"MEDICAL ISOLATION/QUARANTINE ROOMS"

Hybrid Solution

The challenge

An airborne infectious isolation or quarantine rooms are a type of isolation room that isolates patients infected with organisms that can spread via small airborne droplets or for an quarantine room, protect the vulnerable (chemotherapy, bone-marrow transplanted) patient to outside danger.

These isolation/quarantine rooms are designed according to defined requirements. Unfortunately, these rooms are rather expensive and only a few days per week used. The technical installation behind the existing concepts is based on air handling by means of HEPA filtrations, which demands that the system is always running – even without any patients. Of course, this is not ideal looking at sustainability and life cycle costs. Hospitals for these reasons have often only a few central based isolation/quarantine rooms available and patients have to be transferred to these special departments in case of need.

The existing concept

The concept is based on creating an underpressure (isolation) or overpressure (quarantine) in the room, and having the air taken out from ((isolation)) or brought into the room (quarantine) filtered by an HEPA filter based air handling system. Next to the type of filtration, requirements for minimal amount of air suppy, pressure differences and air tightness are also defined. But the advantages are also rather clear:

- Isolation and quarantine rooms are different concepts and fysically different rooms.
- The systems have to be running at minimal 30-50% of capacity, even without occupied by patients to prevent clogging of the filters
- The filter replacement is a rather bio-hazardous job
- …….

Innovations are needed

Analysing the existing concepts, it becomes clear that the HEPA Filter is te limiting factor and the air concepts are rather basic. Let us analyse systematically the ideal concept needed, having safety, sustainability and comfort in mind.

Air hierarchy: Existing rooms are based on mixed ventilation - overhead air distribution models. But from operation theatres we know that displacement (downflow) models are much better in regard of infection control. Scientifical studies showed even much higher HADR (Hygienic Air Delivery Rate) for displacement air distribution models.

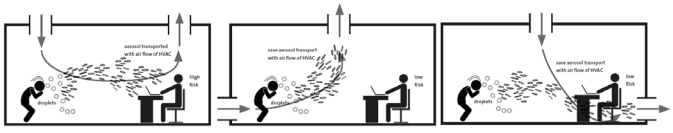


Fig. 1: Mixed ventilation, floor ventilation and displacement ventilation

For each space in an isolation room, the ideal air distribution model must be implemented. For the main room this is displacement, for the douche it is floor ventilation because of the steam rising. And the flow from the floor into the sluice should also be fitted accordingly.

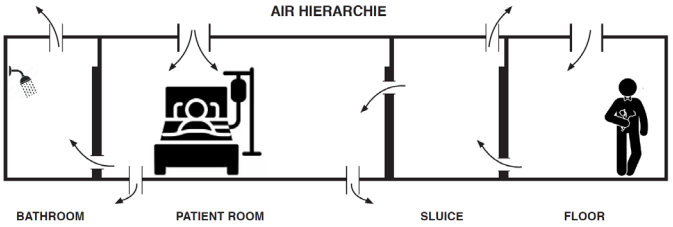


Fig. 2: Schematic profile for the air distribution model in case of an isolated (infected) patient.

Air capacities:

The air capacity required depends on the so-called Air Changes per Hour needed and these are often defined in official norms. Instead of the technical air fan capacity, the HADR value should be used for meeting the ACH required. For isolation/quarantine rooms often minimal 6 ACH is required.

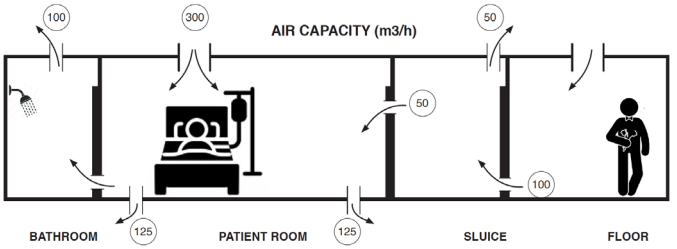


Fig. 3: the exact amounts of air (m3(h) per air inlet or outlet

Air quality:

Both HEPA Filters and UV-C are a serious option for treating the exhaust and contaminated air, Where the use UVC offers the basis for new ways because it has a lot of advantages, such as.

