Contamination Control
The Invisible Walls

PRESSURE CASCADES AND AIR FILTRATION

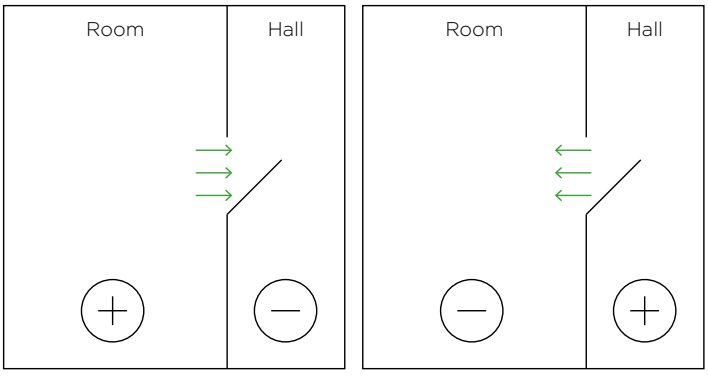
The term “invisible walls” does sound somewhat strange when speaking in the context of air filtration, but when taking a closer look, it all comes down to a simple principle: creating air pressure cascades.

But what are pressure cascades and what are they used for?

There are two different options for pressure cascades depending on the use case. You can keep a room under either positive or negative pressure in comparison to its surrounding environment, e.g. a hallway. Logically, air always moves from higher pressure areas to lower pressure areas.

NEGATIVE PRESSURE

Negative pressure is created and maintained by removing more air from a closed system than is allowed to enter by the use of a ventilation system.



Positive Room Pressure Negative Room Pressure

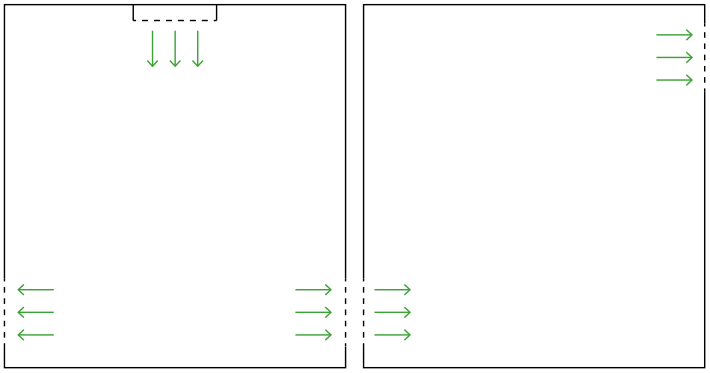
This closed system should be as airtight as possible, except for a small gap of about 1.2 centimeters through which air is allowed to enter. In order to maintain the desired pressure levels, it is crucial to ensure there are no unwanted or uncontrollable leakages.

Two of the most common use cases of negative pressure rooms are isolation rooms in healthcare facilities, or rooms in life science facilities for research and development on infectious diseases or hazardous compounds.

The ultimate goal is to prevent the infection of unprotected people outside of this room. This is achieved by preventing the spread of any airborne contaminants by passing the contagious air through a HEPA filter before exhausting to the outside environment.

POSITIVE PRESSURE

If the pressure within a system is higher than the pressure of its surrounding environment, one can speak of a positive pressure room. If there was any leak in this positive pressure cleanroom, the air would leak to the outside.



Positive Room Pressure Positive Room Pressure

Positive pressure cleanrooms are primarily used for applications where the inside of the room needs to stay clean to ensure that products remain uncontaminated by less clean air – contaminated with particles, airborne molecular contaminants or microbial-carrying particles. A leakage from these rooms does not pose a danger to the outside environment. But it would impact the ability to maintain the needed pressure levels to prevent contaminants from entering the cleanroom.

The micro-electronics industry and food-processing applications are prominent use cases for positive pressure rooms.

