

Learn About BSC Types and Classes

Types of BSC

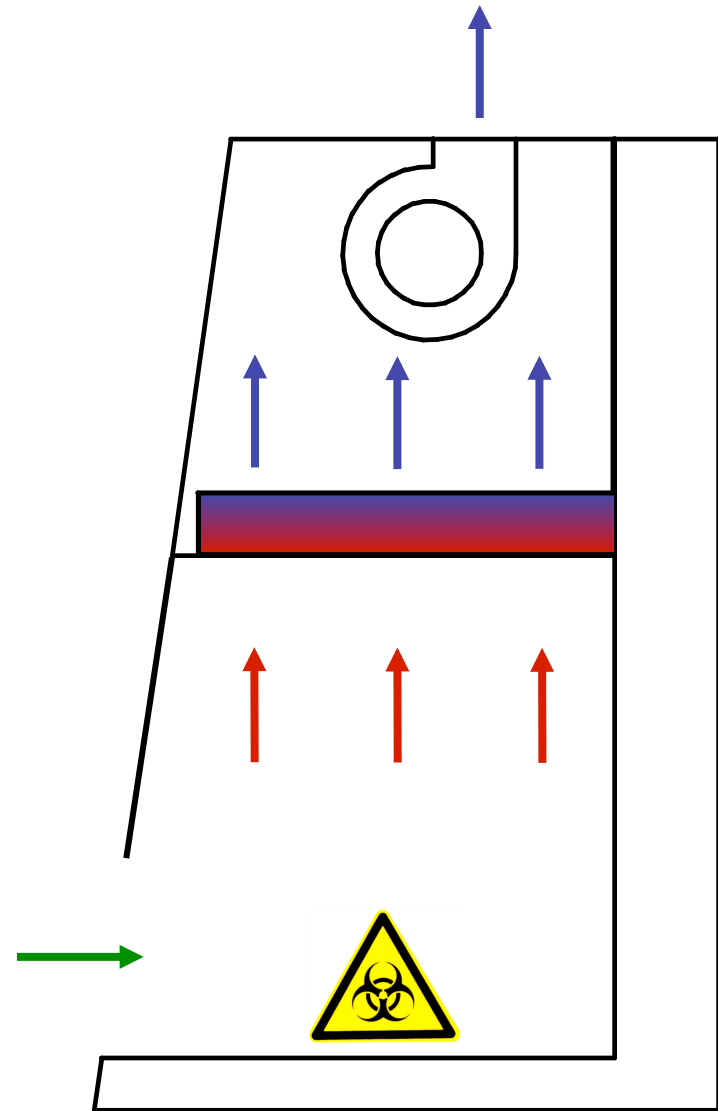
Class	Min Inflow Velocity (fpm)	Recirc. Air	Exhaust Air	Contaminated Plenum Surrounded by	Exhaust Alternatives	Biosafety Level
I	75	0%	100%	Outside air (Lab room)	Inside room / Hard Duct	1,2,3
II A1	75	70%	30%	Outside air (Lab room)	Inside room / Thimble Duct	1,2,3
II A2	100	70%	30%	Negative pressure	Inside room / Thimble Duct	1,2,3
II B1	100	30%	70%	Negative pressure	Hard duct only	1,2,3
II B2	100	0%	100%	Negative pressure	Hard duct only	1,2,3
III	Closed P>0.5"WG	0%	100%	Negative pressure	Inside room / Hard Duct	1,2,3,4

Bio Safety Level (BSL)

	Lethality	Medium	Cure	Example
1	Safe	Liquid	Yes	B.Subtilis
2	Some	Liquid	Some	HIV
3	Serious	Airborne	Some	TBC
4	Extreme	Airborne	None	Ebola

