Ask the Experts

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Do you have a biosafety question and you're not sure whom to ask? Send your questions to the "Ask the Experts" column and I'll get them answered for you. Drawing from my own experience or that of other experts in the field, we'll try to compile a thorough and comprehensive answer to your question. Please e-mail your questions to jkeene@biohaztec.com or to the Editor, Ira F. Salkin, at irasalkin@aol.com.

Question:

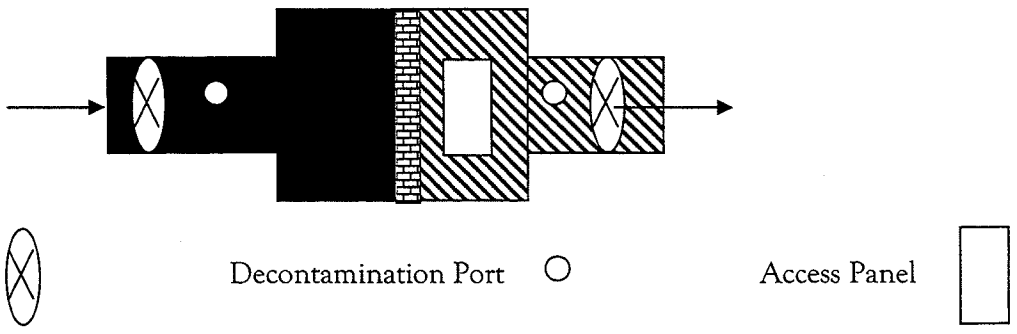
Are there special considerations necessary for installation and testing of HEPA filter housings in the exhaust stream of containment laboratories?

Answer:

This is a subject that is not covered in much detail in most books and articles on the design, construction, and validation of containment laboratories. The NIH Division of Engineering Services' "Design Policy and Guidelines" indicates that: HEPA filter housings "...when installed must be constructed in such a manner as to allow for appropriate particulate testing and must be capable of being isolated from the ventilation system for gas decontamination and testing" (U.S. Department of HHS, 1999).

The key to isolation of these units is the ability to insure that gas-tight dampers are installed on either side of the "sealed" HEPA filter housing. This also requires that the filter housings be appropriately constructed of welded stainless steel to insure containment of the decontaminating gas. Sealed housings and gas-tight dampers are necessary not only to eliminate the possibility of the release of potentially toxic decontamination gas, but also to insure that the volume of the space remains constant in order for the appropriate amount of decontaminant to be introduced into the space. These filter housings must also be equipped with ports on both the upstream and down-stream side of the filter in order to introduce the decontamination gas and the particulate material used for testing the filter (Figure 1.)

Figure 1



On the down-stream side of the filter, there should be an access panel that can be sealed with a gasket, but which can be opened to scan the filter.

Why would anyone put a HEPA filter in the exhaust line? The filter is obviously required for BSL-4 facilities and is optional for BSL-3 facilities. However, we are seeing more and more BSL-3 facilities having HEPA filtration of the exhaust as an extra precaution or as a response to public concern. In either instance the filter is in place to eliminate the possibility of the release of potentially hazardous biological particulates from the laboratory. Many filter certifiers may currently be testing the filter using the decontamination port on the down-stream side of the filter and taking a "grab" sample, because the design of the filter housing and the HVAC system does not allow for scanning the filter.

If the filter can be tested in this way, why would anyone recommend including an access port in the filter housing and scanning the filter? Basically, the answer to this question lies in the purpose, or perceived purpose, of HEPA filtration of the exhaust from containment laboratories: to eliminate accidental release of contaminants into the atmosphere. It is accepted practice to scan the HEPA filters of Biosafety cabinets, particularly the exhaust filters of Class II type A1 and A2 cabinets since they are designed to be exhausted safely to the laboratory atmosphere and there is a need to insure that no infectious particles are released into the laboratory. In addition, there is a requirement to scan the supply filters of clean rooms to insure that no particulates are introduced into the clean room from the supply system. In order to insure similar efficacy of the filters in the exhaust systems of containment laboratories, the "protective" HEPA filters must be tested for efficacy by scanning.

We also have to consider the legal liability that goes with installing such a filtration system and not testing it in a manner consistent with tests done on other HEPA filters used for essentially the same purpose. Failure to scan the filters could be a deciding factor when trying to defend a case of potential exposure, when the standard of the industry is to scan such filters. Such a failure may constitute negligence on the part of the laboratory owner.

The major problem occurs when architects and engineers fail to recognize the sensitive nature of containment design and understand the operation of the containment systems. It is the responsibility of the owner to insure that the arthitectural/ engineering firm understands the requirements and designs systems that can not only be operated efficiently, but also be tested to insure that the system is, in fact, fulfilling the requirements. Maintenance and validation of containment features are a necessary part of the safe operation of any containment facility.

Reference

U.S. Department of HHS, National Institutes of Health, Division of Engineering Services. (1999). Design policy and guidelines. http://des.od.nih.gov/eWeb/planning/pdf/labsecd.pdf.