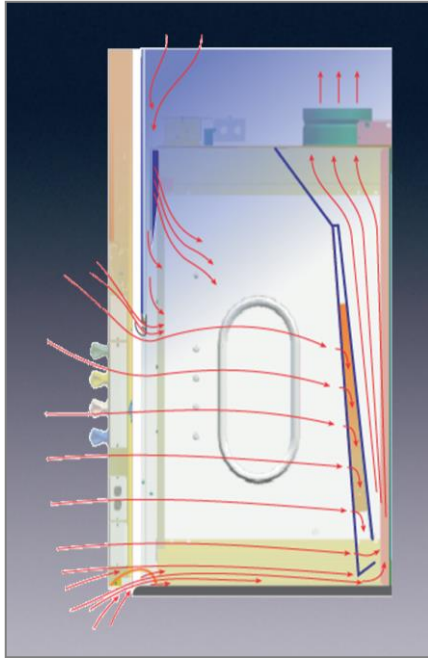


Hoods and Enclosures

Cale Beiermann

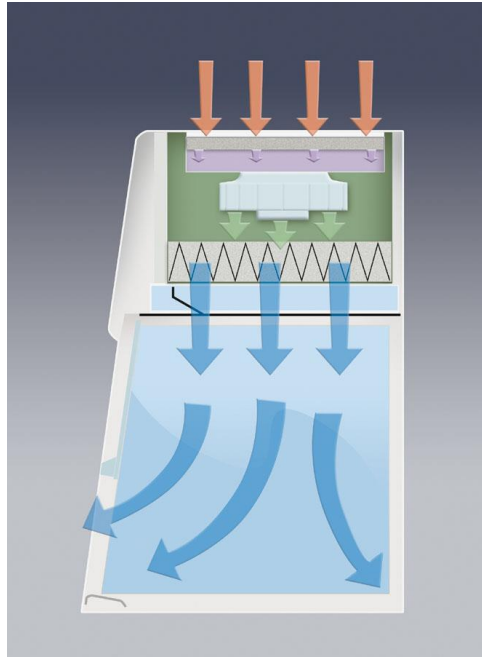


Common Laboratory Enclosures



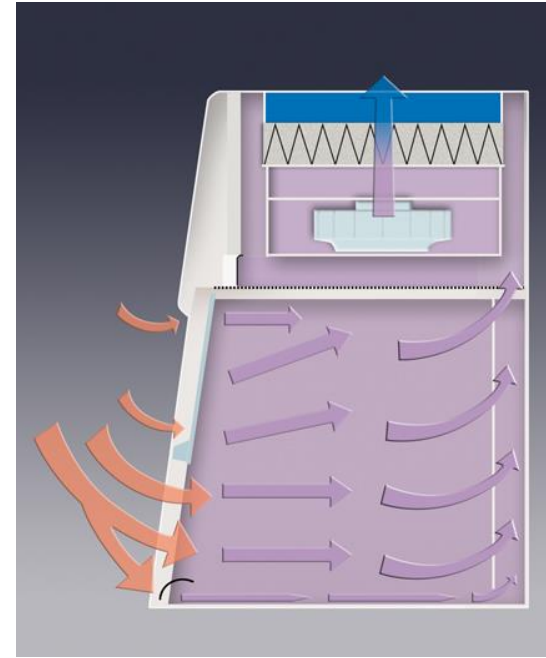
Chemical Fume Hood

- Negative pressure
- Personnel protection
- No HEPA filter



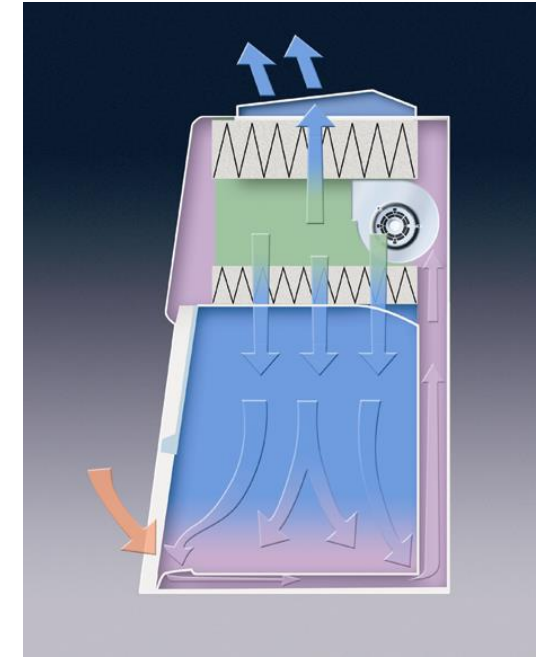
Clean Bench

- Positive pressure
- Product protection
- HEPA filter (supply)



Class I BSC – HEPA
Filtered Enclosure

- Negative pressure
- Personnel protection
- HEPA filter (exhaust)

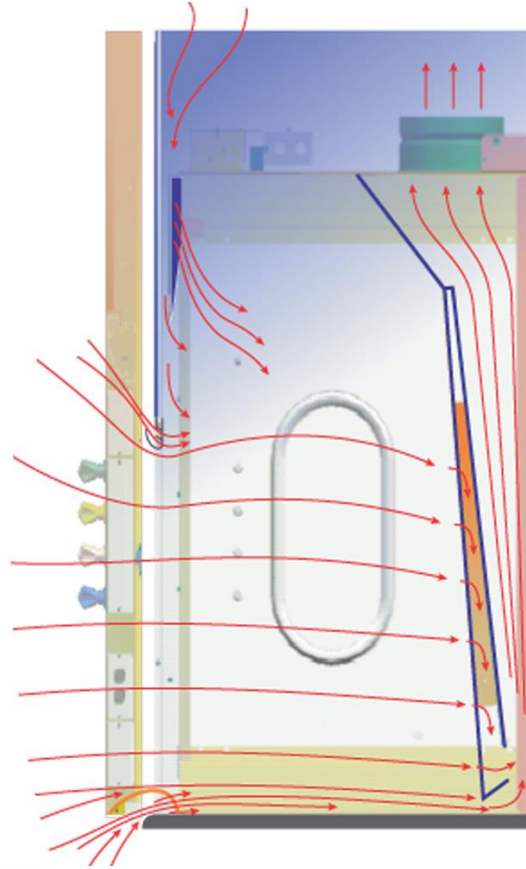


Class II BSC

- Negative & positive pressure
- Personnel & product protection
- HEPA filters (supply & exhaust)