Class I BSC

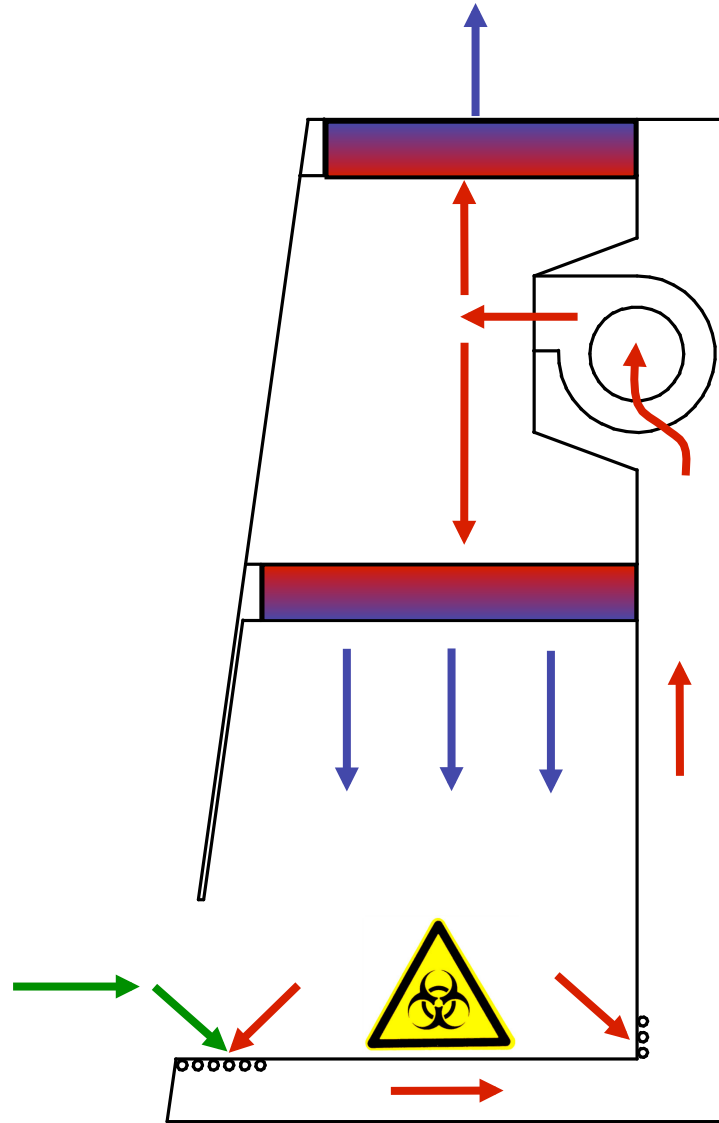
- Only operator protection (no product protection).
- Biosafety level 1,2,3
- Inflow away from operator.
- HEPA filtered exhaust to environment.
- Current trend: Switch to Class II



Class II BSC: Basics

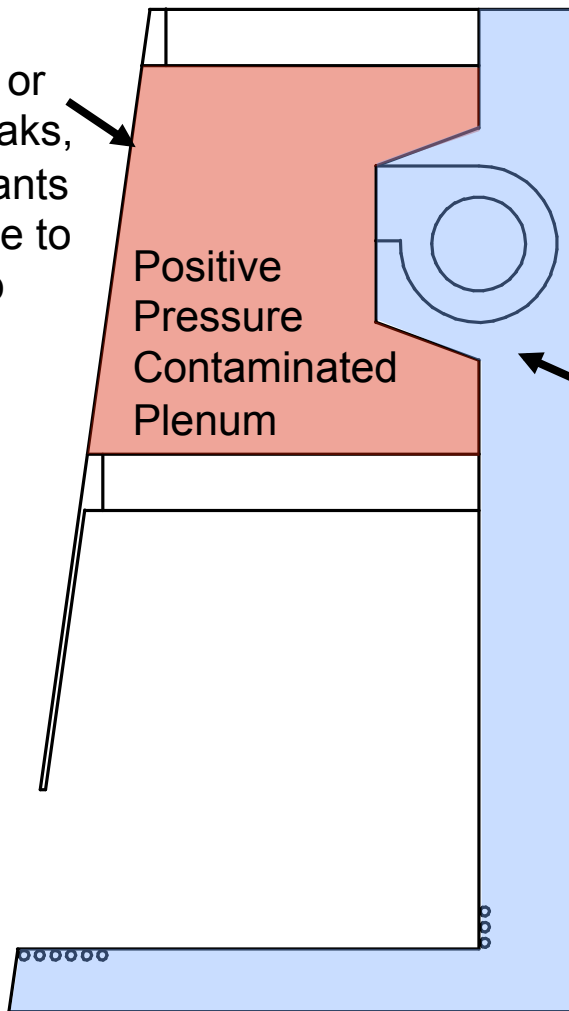
- Both operator and product protection
- Biosafety level 1, 2, 3
- Inflow away from operator
- HEPA filtered exhaust to environment
- HEPA filtered laminar downflow
- If you use Volatile (Vaporizing) Toxic Chemical in cell culture ⇨ you need ducting

