




Biological Safety Cabinets


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Outline

- Introduction
- Class I BSC
- Class II BSC
- Class III BSC
- Installation
- Certification
- Working in the BSC
- Questions & Answers



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Introduction

What is a Biological Safety Cabinet (BSC)?

- a ventilated cabinet or enclosure
- uses directional airflow and HEPA filters to provide:
 - personnel protection
 - environmental protection
 - varying degrees of product protection



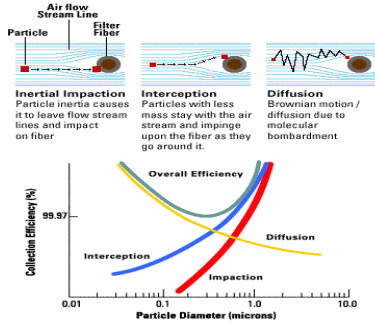
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Introduction

HEPA filtration



Introduction

HEPA filtration



Introduction

HEPA filtration



Introduction

What is a Biological Safety Cabinet?

In CL2:

- used for procedures with potential to produce infectious aerosols
- high concentrations or larger volumes of infectious material

Introduction

What is a Biological Safety Cabinet?

In CL3 & 4:

- used for all manipulations of infectious materials

Introduction

Categories

- Class I
- Class II (A1, A2, B1, B2)
- Class III (glove box)

Introduction

Regulations/Standards

- National Sanitation Foundation (NSF) Standard 49
- covers Class II cabinets only
- older BSCs – covered under NSF 49 (1992)
- newer BSCs – covered under NSF/ANSI 49-2002

<http://www.techstreet.com>

Introduction

Regulations/Standards

- NSF Standards reviewed every 5 years
- tests are conducted on cabinets submitted to NSF by manufacturers
- products which meet these standards are certified by NSF
- tests on cabinets are repeated every 5 years

Class I Biological Safety Cabinet

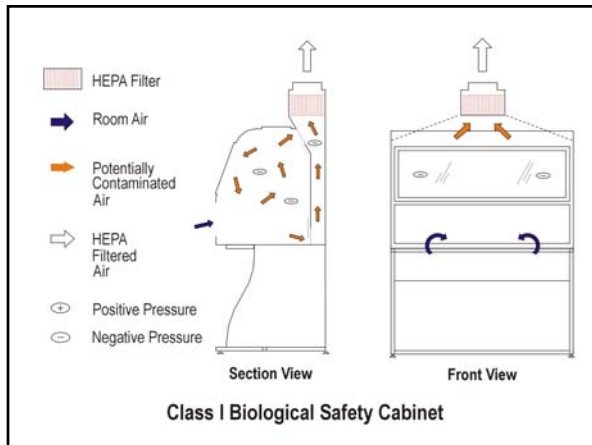
Protection for:

- personnel
- environment

NO product protection!!

Class I Biological Safety Cabinet

- suitable for work with low to moderate risk agents where there is a need for containment but NOT product protection
- protects environment by filtering air before it is exhausted (unlike a fume hood)
- movement of air into cabinet, away from user





Class II Biological Safety Cabinet

Protection for:

- personnel
- product
- environment

Class II Biological Safety Cabinet

Three key features:

- front access opening with carefully maintained inward airflow
- HEPA-filtered, vertical, unidirectional airflow within the work area
- HEPA-filtered exhaust air to the room or to a facility exhaust system

Class II Biological Safety Cabinet

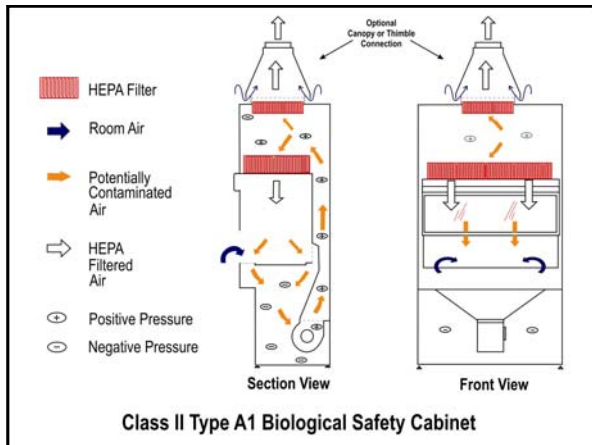
Divided into 4 design sub-categories:

- Class II Type A1 (formerly Class II Type A)
- Class II Type A2 (formerly Class II Type A/B3)
- Class II Type B1
- Class II Type B2

Class II Biological Safety Cabinet

Class II Type A1 (formerly Class II Type A):