Chemical Fume Hood

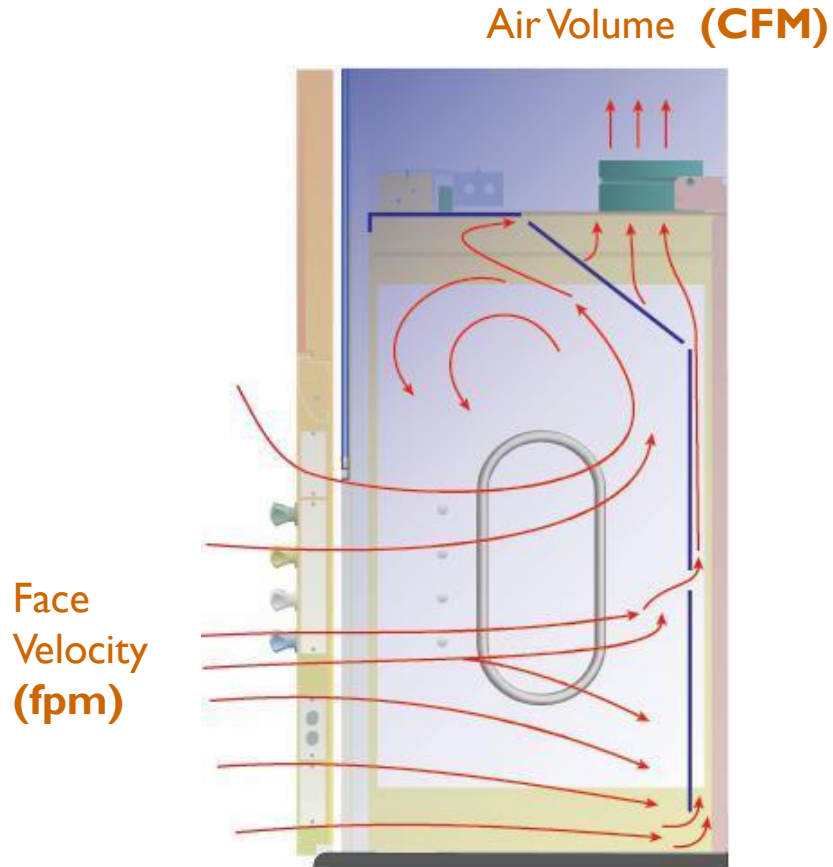


High Performance Fume Hoods

- Protects user from harmful or toxic fumes or vapors
- Can be used for non-hazardous particulates in certain instances
- Can be utilized to eliminate/exhaust heat

Fundamentals

Face Velocity vs. Air Volume



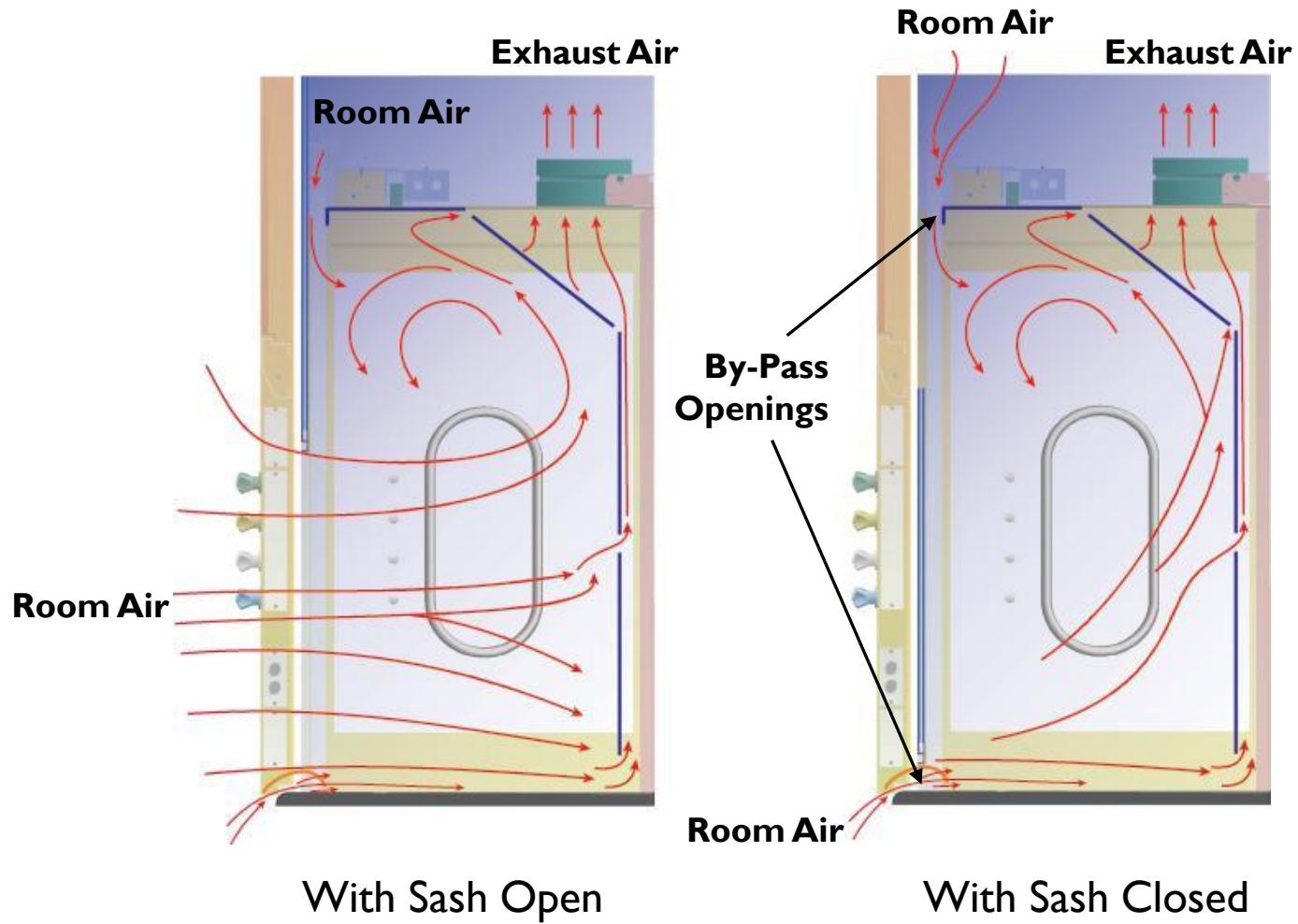
Face Velocity (fpm) – Linear rate of air moving through the face opening

