



Smokes extraction principle

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Smokes extraction principle

Extraction for building

- Unlike an open air fire where smoke and heat are freely diffused into the atmosphere, with a fire in a building, smoke and heat remain confined inside the premises.
- Smoke extraction consists in evacuating part of the smoke produced by the fire by creating a height of free air under the layer of smoke.
- The goal is :
 - To facilitate the evacuation of the occupants
 - To limit the spread of fire
 - To allow firefighters access to the premises.
- The evacuation of hot fumes also helps to limit the increase in temperature inside the premises and to avoid a generalised flashover. The risk to the building is reduced by limiting the temperature increase.

●●● Smokes extraction principle

Principle

- The evacuation of smoke from the premises and circulation is carried out by:
 - natural smoke extraction
 - mechanical smoke extraction
 - protection from smoke (overpressure – stairs areas for ex.)

- Regardless of the technical solution chosen, smoke extraction always consists of sweeping the space to be evacuated by an air stream. This means a smoke exhaust on one side and a fresh air supply on the other.

- For France, technical instruction No 246 of 22 March 2004 makes it possible to dimension the smoke extraction system (surfaces, flow rates, etc.), the NF S 61-93x series standards make it possible to determine the materials to be used.

- Depending on the building category and the area configuration smokes extraction systems are mandatory.

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Extraction

- Because of their low density, hot fumes tend to rise, salvation is found in most cases close to the ground, where temperatures are lowest and air is least toxic and richest in oxygen.

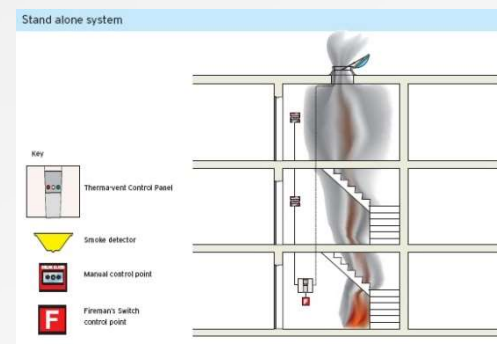
- The evacuation of smoke will therefore always be ensured in the upper part of the room or circulation by :
 - front sashes
 - vents (on the roof)
 - ducts (connected to ducts).

- To prevent the spread of fire to third party buildings, every provision shall be made to ensure that the outlet from the outlets or exhaust ducts is at a sufficient distance from the third parties.

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Natural extraction

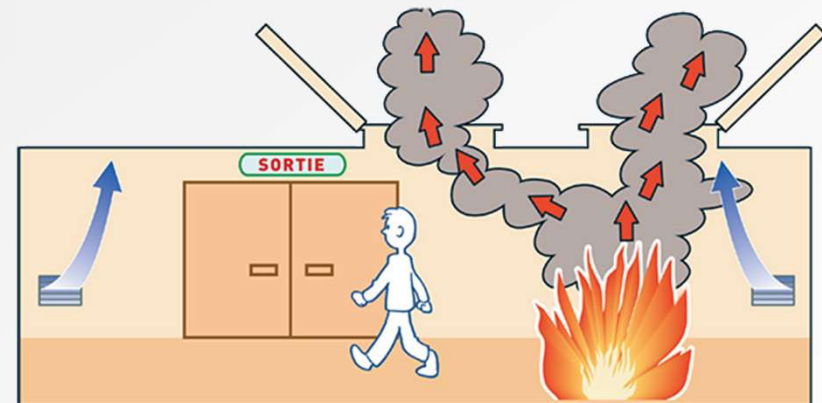
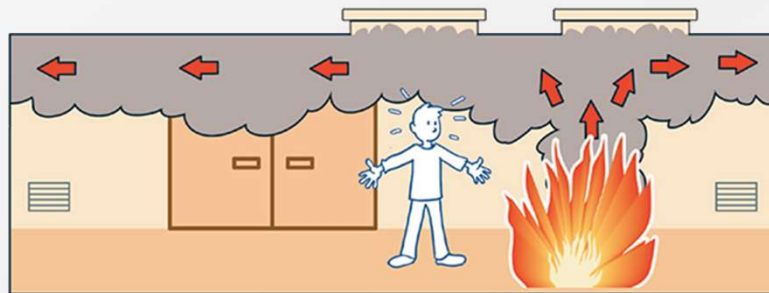
- From thermal draft, it is a question of evacuating the fumes outside by natural thermal draft (chimney effect), either directly by vents or openings in facade, or via ducts.
- The volumes to be smoked must remain reasonable, the first of the constraints is therefore to create zones or compartments likely to contain the smoke before the evacuation to avoid their propagation.
- This compartmentalisation is achieved by vertical screens (or partition screens) located in the upper part of the premises directly under the roof or ceiling.



