

# Information concerning suction hoods

## General information about contaminants in the air of laboratories :

The presence of contaminants due to daily handling of chemicals and solvents requires laboratories to adopt the following measures in order to maintain a healthy work environment:

- Suction at the source
- Sufficient renewal of the lab ambient air
- Storage of chemicals, solvents and chemical waste in ventilated cabinets or spaces
- Fresh air circulation is supposed to follow the direction: **hallway → office → laboratory**

Two complementary approaches are to be considered in relation to the maintenance of air quality in the laboratory: general ventilation (of premises and buildings) and ventilation at the source (suction hoods). This paper focuses on this second approach.

## Use of laboratory hoods :



The use of laboratory hoods (also sometimes called "sorbonnes" or "chapelles" in French) is the most effective technical measure to prevent exposure to chemicals.

The use of laboratory hoods is recommended as much as possible for the handling of any volatile chemical product, gas, aerosol, particles and suspended solids. It is **MANDATORY** for any chemical dangerous product, consult the H hazard statements!

The principle of a suction hood is to capture the contaminants at the source before their diffusion in the ambient air of the lab :

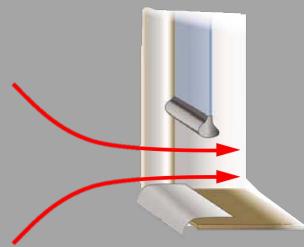
- To avoid the contamination of the air environment of the laboratory
- To avoid the potential accumulation of flammable vapors



Laboratory hoods must conform to the European standard EN 14175. In addition, they must meet the following criteria :

- Pollutants cannot be allowed to enter the laboratory from the hood, i.e. it must have a capacity of retention of pollutants.
- Harmful substances must be eliminated effectively, in order to avoid creating a dangerous atmosphere in the hood, i.e. provide an effective air renewal.
- The user must be protected against projections and corpuscles by a front glass.
- The speed of frontal air flow (known as face velocity) must be greater than 0.5 m/s for a glass of 50 cm height (as the height of the window affects face velocity)

## EN 14175



One of the most important components of lab hoods is the guillotine (i.e. adjustable front glass). The lower the guillotine, the better is the level of protection of the operator. The safety open position of the glass (guaranteeing optimum ventilation) must be indicated on the hood :

- Completely open hood: access for the set-up of the equipment or products. Insufficient suction speed
- Partially opened hood, on the safety position: handling of chemicals or materials when an experiment or an operation is in progress. Correct suction speed
- Lowered hood: process or operation. Optimal suction speed. Optimal protection of laboratory personnel.

The guillotine representing the barrier between contaminated and non-contaminated air, never put the head in a suction hood (except in the case of cleaning and equipped with respiratory protection).

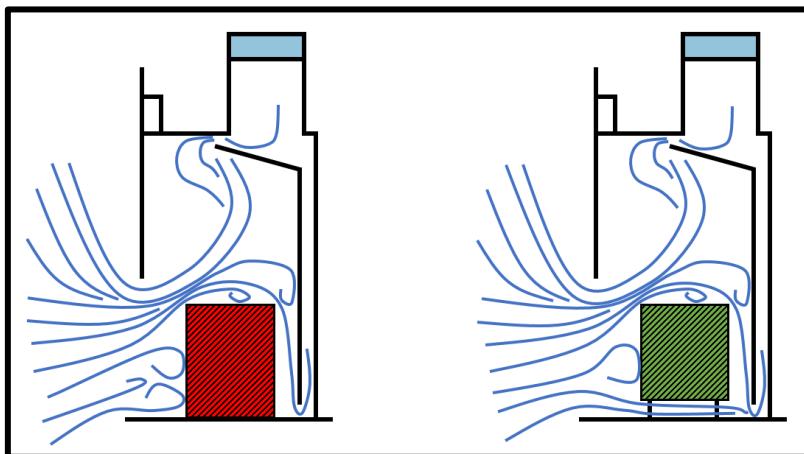


Wearing a visor is necessary in case of danger of explosion.

Ensure to reduce as much as possible sources of disturbance: during the operation, avoid opening and closing the guillotine, the passage of people, fans, as well as sudden movements of objects (inside and outside the hood). Indeed, disturbances can reduce greatly the effectiveness of suction hoods and their retention capacity.



Preferably, use equipment with support, for minimum disruption of the continuous flow.



In principle, suction hoods should not be used for storage, but just for manipulations. Keep the opening of the hood free from clutter. Only keep the minimum of material in the hood. Some hoods have a specific ventilated cabinet allowing the storage of chemicals.