Class II A1 BSC: Airflow



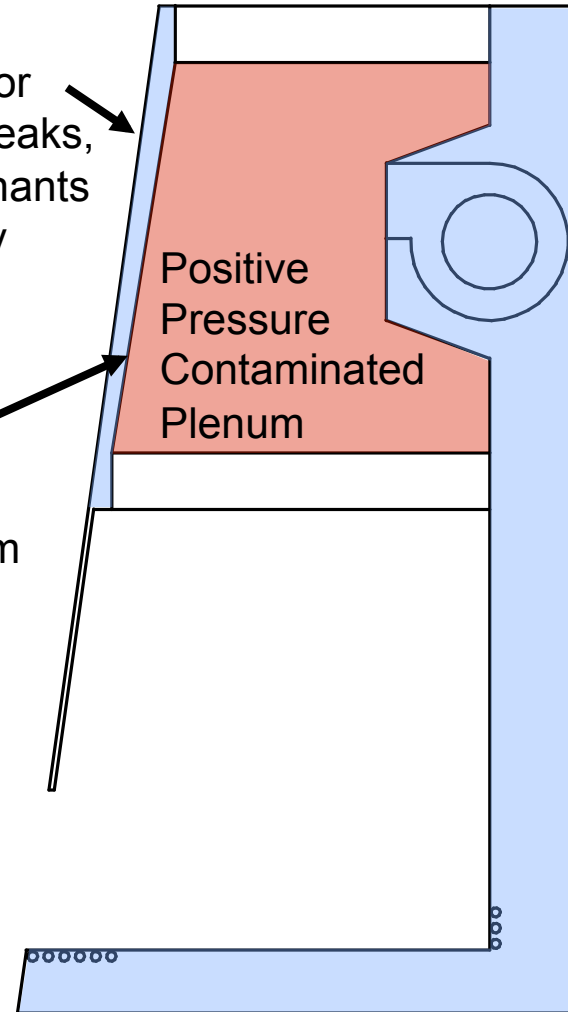
Class II Type A1 vs A2: Negative Pressure Isolated Plenum

