# Dortek Guide:
## Specifying Hermetic Doors


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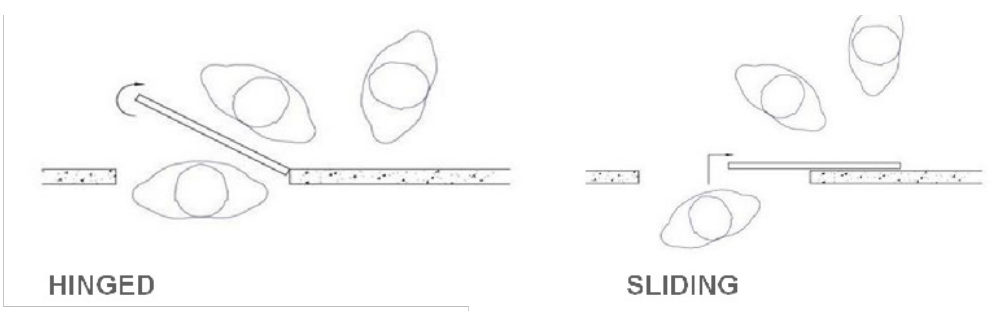
# Hermetic Doors: Cleanrooms and Operating Theatres

**Within Cleanrooms and Operating Theatres, it is the function of the HVAC and overpressure to provide protection against the infiltration of contaminated air. A pressure differential should be maintained between adjacent zones or rooms, with the cleanest rooms operating at the highest pressure within the facility.**

Interior surfaces of a Cleanroom and Operating Theatre (walls, floors, ceilings and doors) should be smooth, free from cracks and open joints, should not shed particulate matter and should permit easy and effective cleaning and, if necessary, disinfection.

The amount of air introduced into a cleanroom is tightly controlled, so is the amount of air that is taken out. Generally, cleanroom pressurisation is achieved by taking out slightly less air than is put in. A minimum of 5pa overpressure between clean zones is required. The extra air then leaks out under the door or through the tiny crevices or gaps that are inevitably in any cleanroom. Pressure can be increased in a room by increasing the volume entering the room or reducing the leakage amount. An air change rate of 10-25 per hour is common for a large, low density Class 100,000 cleanroom. Class 10,000 cleanrooms typically require 40-60 air changes per hour. The cost of air control in a cleanroom can be comparatively high.

The energy requirement of HVAC systems usually amounts to 50-75% of electricity consumption in a clean production space, due to the high airflow rates needed for particular ISO classes. However, when a door is opened, a significant exchange of air (with that of the outside air) will take place.This can affect the cleanliness of air within the room until such time that the HVAC can recirculate and clean the air again.




Entry should be through doors that are interlocked as an airlock in a cleanroom, or an anteroom in an operating theatre. This is to maintain cleanroom pressure differentials and to minimise human, process and product contact with contaminated air from particles, microbial agents or chemicals. Ideally, sealing rooms with differing pressures (with their fast door opening action) will increase cost efficiency, reducing air loss and keeping the filter load low. It is important that a cleanroom door, particularly if automated, has an opening and closing speed that can be easily configured.

All personnel doors and swinging equipment doors should include self-closing mechanisms. Manual and automatic sliding doors may be useful when space is an issue or to facilitate movement between spaces of similar cleanliness class for personnel whose hands are otherwise engaged. As the mechanism of such doors can generate particulate, a design specifically intended for cleanroom applications should be selected. It is important that automated doors have on board safety sensors for both door, personnel and traffic safety protection.

# It is very important that a door can cope with **high air pressure differentials.**

As cleanrooms operate at an elevated pressure, there is often a concerted effort made to make sure the room seals as tightly as possible. There can be difficulties with getting the facility properly pressure balanced at commissioning stage, as well as over the long term to try to keep it within the original specification. A reasonable amount of airflow under a door will make the pressures more static, will reduce stress on the facility as doors are opened and closed, and will keep it within specification for longer. This has to be balanced, of course, with minimising the cross-contamination risk and making sure that there is not too much loss of the conditioned air that is expensively produced.

