

Background:

A fume hood or fume cupboard (FC) is a type of local ventilation device designed to limit exposure to hazardous or noxious fumes, vapours and dust. A fume hood is typically a large piece of equipment enclosing five sides of a work area, the bottom of which is most commonly located at a standing work height.

Two main types exist, ducted and recirculating. The principle is the same for both types: air is drawn in from the front (open) side of the cabinet, and either expelled outside the building or made safe through filtration and fed back into the room. (the recirculating type is not recommended at the University due to testing issues however there are some specific uses where this is the preferred type i.e. lecture theatre). Some fume cupboards have wash down facilities, and some FC have filtering at the outlet.

Laminar Flow Hoods – Crossflow Cabinet:

Laminar flow cabinets (down flow or cross flow) are designed for product protection only and must never be used for work with infectious material. Their use should be limited to the preparation of sterile media, the assembly of sterile components into complete units (eg. membrane filters) or other similar operations. Laminar flow usually have a UV sterilisation capability for the work area prior to use and after use. A bunsen burner can be used in some cases.

Down flow Cabinet - Class I Biosafety Cabinet:

This cabinet is designed for personnel and environment protection.

A protective barrier between the operator and the potential hazard is provided by creating a uniform inflow of air across the entire work opening of sufficient velocity to prevent egress of material from the cabinet work zone to the laboratory environment. The airflow passes from the work zone through a primary filter to remove coarse particulate material in order to protect and prolong the life of the HEPA (High Efficiency Particulate Air) filter. It then passes through the blower and is filtered free (99.99%) of particulate and biological matter before being returned to the laboratory environment as exhaust air.

Each cabinet shall be prominently, legibly and indelibly marked with the following:

- Biological Safety Cabinet Class I – Personnel Protection against ordinary and special health hazards.
- Do Not Use Flammable, Explosive and Highly volatile Liquids in this Cabinet.
- Biological Hazard Symbol.

Down flow Cabinet - Class II Biosafety Cabinet:

The class II biosafety cabinet provides and maintains a work zone free of airborne particulate and biological contamination and also provides a protective barrier between

the product and the operator. This cabinet performs two vital functions at the same time and can be viewed as a combination of a laminar flow cabinet and a class I biosafety cabinet.

This clean work zone is achieved by HEPA filtered air moving in a downward laminar flow at a constant and uniform velocity. 70-75% of this air is re circulated whilst 25-30% is exhausted into the laboratory environment. An air barrier between the work zone and the environment is created across the full width of the opening by induction of air into the sump through the forward section of the grille.

This cabinet has two distinct air movements. They require blending at velocities that do not interfere with each other. The barrier air blends with the re circulated laminar flow air and is then HEPA filtered. There are several causes of disruption to performance affecting class II cabinets in particular:

- The use of bunsen burners. At low flame the disruption to laminar flow is considerable. At high flame great volumes of air can be expelled from the front of the cabinet because hot up-flowing currents interact with the down-flowing air. Therefore use micro-incinerators or preferable electric incinerators.
- Strong air currents discharged from air conditioners or ventilation systems can disturb the barrier air flow of class II cabinets in particular.
- The passage of people near the front of a cabinet again causes disruption particularly to class II cabinets. The air barrier of this cabinet can be destroyed and a suction created at the front opening, causing air to be drawn out of the cabinet.

Each cabinet shall be prominently, legibly and indelibly marked with the following:

- Biological Safety Cabinet Class II – Personnel Protection against Ordinary and Special Health Hazards.
- Do Not Use Flammable, Explosive and Highly Volatile Liquids or Cytotoxic Drugs in this Cabinet.
- The appropriate Biological Hazard Symbol.

Down flow Cabinet - Class III Biosafety Cabinet:

This is totally enclosed and maintained at negative pressure. The air is HEPA filtered before entering and after leaving the cabinet. Access to the work area is through gloves, therefore this cabinet provides a physical barrier between its contents and the laboratory environment. A flexible film isolator can also be used as an alternative to a class III biosafety cabinet. Operator sensitivity is decreased by the use of gloves and they are usually used for extremely hazardous material only.