Danger:
If Plenum or Gasket leaks, contaminants will escape to room / lab

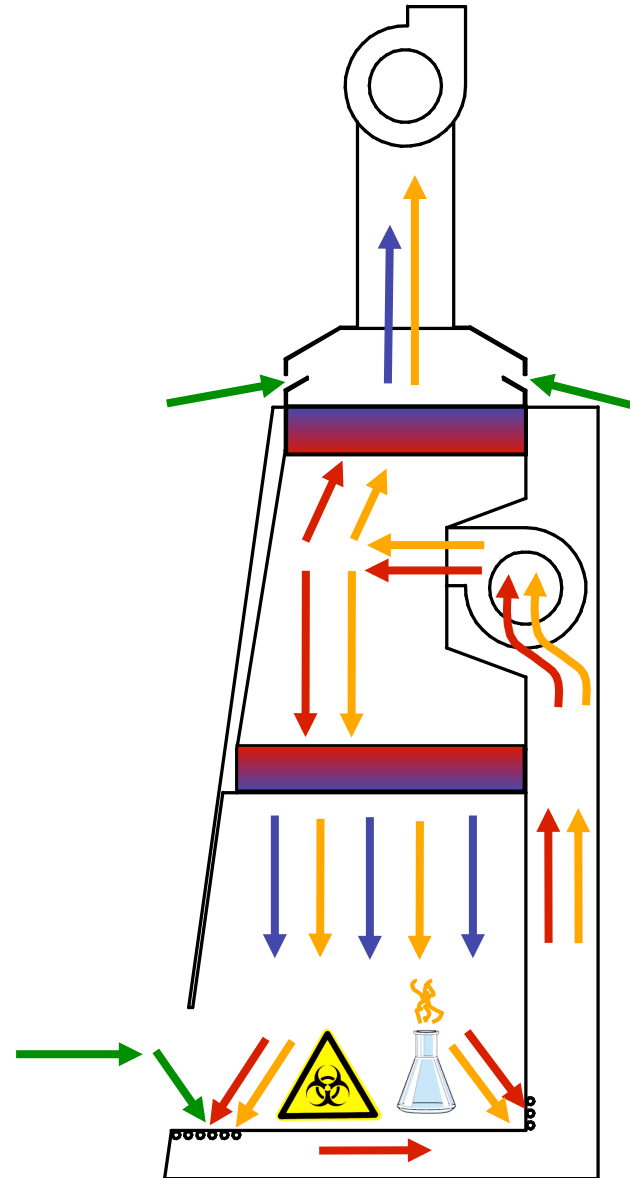


Safe: If Plenum or Gasket leaks, contaminants pulled by blower

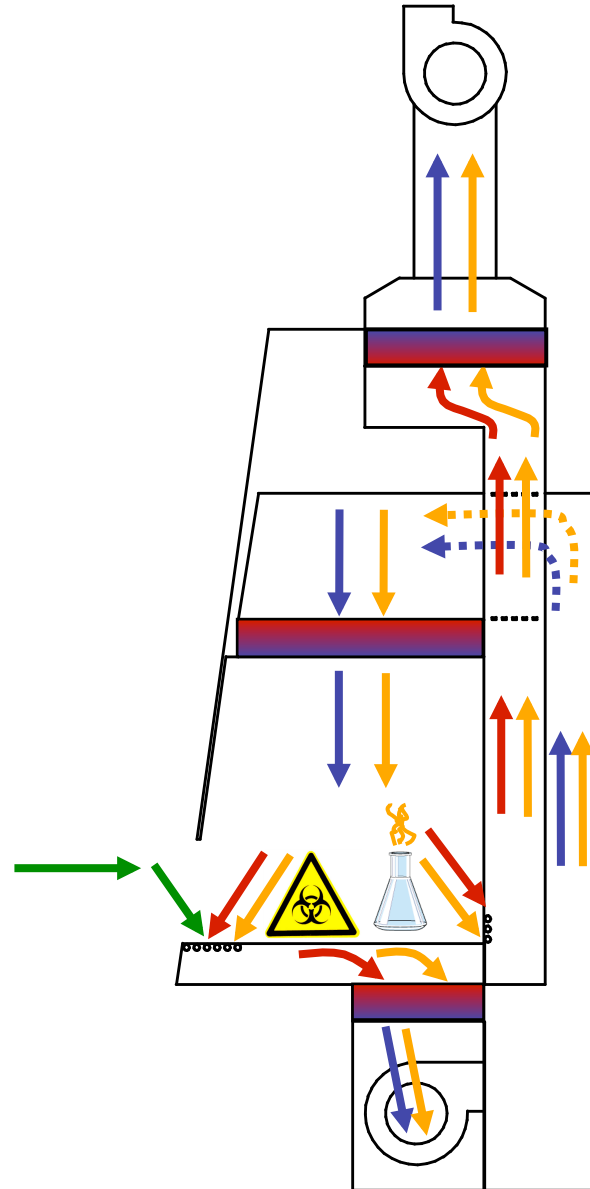
Negative Pressure Space from Blower Suction