Handled chemicals and devices must be at least 15 cm behind the front opening. This precaution avoids the leakage of chemical out of the hood. A marking on the worktop (preferably avoiding tape) can be useful.

Cluttering the hood with stored chemicals or equipment reduces ventilation effectiveness. Do not use a hood for large equipment, unless the guillotine is appropriate, because large equipment may change the air flow and the effectiveness of the hood. It is best to install a ventilation especially designed for large equipment.

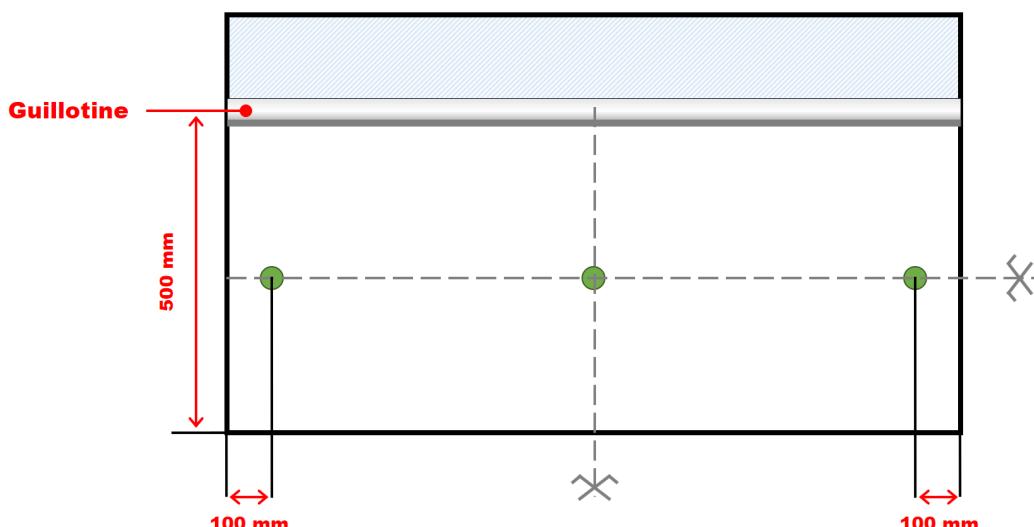
Do not place electrical outlets or other sources of ignition under the hood if flammable products are present. It is, in this case, best to connect electrical devices outside the hood to avoid sparks which may cause flames or a chemical explosion.

After use, the hood (including its worktop and its windows) should be cleaned in a way which preserves its protective properties. Note: Biosafety cabinets (BSC, see below) may require specific maintenance procedures.

## MAINTENANCE AND CHECKS :

Hoods must be subject to annual specific checks. Also, it may be useful to assess the hood's ventilation flow, for example when commissioned or revised by an engineer. This check, based on the European standard EN 14175, has the aim to verify the maintenance of the performance of hoods through time and in real working conditions. It consists in the measurement of air face velocity and can be completed by the visualization of air flow in the hood.

The measurements must be carried out using an anemometer placed in three places, halfway up the opening of the guillotine (ideally 500 mm, or maximum aperture if the hood does not open as much), at the interface of the hood: 100 mm from both ends and in the middle of the hood. Each measurement corresponds to an average over about 10 seconds.



The anemometer must be supported by a tripod. Tape markings can be useful.

**NOTE :** During measurement, it is important to take into account the conditions of the measurement: temperature, humidity, position of the hood, arrangement of the room, etc.

The inner condition of the hood also needs to be taken into account. If the cluttering of the hood is considered as being detrimental to its efficiency, a second measurement must be carried out after reducing the hood's cluttering. However, it is important that the situation be representative of normal working conditions.

To ensure effective protection of users, the SSTE Group of UniSEP Service recommends :

- **Minimum face velocity of 0.3 m/s** at any point for a guillotine opening of 500mm
- **Ideal face velocity of 0.4 m/s** at any point for a guillotine opening of 500mm

## VISUALIZATION OF AIRFLOW IN THE HOOD :

It is possible to assess the air flow in a qualitative way by visualizing the movement of smoke within the hood, by placing a smoke-producing agent at its interface. The smoke-producing agent must be turned toward the ceiling.



## Biosafety cabinets (BSC) :

Microbiological safety cabinets (BSC, also known as biological safety cabinets) are ventilated enclosures designed to create a sterile environment to protect the operator, lab cultures as well as the environment from biological pathogens. Such cabinets do so through ventilation, which prevents the release of pathogens toward the operator and through a very high efficiency air filtration system (HEPA filter, from "High Efficiency Particulate Air").