Smokes extraction principle

Natural extraction

- The useful opening area of the smoke vents depends on the surface area of the fire, which depends on the type of operation, the height of the room, and the thickness of the smoke layer (E_f) determined by the height of the vertical screens.
- The effectiveness of natural smoke extraction is also conditioned by the surface area and the placement of the fresh air supply in the lower part of the building.



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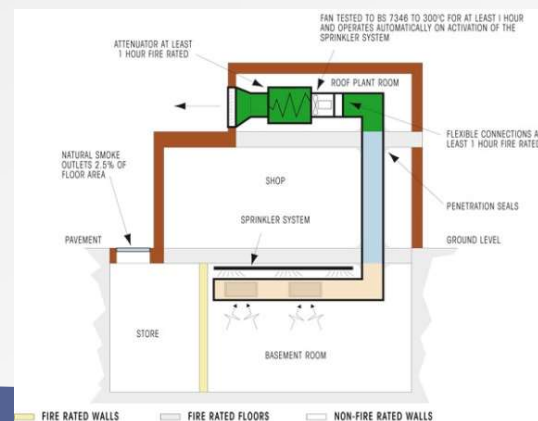
Mechanical extraction

- Mechanical smoke extraction generally concerns stairs, horizontal corridors or corridors and rooms accessible to the public.
- Mechanical draft smoke extraction is a process that includes at least one mechanical element. Either the air is supplied by fans, or the fumes are evacuated by a mechanical extractor which draws them towards the outside, or both are combined.
- Mechanical smoke extraction is carried out by mechanical smoke extraction and natural or mechanical air supply arranged in such a way as to ensure a sweeping of the volume concerned; this sweeping may be supplemented by a relative overpressure of the spaces to be protected from the smoke.
- The extraction of the fumes is carried out by vents connected to an exhaust fan ; the mechanical air supply is carried out by vents connected to a blower fan.

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Mechanical extraction

- To extract smoke in accordance with IT 246, the products involved in smoke extraction must be sized correctly. Smoke dampers must be adapted to the width of the corridor and the dimensions of the duct on which they are installed.
- The air supply ports must be dimensioned very precisely so as not to disturb the extraction flow rates.
- Finally, the smoke extraction fan must be selected taking into account the hydraulic pressure losses of the smoke extraction duct network.





Smokes extraction principle

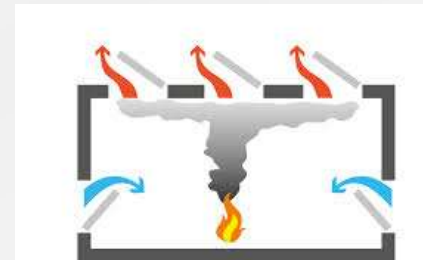
Fresh air supply

- Outdoor fresh air intakes must be located in an area that is not likely to be smoked.
- In order not to destratify the smoke, the fresh air must always enter the lower part of the room or circulation to be desmoked.
- In the same room or traffic to be smoked, never mix natural and mechanical air supplies, preferential flows could be created that would make smoke extraction totally ineffective.

Smokes extraction principle

Fresh air supply

- Natural air supply : The fresh air enters by the depression created by the evacuation of smoke, it is a question of:
 - sashes on the front;
 - doors of rooms to be cleared of smoke giving on the outside or on largely ventilated volumes
 - stairs that are not enclosed
 - mouths.



- Mechanical air supply : Fresh air is blown through mouths.
 - The blowing speed must be limited (≤ 5 m/s) in order not to destratify the fumes.
 - The mechanical air supply flow rate must always remain lower than the extraction flow rate (in France, technical instruction No 246 of 22 March 2004 states that an air supply rate of about 0.6 times the extracted flow rate must be respected), in order to avoid putting the affected room under overpressure compared to the rest of the building (risk of smoke migration).

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Fumes protection

- This method is only authorised for stairs, and exceptionally for horizontal traffic or secure waiting areas, when natural smoke extraction cannot be ensured.
- It consists in blowing in the volume to protect and creating an overpressure. In order for the overpressure to be sufficient but for the doors opening to the volume to remain easily open, the overpressure must be between 20 Pa and 80 Pa.
- In addition, for stairs, the air flow rate must be adjusted to ensure a passage speed of more than 0.5 m/s through the open access door of the damaged level, with the other doors closed.
- It is not exactly smoke extraction since there is no smoke extraction, overpressure prevents smoke from entering, all adjacent rooms must then be smoke extracted.

Smokes extraction principle

Smoke extraction control

- Regardless of how the system operates, it must always be possible to manually activate smoke extraction.
- Depending on the type of work, the safety regulations may require automatic detection to trigger the system.

