations require significant time, resources and planning. Early in your planning process, it is important to consider the type of airflow containment device you will use in your lab. It is a critical decision requiring input from Environmental Health and Safety (EH&S), facility planners, lab planners and end users. Decisions on airflow products influence safety, laboratory designs and flexibility, and dramatically impact facility operational costs.



Smart planning for your lab's protection

As you plan a new laboratory construction or remodel to an existing lab, choosing the right airflow device can be a daunting task. However with thorough planning you can make informed decisions that increase productivity and safety while minimizing the impact on the environment and your budget.

To identify the optimal solution for your laboratory, several areas need to be assessed:

- 1) Required protection levels - for user, product, and environment
- 2) Airflow products available and their biohazard safety levels
- 3) Types of Class II biological safety cabinets (BSCs)
- 4) Additional costs for air handling, ducting and power consumption

What types of protection are provided by biological safety cabinets and clean benches?

Airflow products are designed to manage the containment of particles, biohazards, chemicals or gases during a laboratory process. The type of airflow product your lab needs depends on the type of protection that is required for the user, environment, product and cross-contamination.

User Protection: The user of the cabinet is protected from hazards inside the containment device. Protection is maintained by both the physical barrier of the front sash and the air inflow, or face velocity, at the front opening.

Environmental Protection: BSCs provide two levels of environmental protection. With biohazardous material, the HEPA filters trap >99.995% of bacteria and viruses so the cabinet exhaust can be safely recirculated back into the lab. When volatile and toxic chemical or radionuclides are used as an adjunct to microbiological work, the cabinet can also be exhausted to ensure the chemical hazards are not expelled into the laboratory.

Product Protection: Contamination in the ambient air is prevented from reaching samples. BSCs and clean benches are designed to protect the product by routing the ambient airstream away from the work surface and through a High-Efficiency Particulate Air (HEPA) filter.

Cross-contamination Protection: Inside the work area, sample contamination is prevented. Only Class II BSCs provide this level of protection. Laminar airflow through the downflow HEPA filter prevents aerosols or particles from floating left or right inside the work chamber.

		Airflow Cabinet Type			
		Open Air Lab Bench	Laminar Flow Clean Bench	Class II, A2 BSC	Class II, Triple Filter BSC
Protection Level	User			●	●
	Environment			●	●
	Product		●	●	●
	Cross-contamination		●	●	●

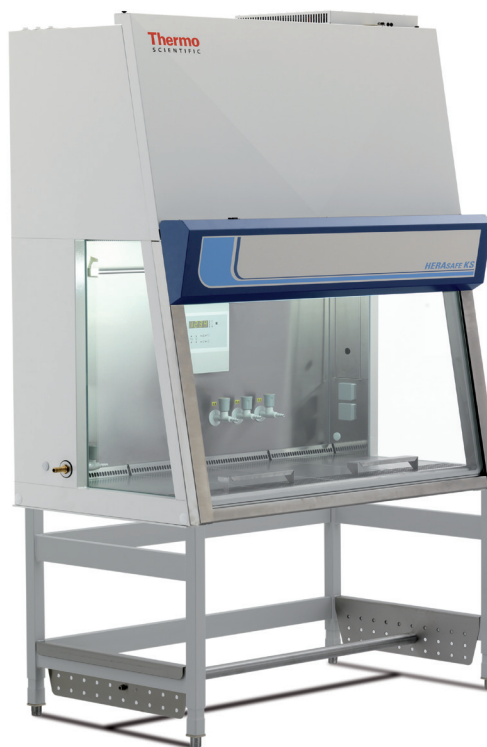
Figure 1: Protection levels provided by four common types of airflow cabinets.

Most commonly used airflow products

Once there is an understanding of the types of protection required for your lab, one must decide which type of airflow products are needed based on whether biohazards or toxic chemicals are used in the application.

Biological Safety Cabinets (BSCs)

BSCs are designed to provide operator protection against biological agents. They also offer product protection within the work area. This is all done by the use of HEPA filters. BSCs can be recirculated into the room or ducted to external exhaust systems for management of toxic gases and fumes as part of microbiological work.