Air Volume (CFM) – Volumetric rate of air exhausted

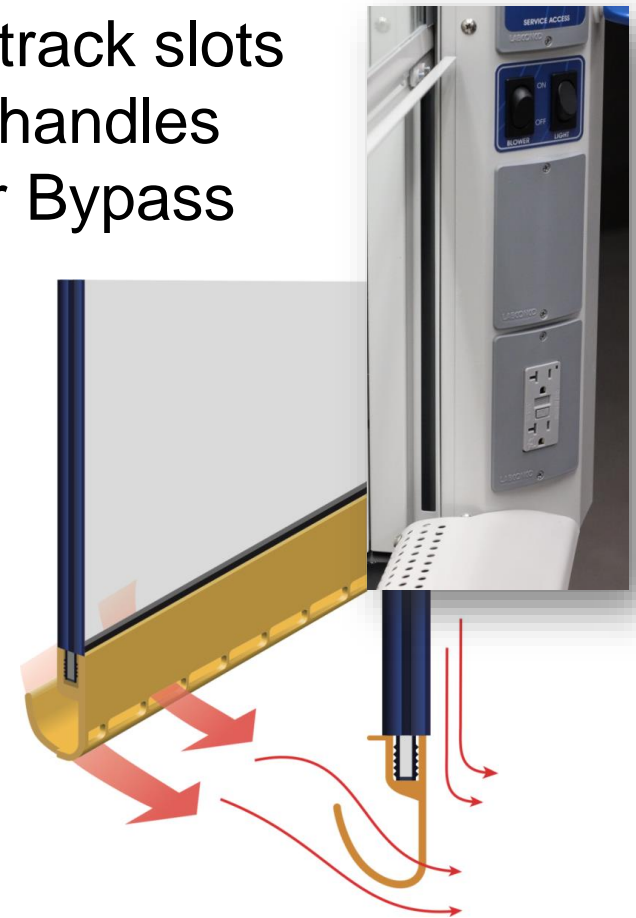
Relationship:

$(\text{Face Velocity}) * (\text{Hood opening area}) = \text{Volumetric Rate}$

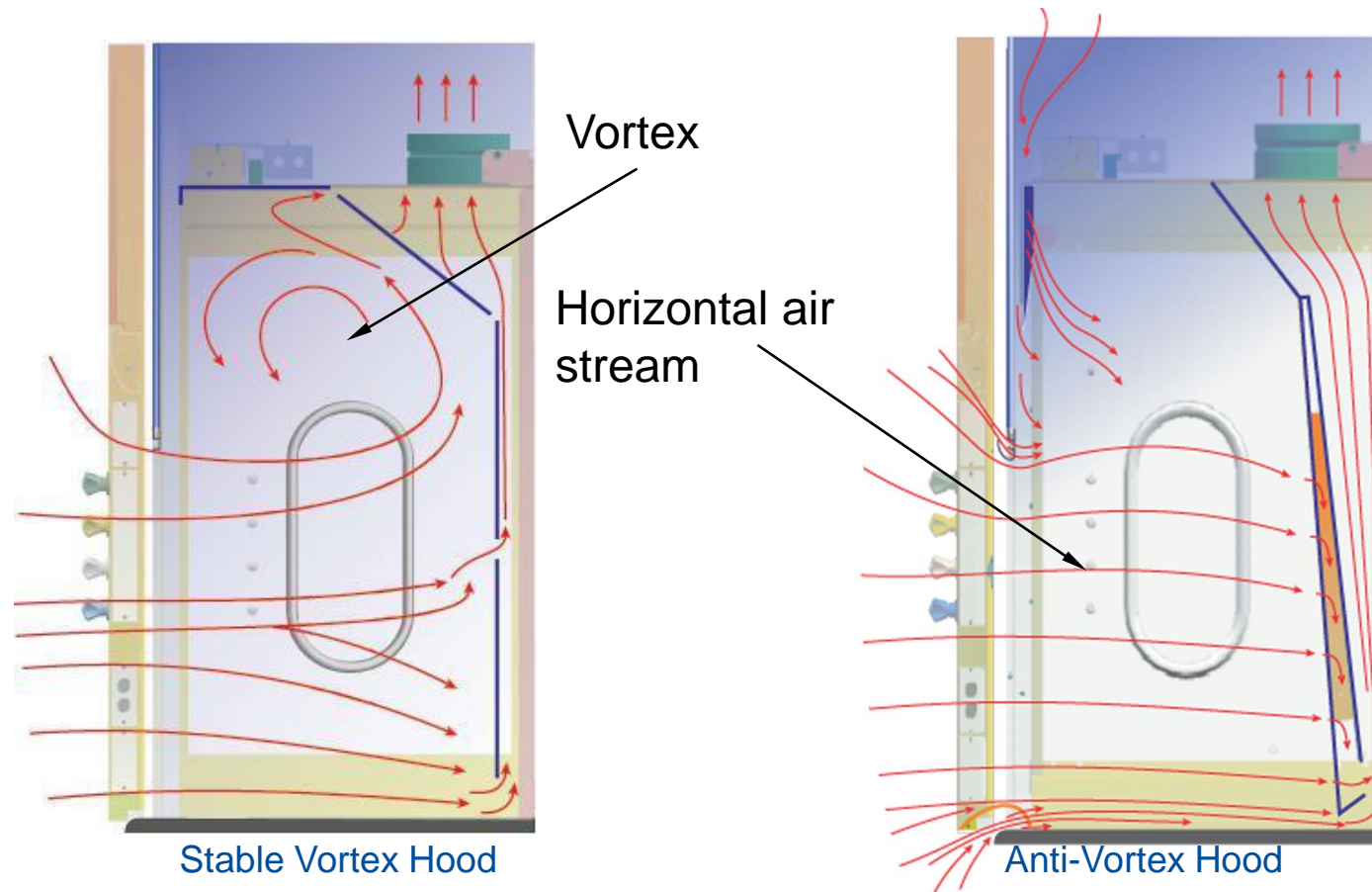
By-pass Air



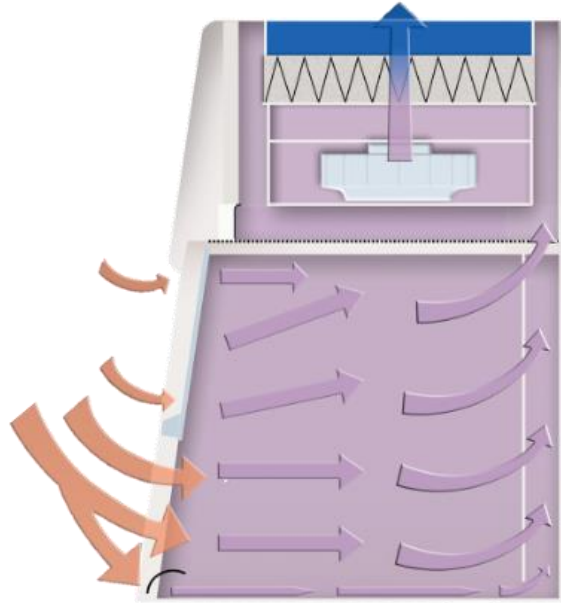
- Sill/airfoil
- Sash track slots
- Sash handles
- Upper Bypass



High Performance Design



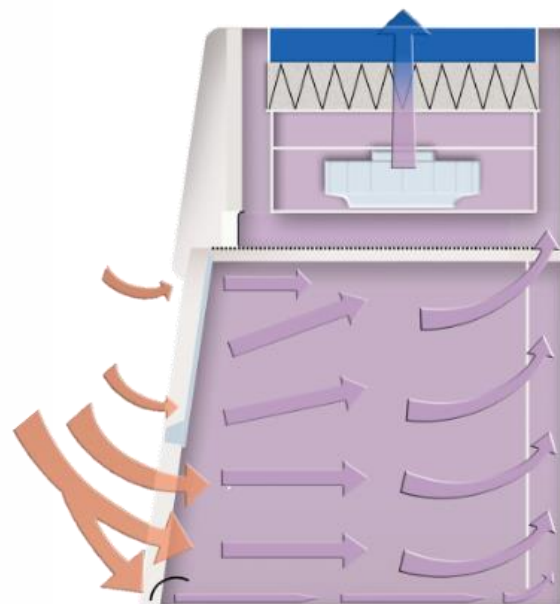
Particulate Enclosures




Balance Enclosures

- For safe weighing of toxic powders and materials
- Recirculate filtered air or exhaust outside
- 2'-6' widths and bulk powder
- 3rd party tested