BSCs are usually equipped with a germicidal effect UV lamp to sterilize the worktop and its contents when not in use.

**Do not use the BSC when the UV lamp is on !**

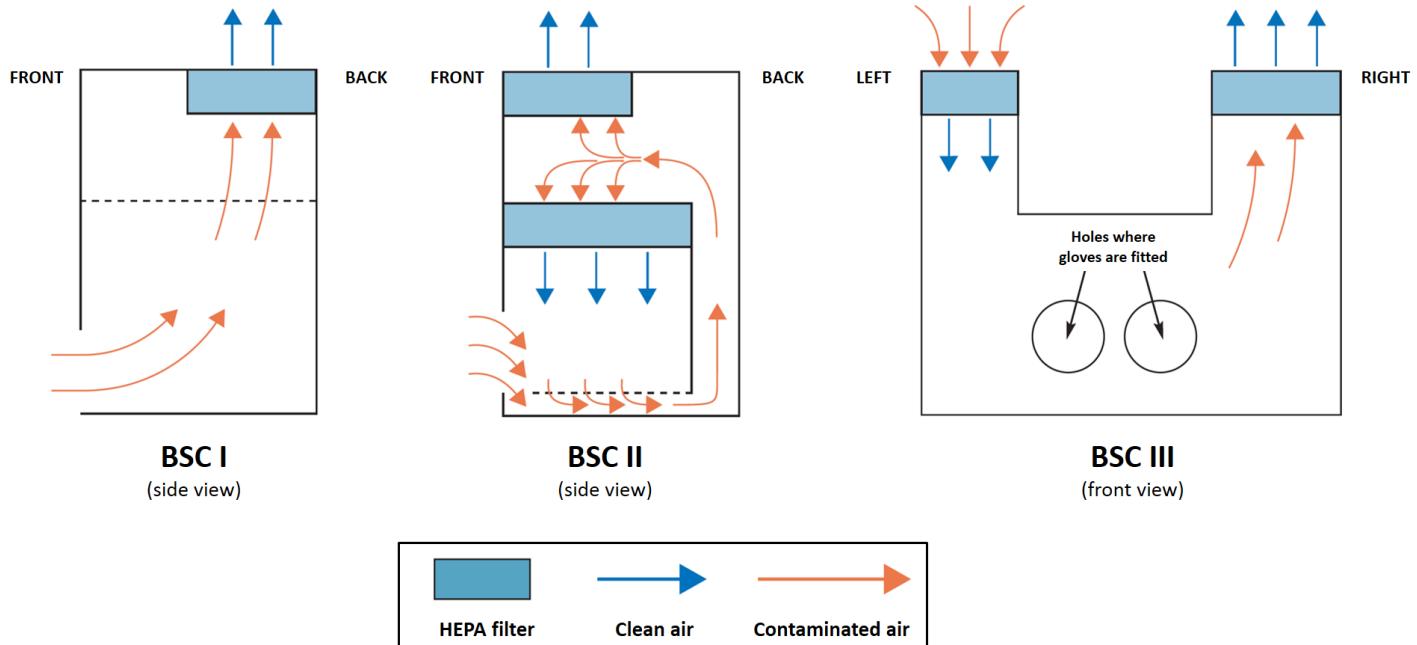
Biosafety cabinets are not suitable for the use of chemicals, as they do not capture vapors.

BSCs meet the EN 12469 standard, which defines three types of BSCs based on the technical means implemented and the protection levels achieved: BSC I, II and III. BSCs I and II have a fixed front opening, whereas BSC III does not have a direct opening toward the lab but two flexible sheaths complete with gloves.

**BSC I** : The laboratory air is suctioned, crosses the working space and is extracted after filtration. The protection of handled products is not ensured

**BSC II** : The working space is ventilated by a one-way downward flow (improperly called "laminar") of filtered air. The worktop may or may not be perforated (if this is not the case, two grids of aspiration are present: at the front and at the back of the working space).

**BSC III** : Absence of direct opening ensuring the protection of the operator and of the product against the pollutants present in the laboratory. Cross-contamination of the product is possible because the flow of air in the working space is not unidirectional.



Other filters, ULPA filters (Ultra Low Penetration Air), also exist and offer a higher degree of air filtration. These filters are reserved for the most demanding applications.

## Sources and links for more information :

### INRS DOCUMENTS :

« Postes de sécurité microbiologique. Postes de sécurité cytotoxique. Choix et utilisation » (in French, ref. ND 2201)

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