- Easy installation in existing and new systems
- Power on/off if needed which safes energy/money
- UV is biologically first choice to handle viruses
- Safe and harmless use and maintenance

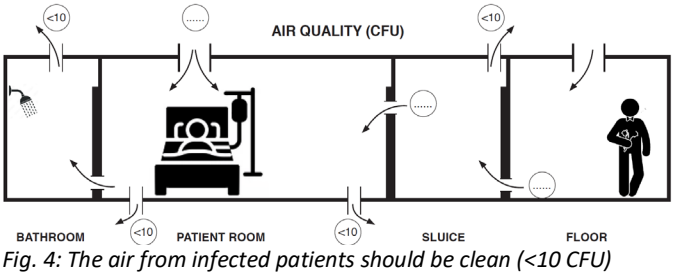


Fig. 4: The air from infected patients should be clean (<10 CFU)

Air Handling Installation:

Using the Virobuster Steritube as air disinfection unit comes with several advantages as mentioned above. One unit can handle up to 800 (for viruses), 600 (bacteria) and 300 m3/h (Fungi)

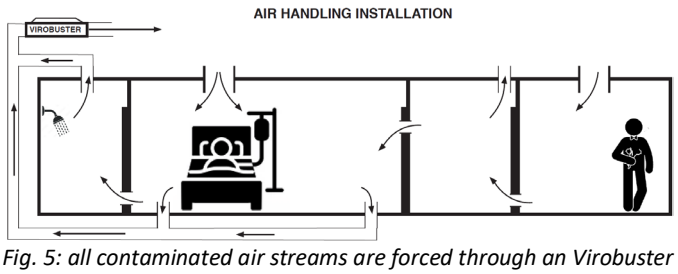


Fig. 5: all contaminated air streams are forced through an Virobuster Steritube.

Some Projects:

A German university clinic requested a new heart-catheter operation room, but space failing conditions prevented a classic HEPA based implementation. The Steritubes did fit exactly in the existing ducts and proofed after independent measurements to provide the same or even better air quality.

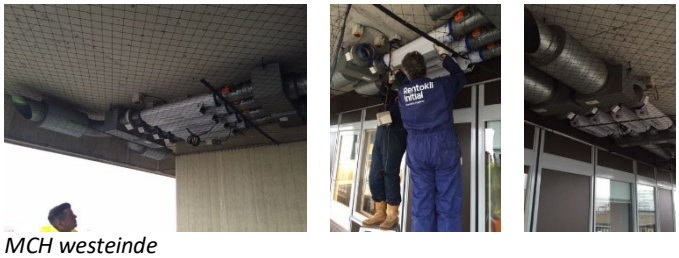
Uniklinik Dortmund

Several Dutch clinics were forced to implement some isolation rooms for incoming patients who had stayed in foreign hospitals (seek & destroy policy towards MRSA). With the Steritubes, the just changed on every department 2 patients' rooms into isolation rooms on-demand.

MC Alkmaar

Westfriesgasthuis Hoorn

MST Enschede

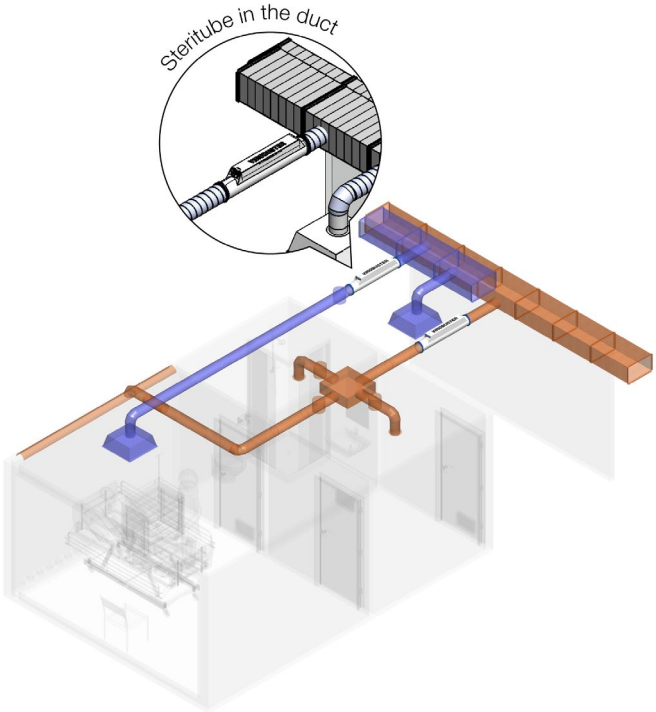


MCH westeinde

Retrofit in existing ducting

And much more

Easy and safe installation and maintenance possible



0f course, this concept of hybrid isolations rooms can also be executed for a quarantine room, where patients are vulnerable due to burn wounds, a chemotherapy or for example due to above marrow transplantation

Autor: Fahmi Yigit
VIROBUSTER® International GmbH
Köhlershohner Straße 60 • D-53578 Windhagen
Tel +49-2224-818 780 • info@virobuster.com •www.virobuster.com