Particulate Enclosures



Nano Enclosures

- For safe handling of nanomaterials
- Operator protection only
- Bag-in/bag-out ULPA filters
- Optional ionizer
- NANOSAFE TESTED™ 

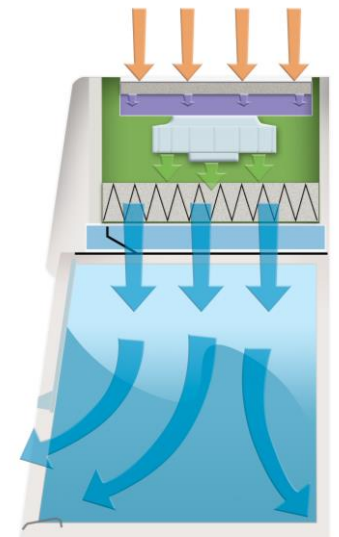
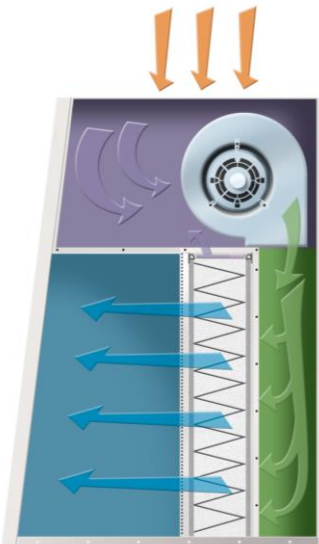


Positive Pressure/Sample Protection



Clean Benches

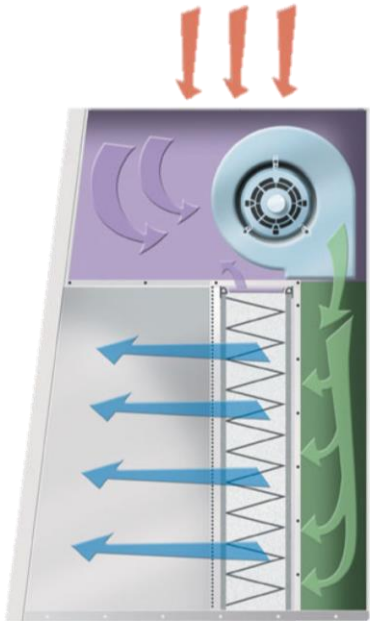
- Protects your work from airborne particulates and cross contamination
- For product protection only



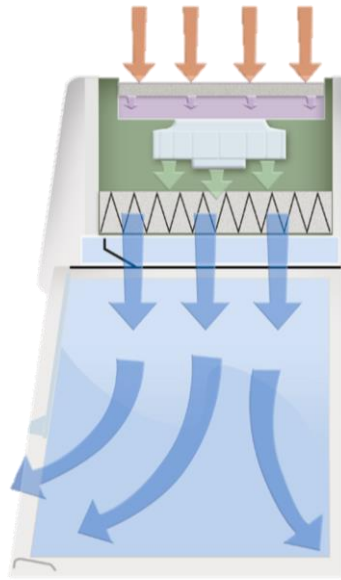
Sample Protection

Clean Benches

- Protects your work from airborne particulates and cross contamination
- For product protection only
- 2', 3', 4', 6' vertical clean benches and PCR enclosures
- 3', 4', 6', 8' horizontal clean benches



Horizontal

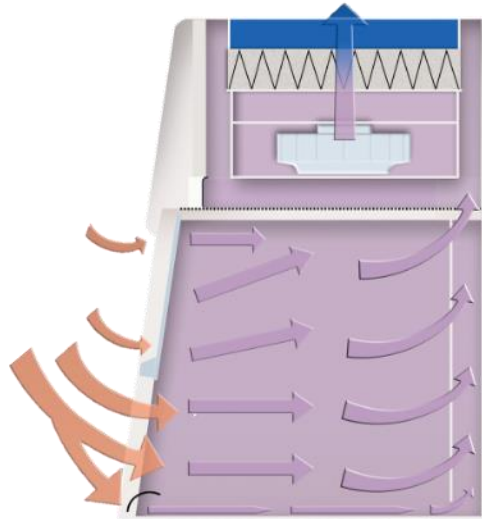


Vertical

Biosafety Cabinet Selection

- 1) Construction
- 2) Airflow Velocities
- 3) Airflow Profile
- 4) Exhaust System



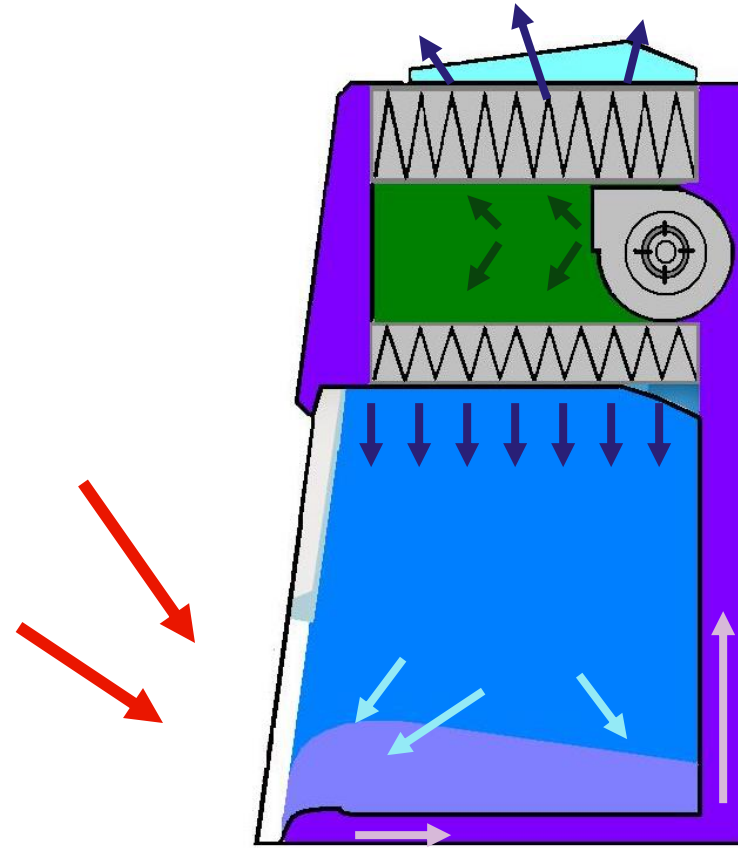


Class I Enclosures

- Protects user from hazardous particulates
- Economical alternative when product protection isn't required
- 2', 3', 4' widths
- Intrinsically safe