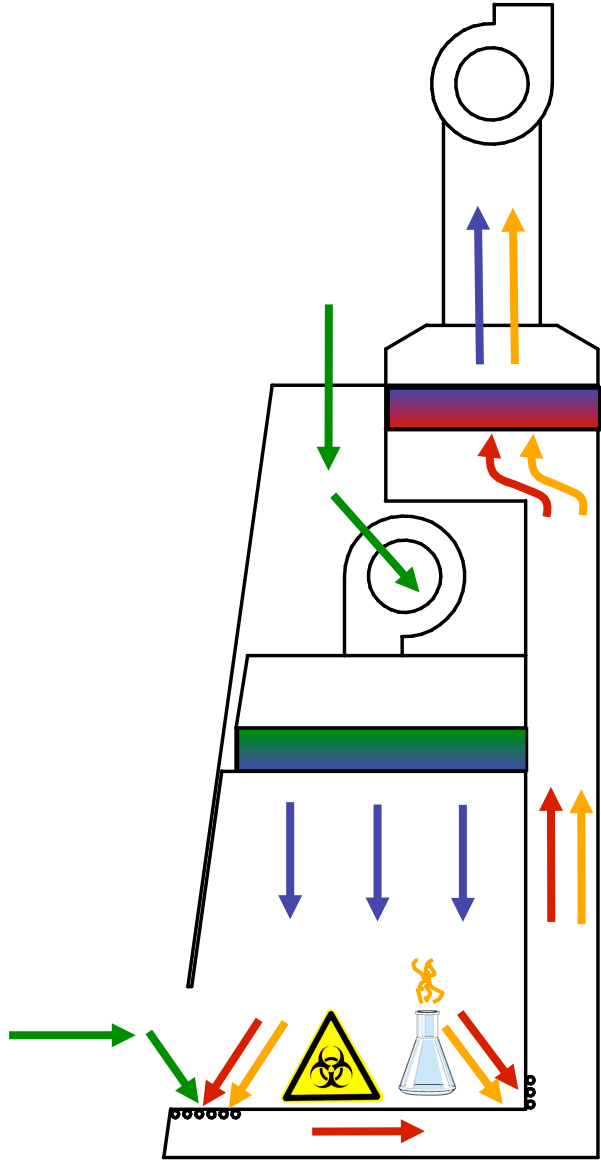
Class II Type A2 with Thimble Ducting



Class II B1 BSC: Airflow



Class II B2 BSC Airflow



NIOSH Alert on Chemical Vapor Ducting

If the hazardous chemicals in use will volatilize (vaporize) while:

- Being handled
- After they are captured by HEPA filter

Do not use a ventilated cabinet that re-circulates air:

- Inside the cabinet
- Exhaust air back to the room / lab

Therefore for vaporizing chemical:

- Use Class II B2
- Don't use Class II A2 even with thimble ducting

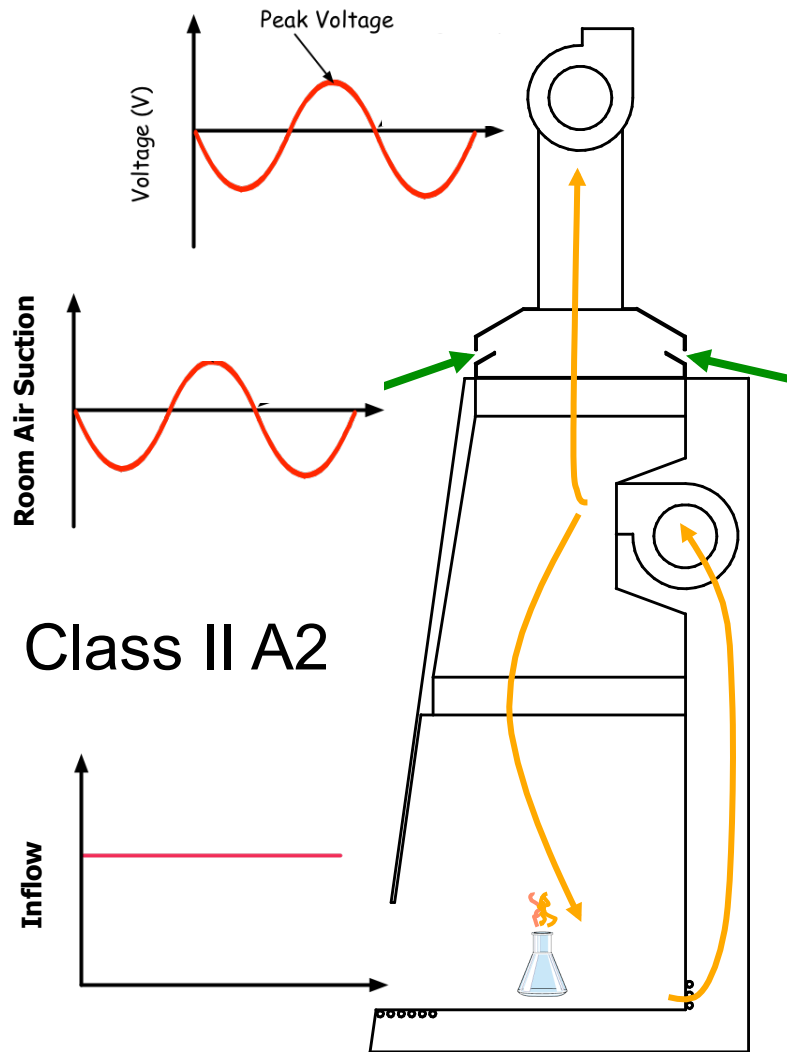
Class II Type B2 Precautions

- Ensure that the chemicals used will not damage HEPA / ULPA filters
- Exhausting 1420 cmh (830 cfm) for 4ft unit: expensive to operate
- Need interlock system: if building exhaust fails, cabinet internal blower must be turned off
- Exhaust fan must be able the cabinet:
 - airflow volume
 - static pressure
 - plus extra pressure drop from ducting system
- Fluctuations in building exhaust cfm can be $\pm 10\%$