Thermo Scientific™ Herasafe™ KS biological safety cabinet



Thermo Scientific™ Heraguard™ ECO* clean bench

* Due to DC motors, Heraguard ECO clean benches use less energy to operate, so there is less heat emitted into the lab than traditional AC motor clean benches. Based on data from internal testing and The University of Michigan Field Study, published in American Biotechnology Laboratory.

Horizontal Laminar Flow Clean Benches

Clean benches are designed to provide sample protection only against biological agents. Airflow crossing the work area is HEPA filtered then expelled back into the laboratory.

Fume Cupboards

Fume cupboards are designed to prevent operators from being exposed to dangerous or harmful chemicals. It is important to recognize that they are not designed for use with biological agents such as micro-organisms. They are fume extraction systems designed to contain and extract toxic fumes only.

Choosing the appropriate BSC for your biohazard level

Understanding the biohazard level in your lab is critical to choosing the right biological safety cabinet.

Biosafety Level Overview

Biological hazards vary based on risk to human health, and the laboratory should be designed with this risk in mind. BSC selection is an essential component of higher-risk biosafety level (BSL) laboratories.

Biological Safety Levels (BSL)		
	BSL Definition	Application(s)
BSL 1	Defined and characterized strains of viable microorganisms not known to consistently cause disease in healthy adult humans	Standard microbiological practices with no special primary or secondary barriers recommended, other than a sink
BSL 2	Broad spectrum of indigenous moderate-risk agents that are present in the community and associated with human disease of varying severity	Procedures with aerosol or high splash potential that must be conducted in primary containment equipment, or in devices such as a biological safety cabinet
BSL 3	Indigenous or exotic agents with a potential for respiratory transmission, which may cause serious and potentially lethal infections	All laboratory manipulations should be performed in a biological safety cabinet in a category III lab installation
BSL 4	Dangerous and exotic agents that pose a high individual risk of life-threatening disease, which may be transmitted via the aerosol route and for which there is no available vaccine or therapy	All laboratory manipulations should be performed in a class III biological safety cabinet or isolator, or potentially with a class II biological safety cabinet in a fully pressurized lab suit

Figure 2: Information from this table is based on the CDC/NIH's "Biosafety in microbiological and biomedical laboratories" 5th ed. and NSF/ANSI Standard 49. Class II (laminar flow) biosafety cabinetry.

Configuring Your BSC

Recirculating A2 biological safety cabinets will cover most applications, however it is sometimes necessary to use chemicals as an adjunct to microbiological studies. In these cases, it is important to consider ducting the BSC.

Chemical / Toxin Level		
Biosafety Level	No volatile or toxic chemicals	Minute amounts of volatile or toxic chemicals as part of microbiological work
None	Laminar Flow Clean Bench or Open Air Lab Bench	Chemical Fume Hood or Ducted Class II, Type A2 Biological Safety Cabinet
BSL 1	Laminar Flow Clean Bench or Recirculating Class II, Type A2 Biological Safety Cabinet	Ducted Class II, Type A2 Biological Safety Cabinet
BSL 2	Recirculating Class II, Type A2 Biological Safety Cabinet	Ducted Class II, Type A2 Biological Safety Cabinet
BSL 3	Recirculating Class II, Type A2 Biological Safety Cabinet (negative pressure room)	Ducted Class II, Type A2 Biological Safety Cabinet (negative pressure room)
BSL 4	Recirculating Class II, Type A2 Biological Safety Cabinet (suit laboratory)	Ducted Class II, Type A2 Biological Safety Cabinet (suit laboratory)

Figure 3: Recirculating or ducting biological safety cabinets

protection

that never takes a day off



With Thermo Scientific biological safety cabinets, the certified performance and protection you get on Day 1 stays with you every day in the lab. Not true with ordinary cabinets. The difference is our design: SmartFlow™ technology features dual-DC motors to automatically balance the cabinet inflow and downflow air velocities in real time – even as the filters load.

That means exceptional user and sample protection you never have to think about. Plus, our Digital Airflow Verification™ (DAVE) alarm signals any out-of-spec conditions for added assurance. Combined with our proven reliability, ergonomics, and energy efficiency, the ideal choice is also the one you can trust completely. And not just on Day 1.

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