BSC Operation

- Personnel (User) Protection
 - Pulls room air around the user into BSC
 - Returns HEPA filtered air into the lab
 - 100-110 FPM inflow
- Product (Sample) Protection
 - Produces HEPA filtered air
 - Filtered air flows downward through cabinet
 - Sterile/aseptic environment
 - Varies, typically 50-60 FPM downflow



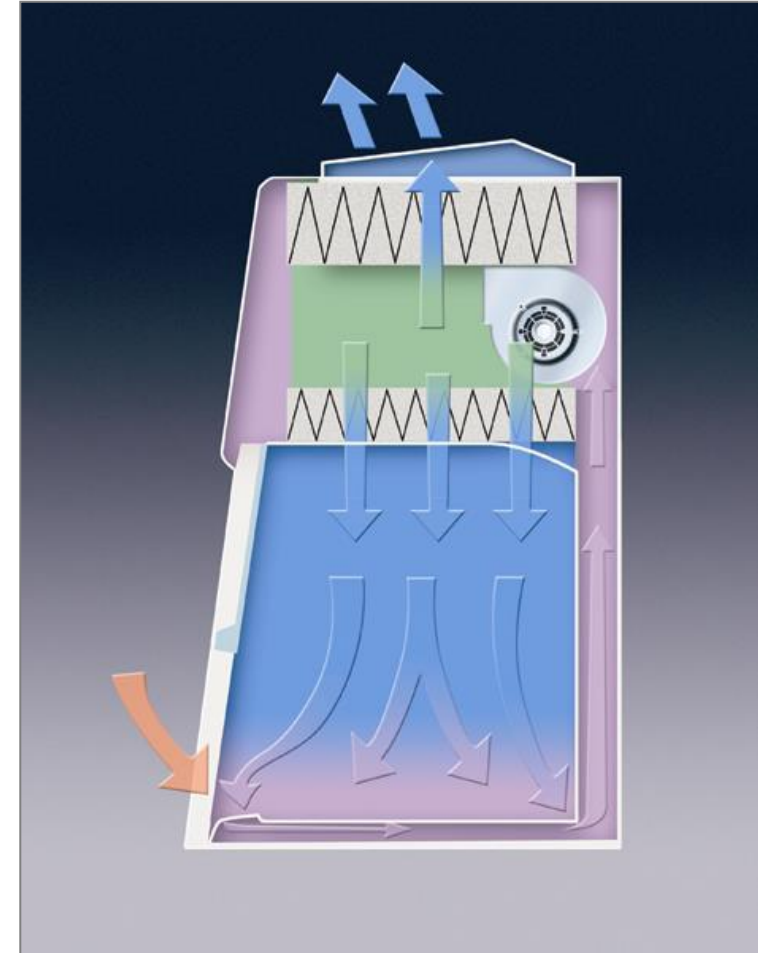
How do Class II BSCs work?

- Air is pulled through the enclosure to contain and filter pathogens and contaminants
- Air is filtered and distributed across the work area to provide aseptic working conditions
- Class II BSCs provide:
 - Personnel Protection (user safety)
 - Product Protection (contamination prevention)
 - Environmental Protection (user safety)



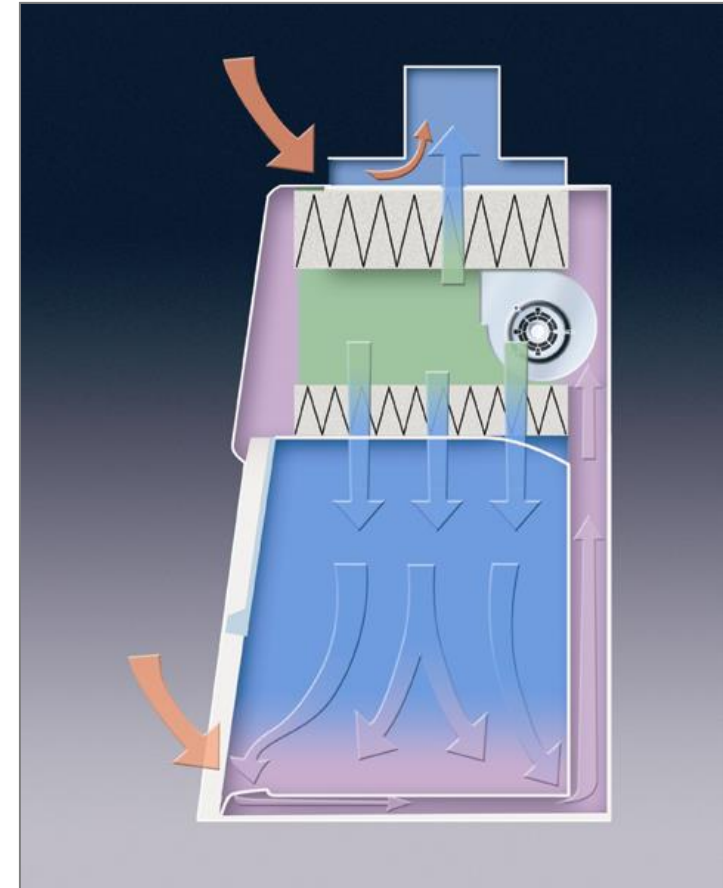
Class II, Type A2

- Personnel & product protection
- Airflow recirculates back into lab after filtration
- For traditional microbiological work only
 - No hazardous chemicals
- Most common BSC

