

Containment Equipment and Facilities

Biocontainment

- The principle of holding or being capable of holding or including within a fixed limit or area
- Preventing the unintentional release of biological agents through a combination of laboratory practices, containment equipment (primary barrier) and laboratory facility design (secondary barrier)

Primary Barrier

- Primary barriers contain the agent at the source
- Equipment/Engineering Control
 - ◆ Biological safety cabinet, fumehood, glove box, animal housing, centrifuge, fermenter

Secondary Barrier

- Secondary barrier is the structure surrounding the primary barrier
- Facility/Engineering Control
 - ◆ Rooms, building
- Types of Facilities
 - ◆ Basic laboratory
 - ◆ Containment laboratory

Primary Barriers - Equipment

■ Personnel Protection

- ◆ Any aerosol generated within the cabinet is contained and kept away from the researcher

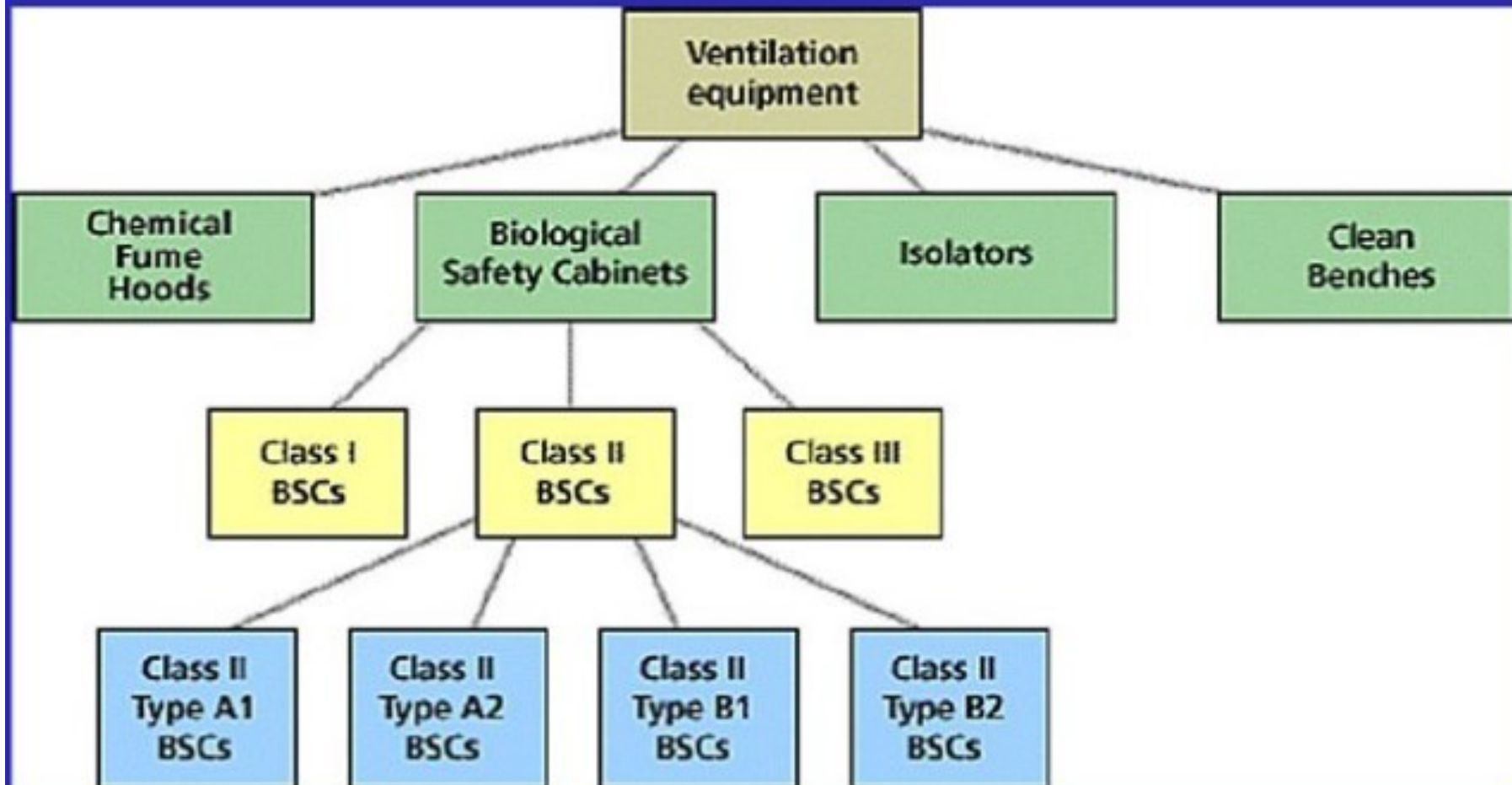
■ Product Protection

- ◆ Air within the work space of the cabinet has been filtered so that it is virtually free of airborne particles and organisms; thus protecting the work from outside contamination

■ Environmental Protection

- ◆ Aerosols generated within the unit are removed from the air before the air is discharged

Ventilation Equipment Classes and Types



Chemical Fume Hood

- 100 fpm face velocity
- Offer only personnel protection
- Always exhaust air to the outside
- Do not offer protection to the product or the environment, as there is no filtration of intake and exhaust air
(Sometimes air cleaning treatment is added to the exhaust.)
- Do draw contaminants in the laboratory air directly over the product being worked on
- Used for work with chemical hazards



Chemical Hood

Clean Bench / Laminar Flow Hoods

- Provide product protection only
- Product protection is provided by creating a unidirectional airflow generated through a HEPA filter
- Discharge air goes directly into workroom
- Applications
 - Any application where the product is not hazardous but must be kept contaminant free
 - Preparation of non-hazardous intravenous mixtures and media
 - Particulate free assembly of sterile equipment and electronic devices
- Eliminate Clean Bench in containment laboratory



Clean Bench



Laminar air flow

Biological Safety Cabinets

- Designed to contain biological hazards
- Inward airflow for personnel protection
- HEPA filtered exhaust air for environmental protection
- Supply air HEPA filter for product protection (except Class I)
- Separated into Classes and Types
 - Class I
 - Class II
 - Type A1, A2
 - Type B1, B2 C1
 - Class III
- Microbiological studies, cell cultures, pharmaceutical research and procedures...