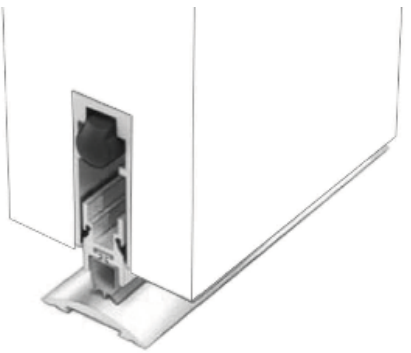
It is very important that a door can cope with high air pressure differentials, but it is not necessarily a requirement for the doors to be fully air tight unless the cleanroom or air pressure differential is designed to that requirement. However, it is important that a door preforms consistently over hundreds and thousands of opening and closing cycles. If the door seals wear quickly, due to continuous friction with the frame and floor, air leakage will quickly become both excessive and costly.

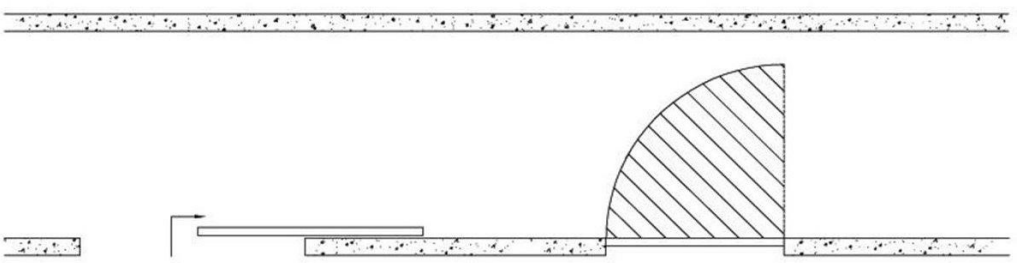
Emergency exit doors should incorporate crash-bar mechanisms, or a similar emergency opening mechanism, with alarms for exit only. Emergency exit doors must be locked to exclude entry from the outside yet permit exiting from within.

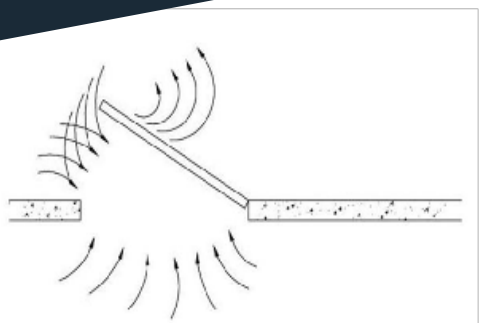
All doors should essentially include air-tight seals. Neoprene seals are generally acceptable. Brush-type door seals are not recommended. Foam rubber doors seals are also not recommended as these have been found to quickly deteriorate and shed particles. Cleanrooms or theatres that have hermetic sliding doors can give consistent sealing and air leakage control over long periods. This can be done with sliding doors that have special indentations in the track, using the door's own weight to seal perfectly against the frame and floor. Also, sliding doors containing tough neoprene-type gasket seals perfectly against a level floor, without the need for a raised threshold.

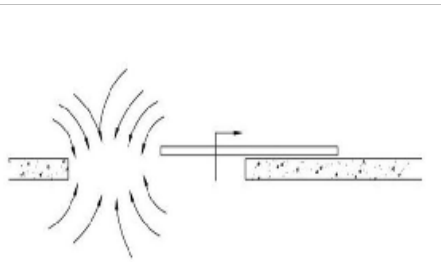
Sliding doors are sometimes a better alternative to hinged doors in cleanrooms or operating theatres, as they have lower space requirements. As floor space is very valuable and turning circles can be tight, sliding doors providing a better option against the potential impact through the movement of pallet trucks, IBCs or operating theatre beds.