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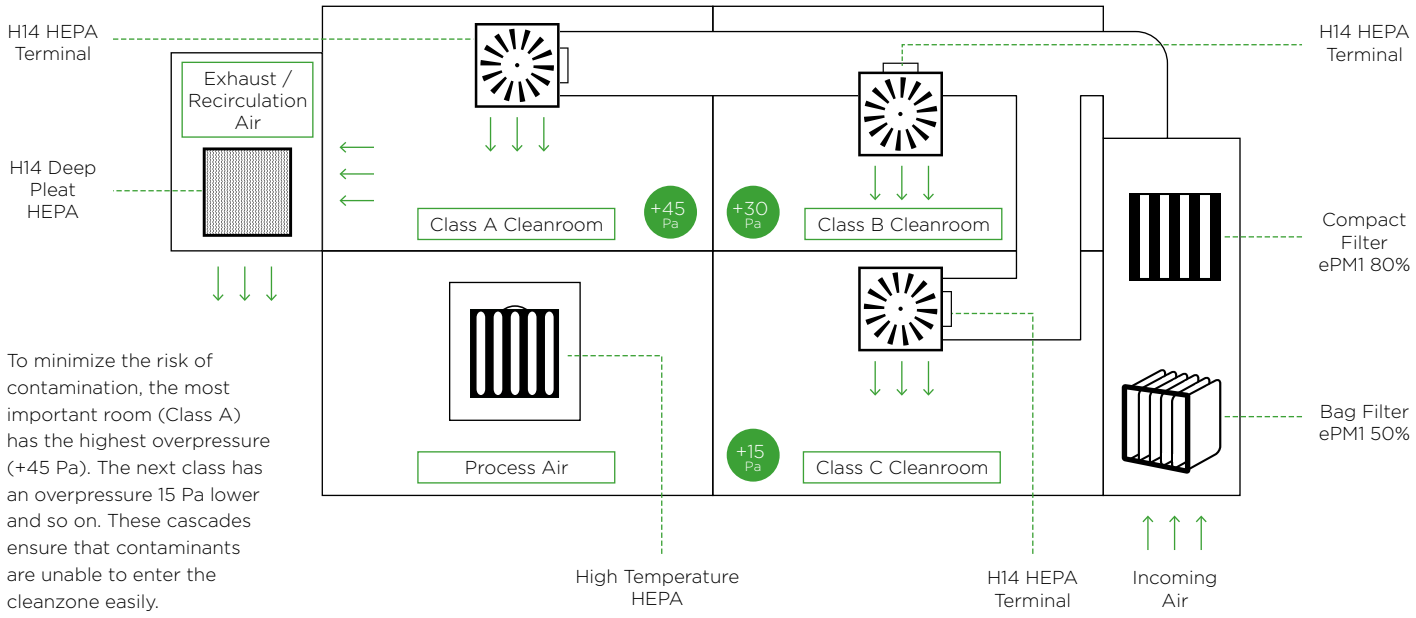
CHOOSING THE RIGHT FILTERS IS KEY

When looking at negative pressure rooms, the exhaust air should always be filtered through HEPA filters before being released outside. It should not be recirculated unless it has passed a HEPA filter stage before being returned to the inside environment.

In hazardous applications (such as the nuclear industry and virus research) return or exhausted air is filtered through safe-change filter housings.

These special filter housings comprise prefilters and HEPA filters which are only changeable within a safe-bagging system. This ensures that hazardous contaminants remain in the filter media and are not accidently released into the surrounding air during filter change.

Whether the system delivers single pass or recirculation of the air depends on local regulations, and the decision of the authority or department responsible for health and safety.



To minimize the risk of contamination, the most important room (Class A) has the highest overpressure (+45 Pa). The next class has an overpressure 15 Pa lower and so on. These cascades ensure that contaminants are unable to enter the cleanzone easily.

We are well-established experts for cleanroom technology. Our experienced engineers support all relevant disciplines of contamination control in the World's most sophisticated industries, including micro electronics, pharmaceutical, food and beverage, and nuclear industries. Get in touch with your local MANN+HUMMEL representative or just drop us an email at: covid-19@mann-hummel.com

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covid-19@mann-hummel.com
airfiltration.mann-hummel.com