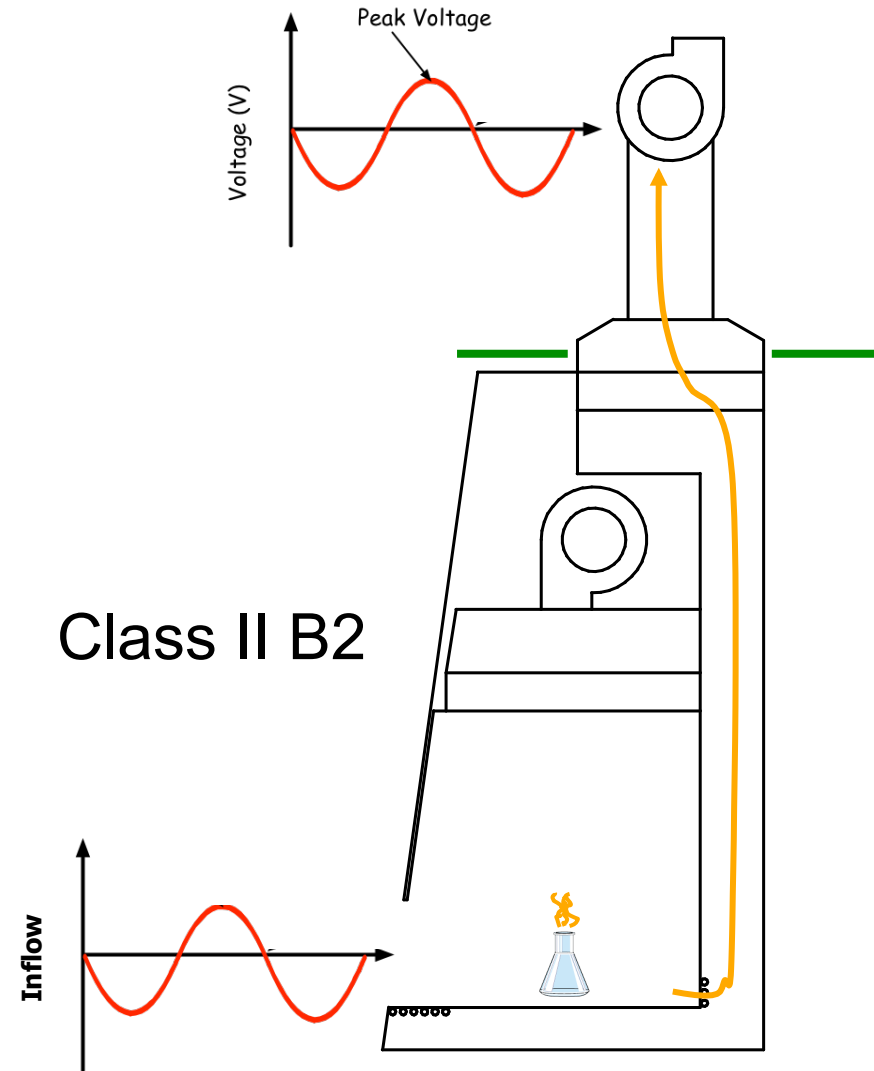
Ducting Exhaust Fluctuations

- Thimble duct on A2: have holes for room air
 - ⇒ Building exhaust fluctuations will not affect cabinet airflow
- Hard ducting on B2: no holes for room air
 - difficulty from exhaust fan fluctuations
 - ⇒ Building exhaust must precisely match the cabinet airflow requirements

Class II A2 vs B2: Pro and Con



- Pro:** Easy to install & operate
- Con:** Recirculation of chemical vapor

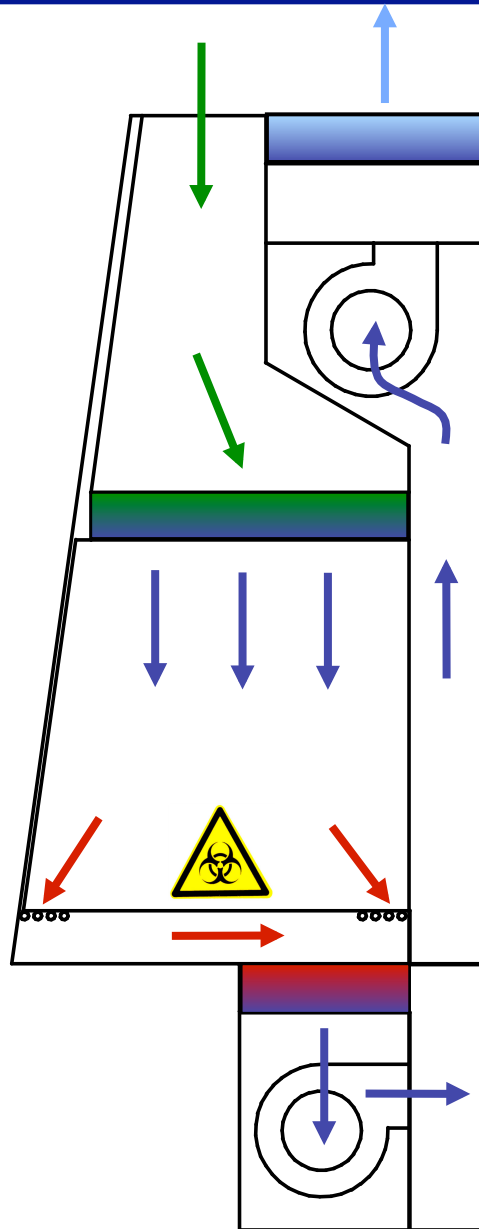


- Con:** Hard to install & operate
- Pro:** No recirculation of chem. vapor

Class III BSC

- Biosafety level 1, 2, 3, 4
- Product and operator protection
- Gas leak tight 1×10^{-5} cc/sec leak rate
- Internal operations with attached glove
- Material transfer: through 2 doors pass box
- Negative air pressure > 0.5 "WG
- Supply is HEPA filtered
- Double exhaust HEPA filter in series or:
Single exhaust HEPA and an incinerator

Class III BSC



Thank You for Your Time

The End