Biosafety Cabinets



Class I

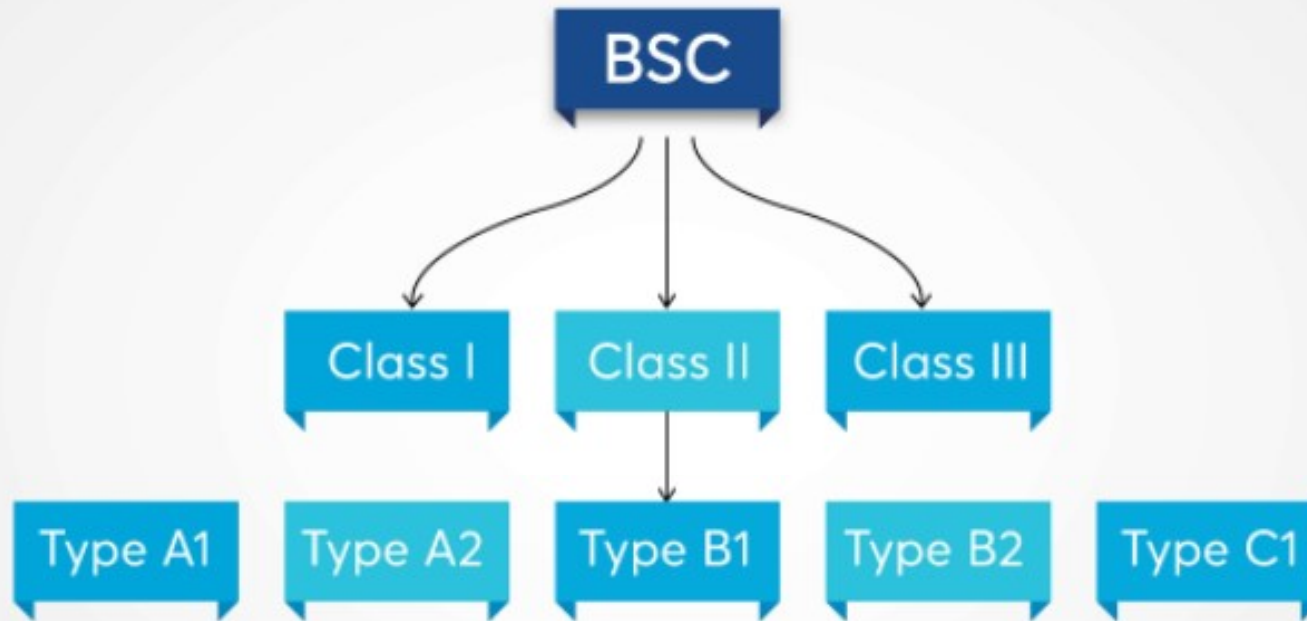


Class II



Class III

Biosafety Cabinets come in three classes, depending on the protection to personnel, products, and environment.



Class 1

Provides personnel and environmental protection but no product protection

Class 2

Partial barrier systems relying on movement of air to provide protection for personnel, environment, and product.

Class 3

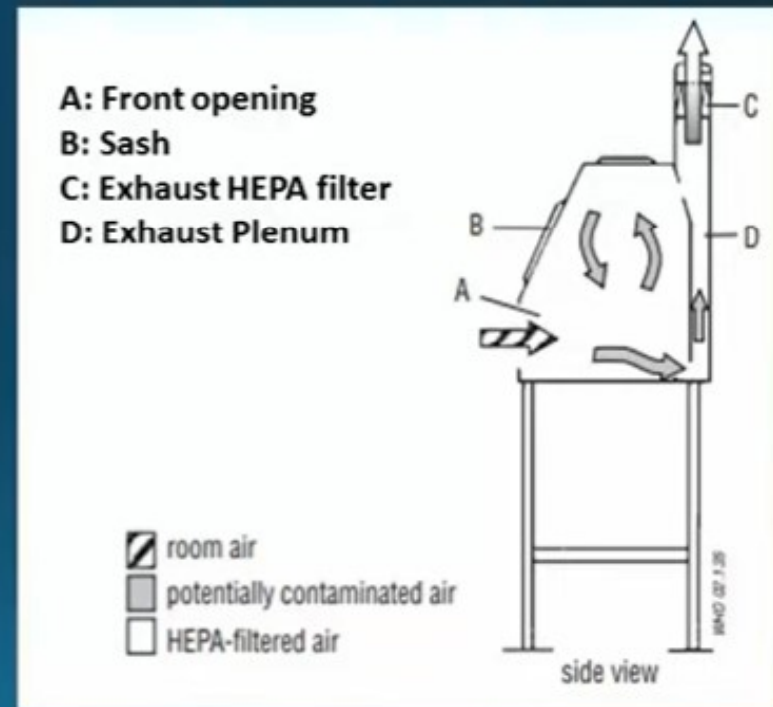
A gas-tight enclosure providing the maximum protection for personnel, product, and environment.

Class I Cabinet

- 75 fpm face velocity
- Provides personnel and environmental protection
- No product protection
- Requires an exhaust blower to pull the air through
 - usually to the outdoors
- Applications
 - Housing centrifuges, fermenters
 - Cage dumping in an animal lab
 - Aerating cultures