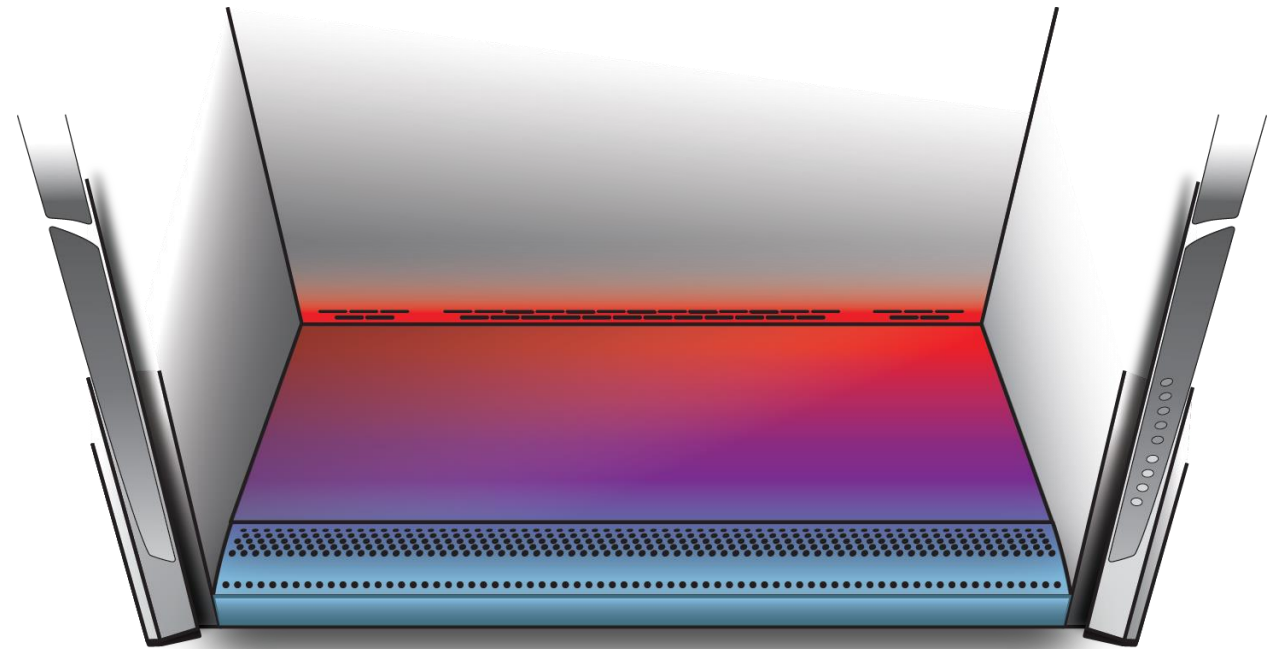
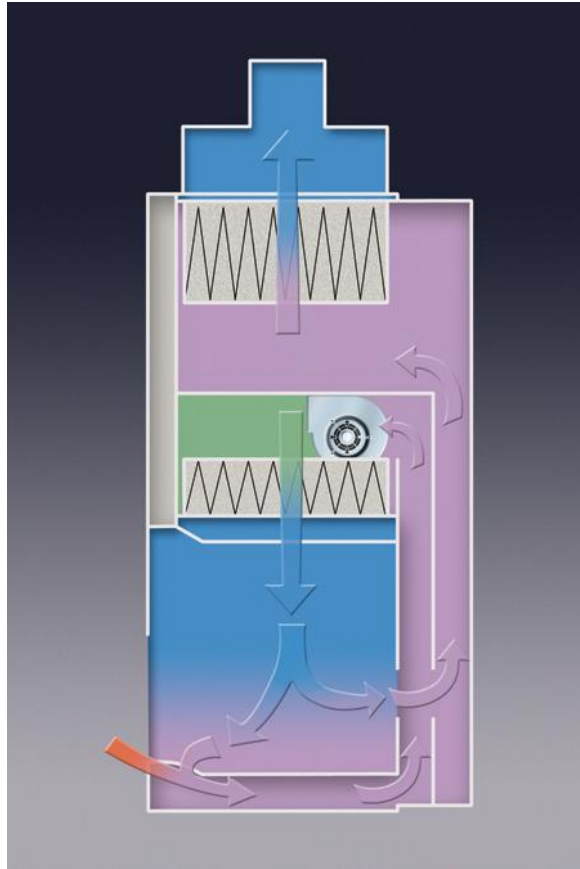


Class II, Type A2 w/ Canopy

- Canopy = A2 exhaust connection accessory
- Airflow exhausts to outside via ductwork
- For traditional microbiological plus minute quantities of...
 - Volatile/toxic chemicals
 - Radionuclides
 - Samples with unpleasant odors

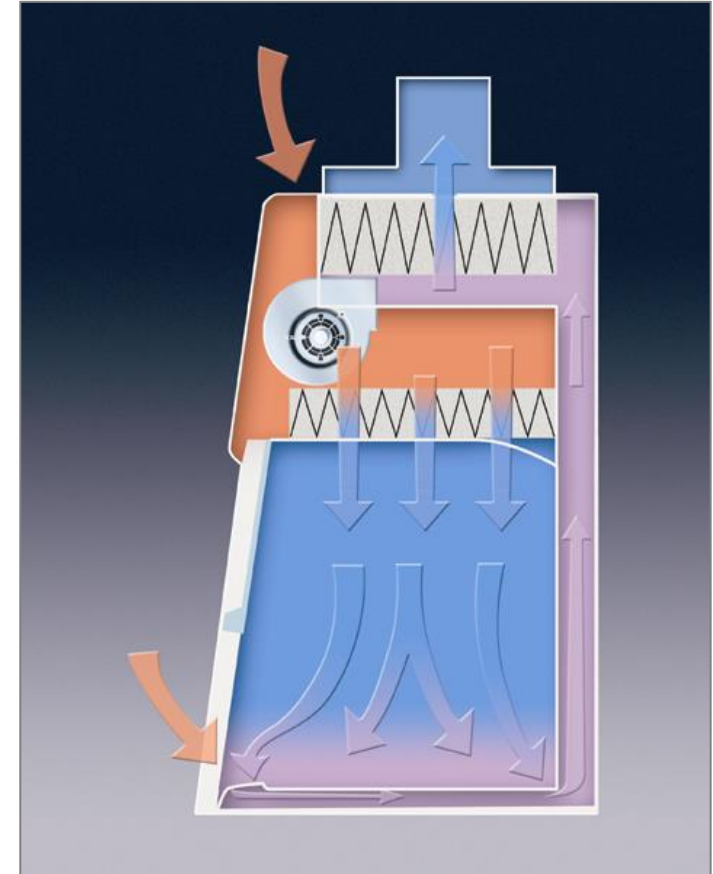
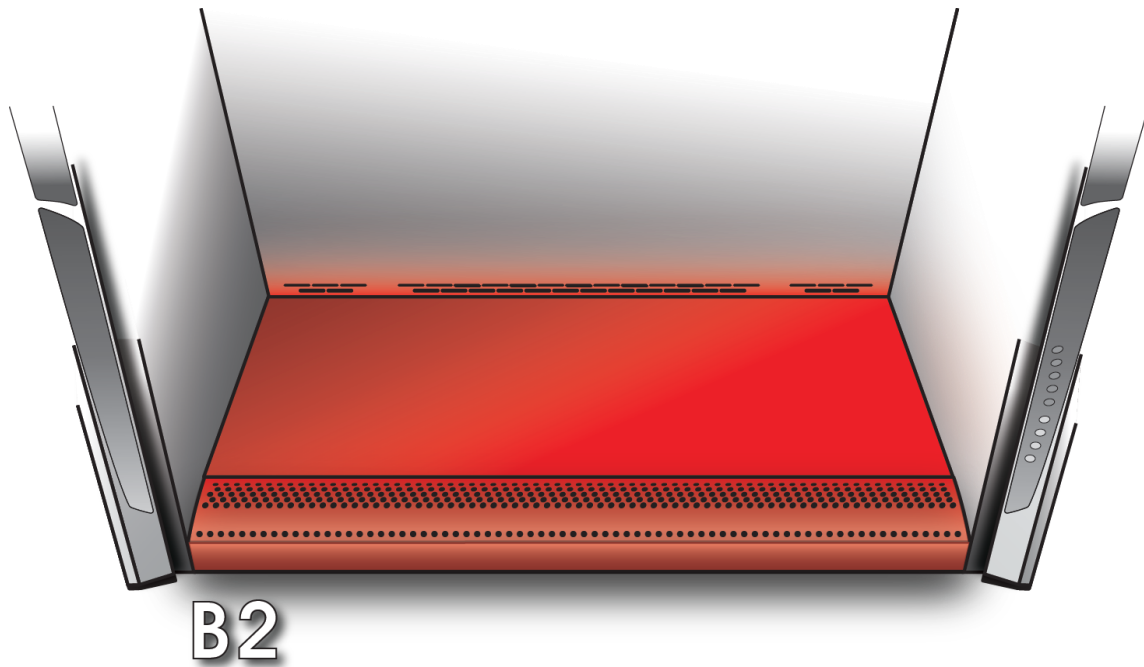


