
# HEPA FILTERS IN HOSPITALS

## HEPA Filters Pose System Operations Problems

For an immediate solution to providing protection against CBR (chemical, biological or radiological) terrorist attacks without renovating the building's air handling system, installing HEPA filters poses some operating problems.

While cost is an issue, more importantly, it is an HVAC system operating issue. The fans used to circulate air in a building are sized to operate within a given range of resistance. Resistance is caused by duct work, coils, diffusers etc. All of these factors are static, that is, the resistance remains constant at any given rate of flow. Filter resistance, however, increases as they load with dirt. HVAC systems are designed to accommodate the resistance of dirty filters up to a given level, typically, about 2.5" of water (Water Gauge) for a two stage filtration system (1.0" W.G. for the prefilters; 1.5" W.G. for the final filters.)

The biggest problem with installing HEPA filters is they operate at far higher resistance than the final filters (second stage) used in hospital HVAC systems. At normal air flow rates used in health care as well as other commercial buildings (commonly about 500 feet per minute), typical final filters have an initial (clean) resistance of from .30" W.G. to .70" W.G. Recommended final resistance is usually about 1.5" W.G. for these filters. HEPA filters, on the other hand, have an initial resistance of from 1.0" W.G. to 2.0" W.G. at 500 FPM.

The increase in resistance can have a serious affect on the operation of the air handling system by changing the engineered balance of the interior environment. Most notably the consequence is in the form degrading indoor air quality leading to sick building syndrome. There is also a significant increase in the energy cost of operating the HVAC system due to the increased level of resistance.

The second problem with installing HEPAs is leakage around the filters. The framing systems used in hospital facilities to support the filters are not designed to seal the filters to the same degree as HEPA filter framing systems. The very high efficiency of HEPA filters would be compromised by the lower integrity seal typically used in HVAC systems.

The third issue is the additional cost of HEPAs compared to the cost of the filters typically used in hospitals. Typical final filters range in cost from about $50 (bag filters) to $140 (high efficiency rigid filters). HEPA filters cost from $180 to $500. In addition, the HEPAs would have to be changed out more frequently due to their high resistance and shorter service life.

## Options

There are other high efficiency filters (although not as high as HEPA filters) that can be used within the operating parameters of health care facilities that will do a very good job of removing contaminants from the air. (See table below.)

| Rated Efficiency | Efficiency on One (1) Micron | Initial Resistance (In. W.G.) @ 500 FPM |
|---|---|---|
| HEPA | 99.99% | 1.0" - 2.0" W.G. |
| 95% DOP | 98% | .85" - 1.0" W.G. |
| 95% (ASHRAE) | 95% | .55" W.G. |
| 90-95% | 90% | .35" - .75" W.G. |
| 80-85% | 85% | .30" - .65" W.G |
| 60-65% | 50% | .25" - .45" W.G. |
| PowerGuard Pleated Filters | 55% | .30" - .40" W.G. |

For a longer term solution, the air handling system can be retrofitted to accommodate HEPAs, but a major renovation is required to re-engineer the system, including increasing the size of the fans and changing the framing system to a higher integrity seal.

## Other Preventative Measures

- Improve security to restrict access to the mechanical rooms.
- Install dampers or a shutoff system to shut down movement of air if a contaminant is detected or suspected.
- Operate the system to maintain a slight positive pressure in the building to minimize infiltration through doors, windows, vents, etc.
- Relocate ground level air intakes to above the first two floors to reduce access to the intakes.

(Refer to Airguard Technical Data Sheet, "*The Role of Air Filters in Protecting Building Environments from Airborne Chemical, Biological or Radiological (CBR) Attacks*" for more information.)