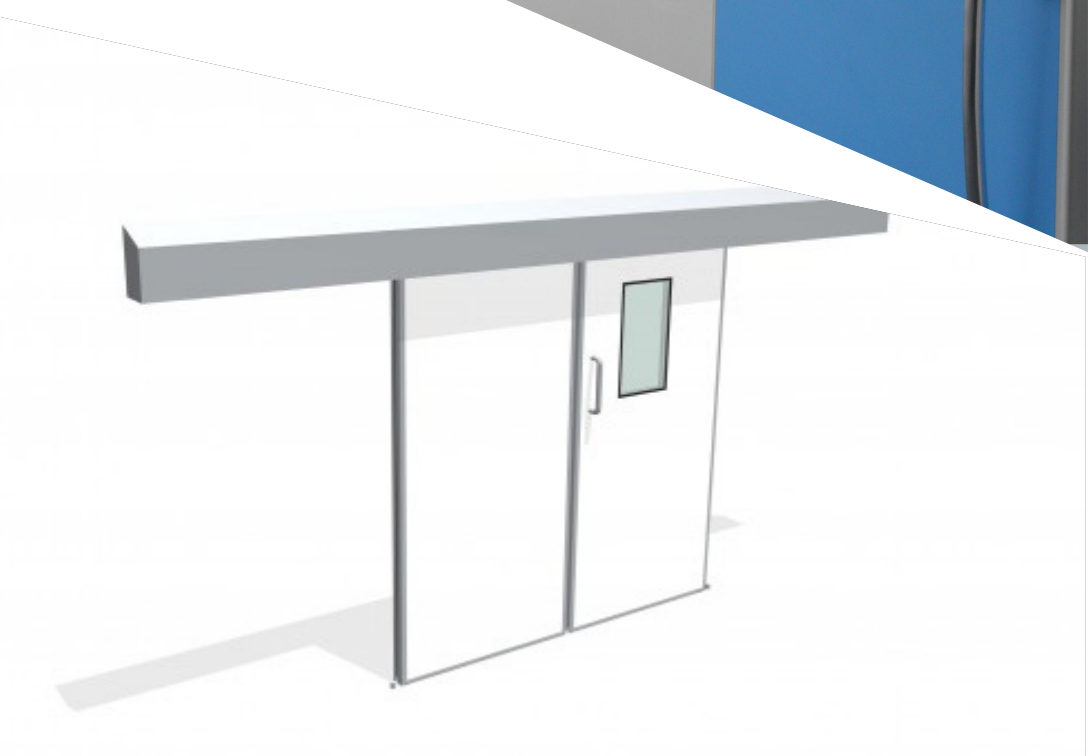
Hinged doors used in cleanrooms should have a mechanical retractable bottom seal that will drop down when the door is in the closed positon. It is not advisable that doors have face-fixed seals as they brush the ground while opening and closing, collecting dirt and bacteria under the door, which can be difficult to clean.











Depending on the opening speed of the door, the manual opening of a hinged door can create an amount of high air turbulence which can cause uncontrolled air exchange between adjacent rooms of different cleanroom zones. In order to enable smooth and steady closing, cleanroom doors can be equipped with drives for automatic opening by sensors or by manual control units such as door closers. The suitability of the drive for use in a clean room should be proven. The safety requirements of the European product standard EN 160053241 must be complied with. Thresholds or stop rails on the floor are not recommended.

In order to ensure that doors can meet the proper testing, it is vital to ensure that they have been tested to BS EN 1026:2000 to give the proper performance under high pressure differentials. Similarly, there may also be requirements for hermetic doors to meet that country's fire certification regulation so testing certificates are crucial. Also, within Hybrid Operating Theatres, it may be a requirement for the hermetic doors to provide adequate lead lining protection for X Ray. Interior surfaces (walls, floors, ceilings and doors) should be smooth, free from cracks and open joints, should not shed particulate matter and should permit easy and effective cleaning and, if necessary, disinfection.

Hygiene, secure sealing, minimising pressure drops, protecting against contaminants and drafts, reducing energy costs, improving user safety and ease of cleaning; these are just some of the key issues that Dortek Hermetically Sealing Doors address.

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