Class II, Type B1



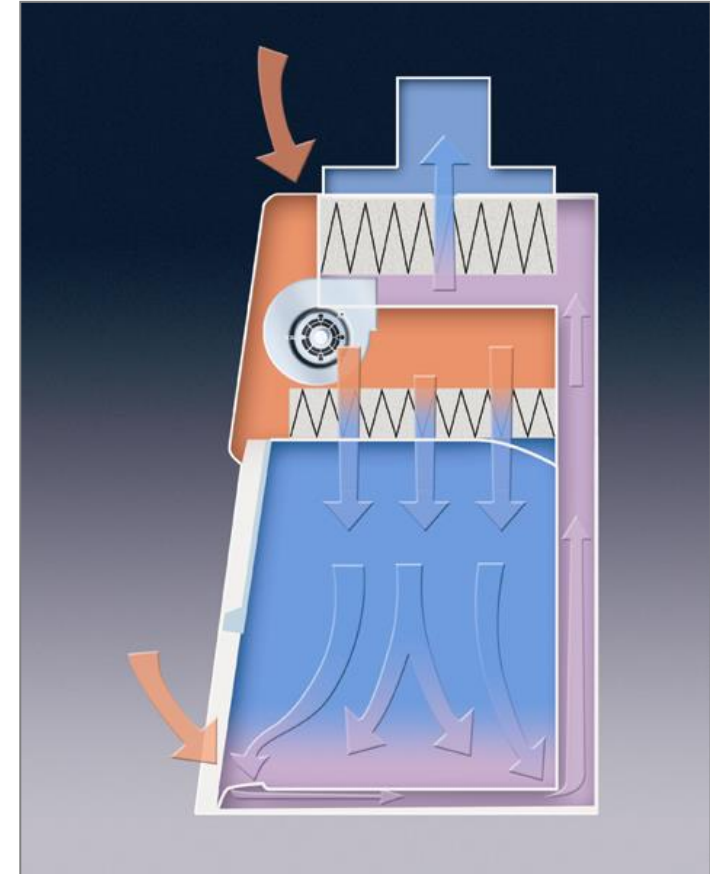
B1

Class II, Type B2 – Total Exhaust

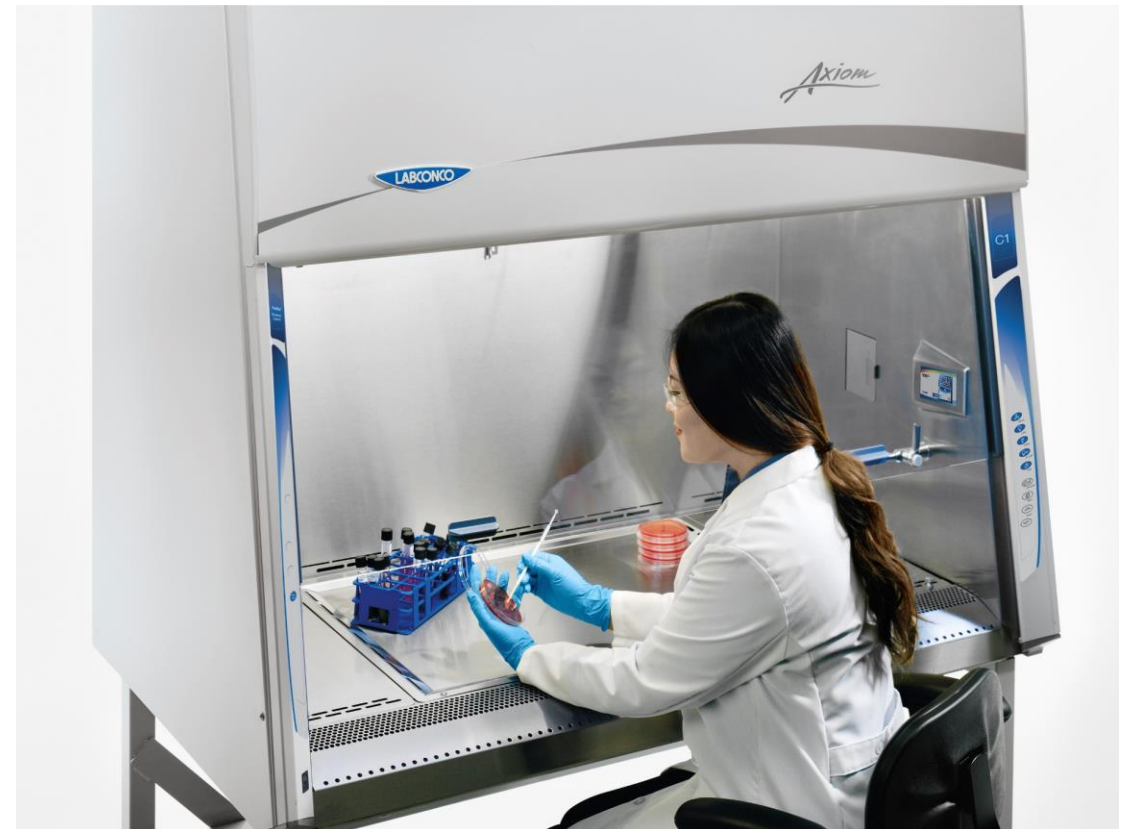
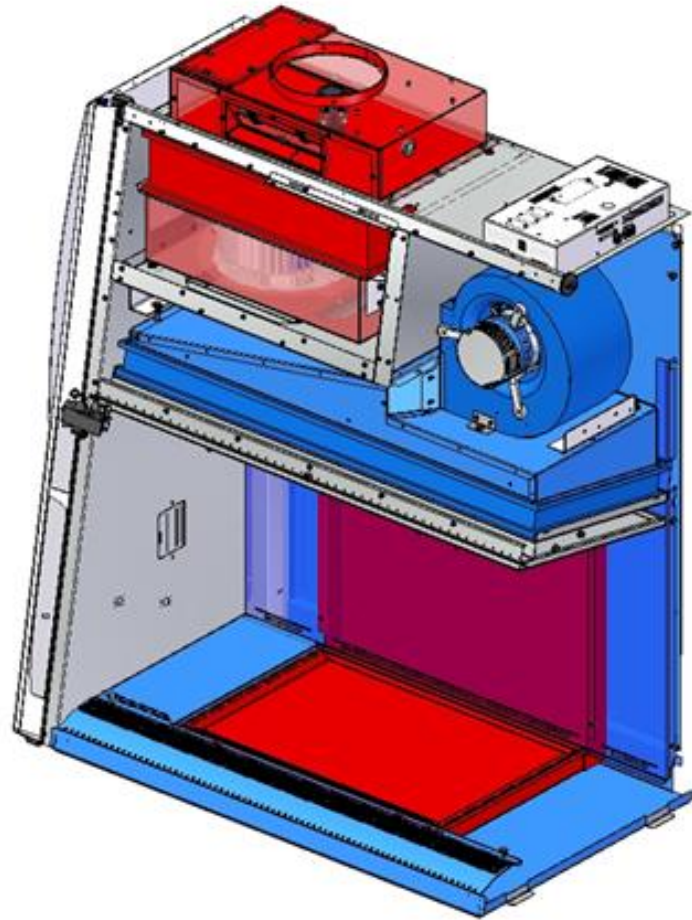