Class I Biosafety Cabinet

- 100% Exhaust
- Provides personnel and environmental protection



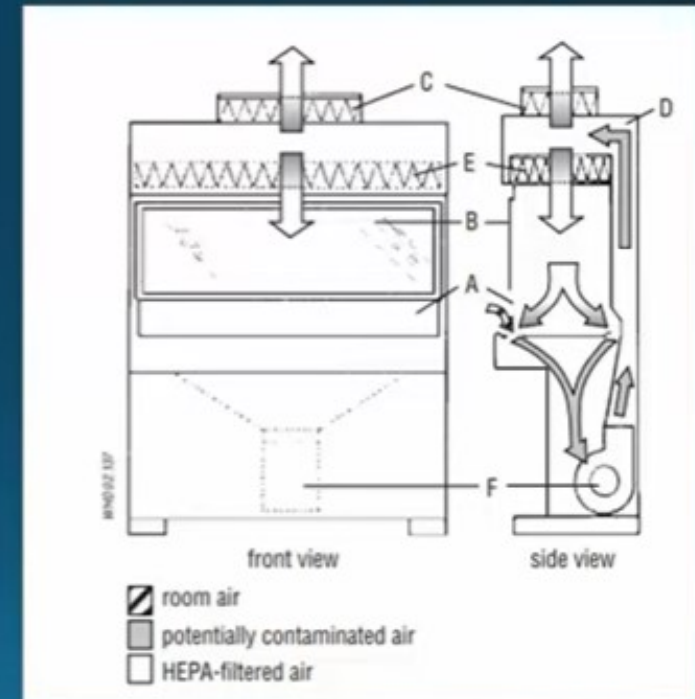
Class II Cabinets

- Ventilated cabinet
- Provides personnel, product, and environmental protection
- Open front with inward airflow for personnel protection
- Downward HEPA filtered laminar airflow for product protection
- HEPA filtered exhaust air for environmental protection

Class II Biosafety Cabinet

Class II Type A1

- 30% Exhaust , 70% Recirculate back into the Biosafety cabinet
- Inflow velocity: 75fpm minimum
- Provides personnel, product and environmental protection
- Suitable for biosafety level 1 & 2 usage.



Class II Biosafety Cabinets

Class II Type A2

- It is similar to Type A1
- 30% Exhaust , 70% Recirculate back into the Biosafety cabinet
- Inflow velocity: 100fpm minimum
- Provides personnel, product and environmental protection
- Suitable for biosafety level 1, 2 or 3 usage.

Class II – Type B1

- 70% Exhaust, 30% Recirculate

Class II – Type B2

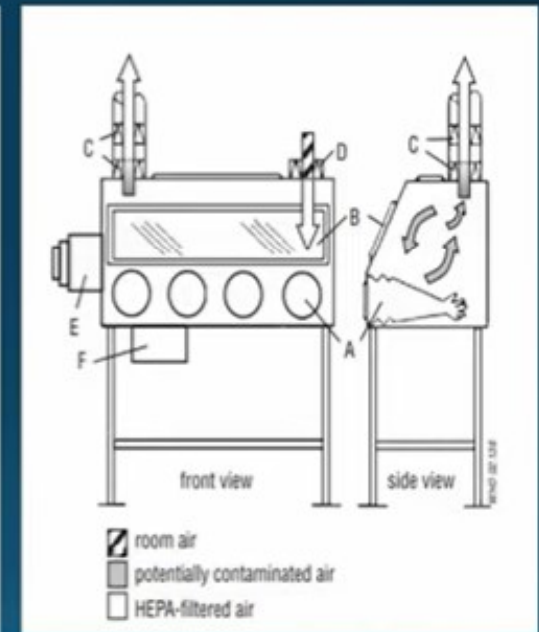
- 100% Exhaust

Different Classes of Biosafety Cabinets

Type	Face velocity (m/s)	Airflow (recirculated)	Airflow (exhausted)	Exhaust System
Class I	0.36	0	100	Hard duct
Class IIA1	0.38-0.51	70	30	Exhaust to room or thimble connection
Class IIA2	0.51	70	30	Exhaust to room or thimble connection
Class IIB1	0.51	30	70	Hard duct
Class IIB2 (Total Exhaust BSC)	0.51	0	100	Hard duct
Class III	NA	0	100	Hard duct

Class III Biosafety Cabinets

- 100% Exhaust
- Glove Box
- Double HEPA filter exhaust
- Suitable for Biosafety Level 4
- Provides personnel, product and environmental protection



Primary Barriers

	Personnel	Product	Environment
Chemical Fumehood	X		
Laminar Flowhood		X	
Class I Biosafety Cabinet	X		X
Class II Biosafety Cabinet	X	X	X
Class III Biosafety Cabinet	X	X	X
Isolators	X	X	X

Other Primary Barriers- Engineering Control

- Gasketed blenders, homogenizers
- Cotton plugs, filters for flasks in shakers
- Filtered pipette tips
- HEPA and hydrophobic vacuum line filters
- Plasticware substituted for glassware
- Gas burners with shield, microincinerator
- Centrifuges
 - ◆ Interlock, solid cover, safety buckets, O-rings

Secondary Barrier- Facilities

Laboratory Biosafety Level 2

- Lockable doors (a must for restricted agents)
- Sink
- Bench tops impervious and easily cleaned
- Biological safety cabinet (if applicable)
- Eyewash
- Inward airflow (desirable)

THANK YOU