- 70% air re-circulated; 30% exhausted to the room
- 75 FPM intake
- may have biologically contaminated positive pressure plenum



Class II Biological Safety Cabinet

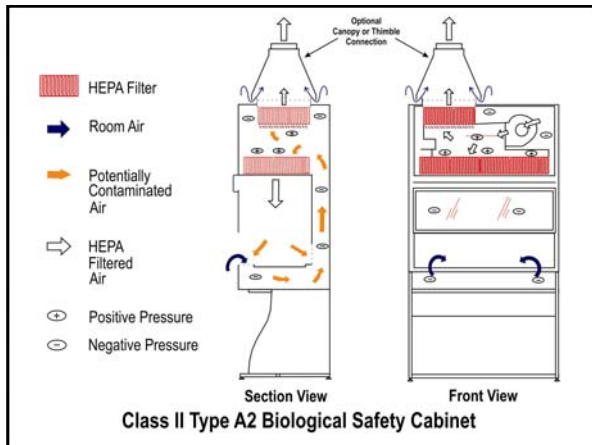
Class II Type A1 (formerly Class II Type A):



Class II Biological Safety Cabinet

Class II Type A2 (formerly Class II Type A/B3):

- 70% air re-circulated; 30% exhausted to the room or outdoors via a canopy (thimble)
- 100 FPM intake
- biologically contaminated plenum under negative pressure or surrounded by negative pressure



Class II Biological Safety Cabinet

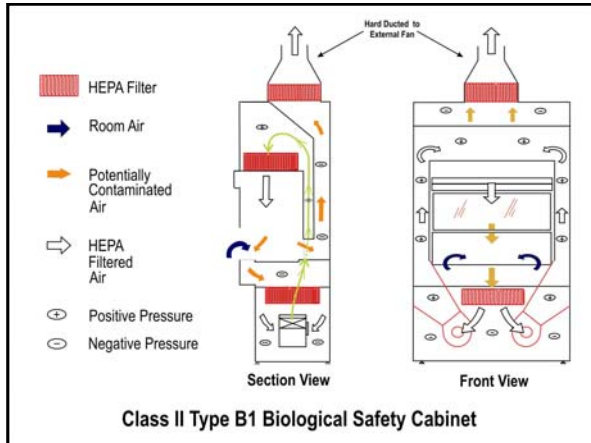
Class II Type A2 (formerly Class II Type A/B3):



Class II Biological Safety Cabinet

Class II Type B1:

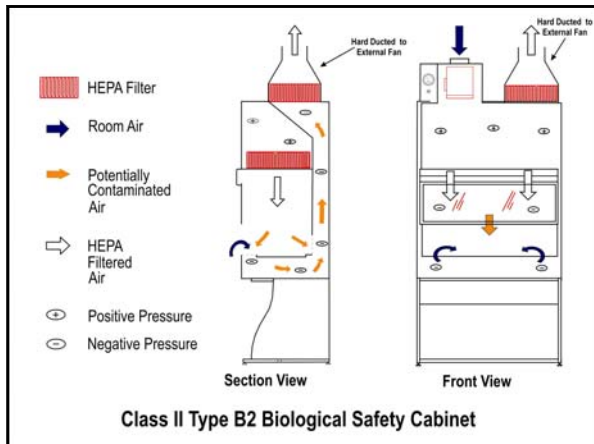
- 40% air re-circulated; 60% exhausted from cabinet
- exhaust pulled through dedicated exhaust duct into facility exhaust system
- 100 FPM intake
- all biologically contaminated plenums are negative to the room or surrounded by negative pressure plenums



Class II Biological Safety Cabinet

Class II Type B2:

- 0% air re-circulated; 100% exhausted from cabinet
- exhaust pulled through dedicated exhaust duct into facility exhaust system
- 100 FPM intake
- all ducts and plenums under negative pressure
- all contaminated ducts are under negative pressure or surrounded by directly exhausted negative pressure ducts or plenums



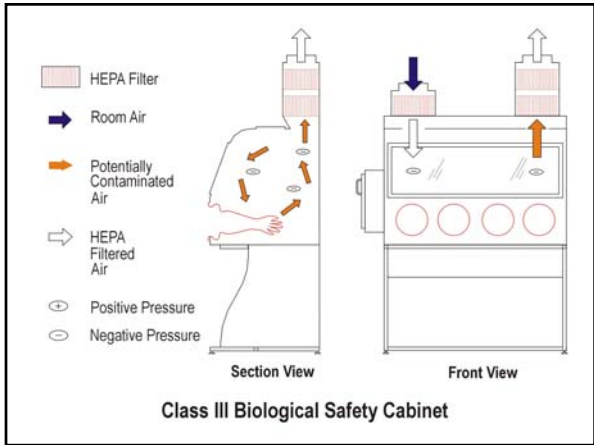


Class II Biological Safety Cabinet
Class III:

- totally enclosed ventilated cabinet
- gas-tight construction
- work done through gloves attached to BSC
- exhaust air is double HEPA filtered, or single HEPA filtered and incinerated
- 'CL4' conditions

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Installation

- air curtain at front of cabinet can be easily disrupted
- should be located away from high traffic areas, doors and air supply/exhaust grilles
- 40 cm from top exhaust and overhead obstructions disrupt airflow patterns
- 30 cm on each side to allow for maintenance

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Installation

Ducted cabinets:

- blowers on exhaust system should be located at terminal end of ductwork
- failure of exhaust should signal an alarm to the user
- to prevent pressurization - interlock system should be installed to stop cabinet blower from operating if there is insufficient exhaust flow

Installation

- natural gas port not recommended
- open flames
 - create turbulence
 - disrupt airflow patterns
 - can damage HEPA filter
- continuous operation helps control dust & other airborne particulate levels in lab
- if operated only when needed, balancing of lab room air must be considered

Certification

- correct operation must be verified before use and then annually & after any repairs or relocation
- measuring equipment must be calibrated and maintained
- a copy of the certification report must be kept by the user

Certification

Label affixed on outside of BSC with:

- date of certification
- date of next certification
- standards that BSC was tested to
- name of certifier

Certification

- field testing must be done by experienced, qualified persons
- recommended that NSF-certified field testers be used

Certification

Preparation of the BSC for certification:

- BSC surface must be surface disinfected with a suitable disinfectant
- certifier may decontaminate the BSC with formaldehyde gas or VHP



Working in the BSC

Start-up procedures:


- turn off UV lights if used (use is discouraged)
- turn on fluorescent light and blower, if off
- check air intake & exhaust grilles for obstructions
- if BSC has an alarm, check & switch to 'on'
- disinfect all interior surfaces with 70% ethanol or a suitable disinfectant

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Working in the BSC

Start-up procedures (cont'd):

- work surface may be lined with absorbent paper



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Working in the BSC

Start-up procedures (cont'd):

- place items required for procedure into cabinet; do not obstruct grilles
- wait 5 minutes for contaminants to purge from the work area



Working in the BSC

Start-up procedures (cont'd):



DO NOT hang spray bottles on the outside grille!

Working in the BSC

Good Technique:

- don protective clothing, gloves, respirator as appropriate
- enter BSC straight on – avoid rapid & sweeping motions
- position yourself with arm pits level with top of sash



Working in the BSC

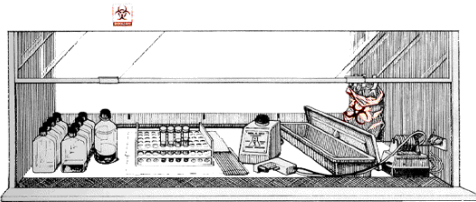
Good Technique (cont'd):

- perform operations as far to the rear of work surface as possible
- only one person should be working in a BSC at a time



Working in the BSC

Good Technique (cont'd):



Work from 'clean' to 'dirty'

Working in the BSC

Good Technique (cont'd):

- keep discarded, contaminated material to the rear of BSC; do not discard items in containers outside of BSC
- vacuum lines must have a 0.22 μ filter attached on the tubing inside the BSC

Working in the BSC

Good Technique (cont'd):

- do **NOT** use toxic or volatile chemicals in the BSC
- **NO OPEN FLAMES**
- if spill occurs, surface decon all objects; disinfect the work surface (underneath if necessary) with BSC 'on'

Working in the BSC

Upon completion of work:

- close open containers
- allow BSC to run for 5 min with no activity
- surface disinfect all objects in BSC before removal from cabinet
- do not use BSC for storage!

Working in the BSC

Upon completion of work (cont'd):

- spray off or remove first set of gloves to the biohazard bag within the BSC
- wipe down work surfaces with 70% ethanol or a suitable disinfectant
- turn off fluorescent light & cabinet blower (some BSCs to be left on at all times)

Working in the BSC

UV lights:

- time of exposure, distance, presence of dust & UV lamp intensity affect the germicidal activity of the UV light
- UV light must be cleaned periodically to remove dust

Working in the BSC

UV lights (cont'd):

- may damage eyes, skin & laboratory equipment
- should be turned off when room is occupied

UV lights should NOT be used for primary disinfection of BSC!



Thank you!!



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