Class II, Type B2 – Total Exhaust

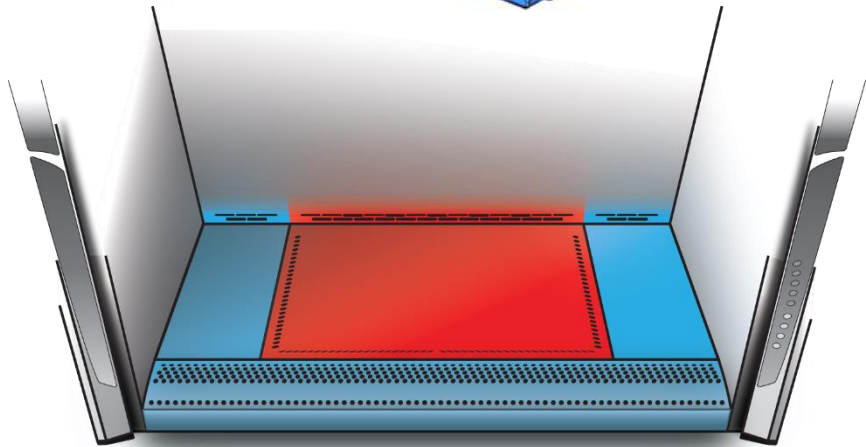
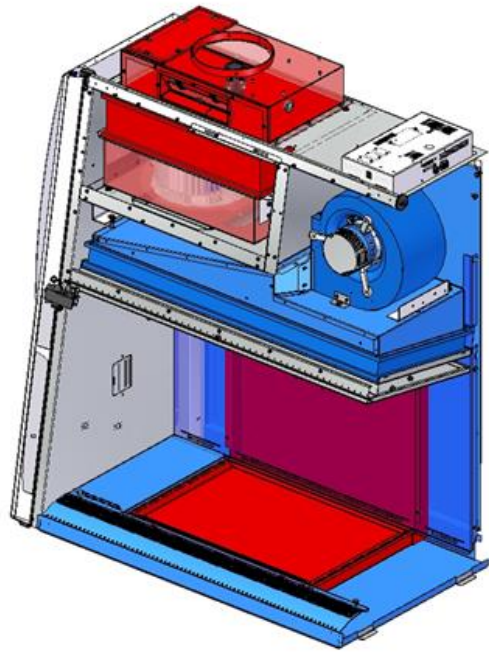
- Entire work surface is 100% exhausted
- High CFM requirement (2x A2)
- Dedicated exhaust duct/blower per BSC
- Shuts down within 15 seconds if exhaust system fails



Type C1 Exhaust Pathway



Axiom Type C1 – a flexible alternative.



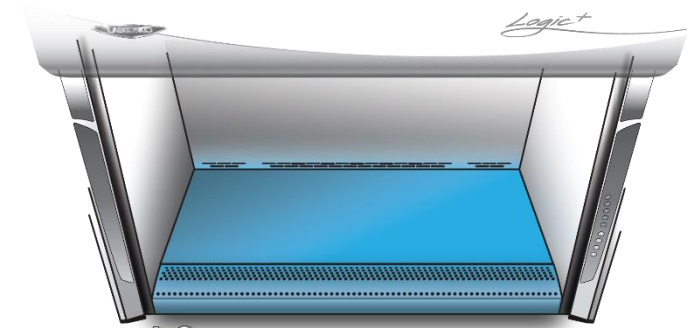
C1

- Flexible
 - Works in Type A or Type B modes
 - Exhausted 'Type B' mode saves energy vs. Type B2 cabinets
 - When ducted, has minimal exhaust requirements
 - Switch from A to B mode as work changes
- Work surface divided to promote aseptic workflow
- Max operational safety
 - Runs up to 5 minutes after building exhaust failure

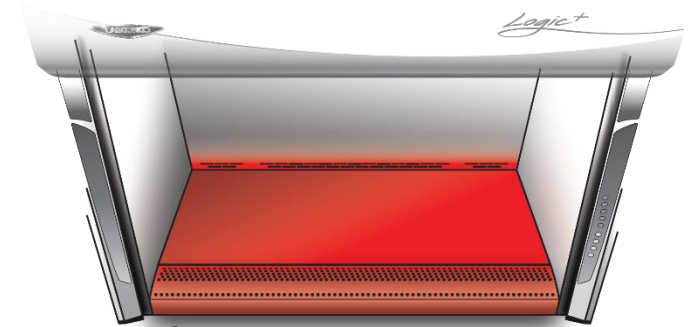
LABCONCO

BSC Types - Recap

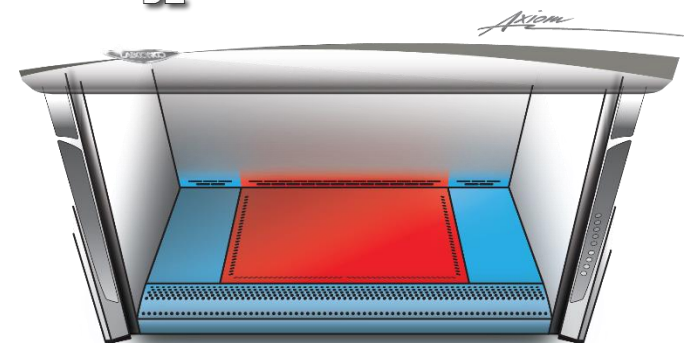
- Type A2
 - Most common type of BSC
 - Can be vented for odors or small volumes of chemicals
- Type B2
 - 100% exhaust design for high volumes of chemicals
 - Expensive installation and operating costs
- Type C1
 - Flexible: Type A or B (100% exhaust) modes
 - Easy installation when vented with reduced operating costs
 - Additional safety features when vented over A2 and B2 BSCs



A2



B2



C1