

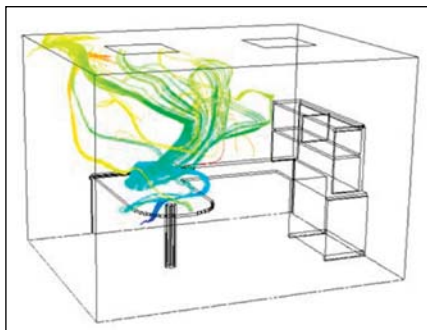
Building Retrofits for Increased Protection Against Airborne Chemical and Biological Releases

DCMD report and software evaluate retrofit technologies and strategies to protect buildings

A new report provides owners, managers, engineers, and other decision makers with information about various building retrofit options that will improve building protection against airborne hazards. The accompanying software provides economic analysis tools for selecting cost-effective approaches to mitigate these hazards. The report and software are the result of research conducted by the EPA National Homeland Security Research Center (NHSRC) and the National Institute for Standards and Technology (NIST). This research supports responsibilities assigned to EPA by the 2002 Presidential budget and by Homeland Security Presidential Directive 10, which addresses biodefense research and decontamination issues.

Research Addresses Building Owner Needs

The research addresses concerns of building owners, building managers, and other decision makers about potential airborne chemical and biological releases in or near buildings. When these professionals consider retrofitting buildings to provide protection against such events, they need to know the benefits



Dispersion of airborne contaminant in an office

of each technology and strategy in specific applications. Industry has been proposing retrofit technologies that have varying levels of effectiveness and costs, as well as varying degrees of applicability to particular buildings and ventilation systems.

The report describes each retrofit technology and strategy in detail, presenting relevant performance data and the level of protection that might be expected from the retrofit. Potential disadvantages and knowledge gaps for each technology are also presented. By using building airflow and contaminant dispersion modeling to compare a retrofitted building to one that was not retrofitted, researchers evaluated the potential of each option to protect building occupants from generic contaminant releases.

A case study (with preinstallation designs and cost estimates) evaluated specific retrofit options for two buildings. An economic analysis software tool, using life-cycle cost analysis techniques, was also developed. An appendix to the report describes how to use the software.

As part of USEPA's Office of Research and Development, the National Homeland Security Research Center (NHSRC) provides products and expertise to improve our nation's ability to respond to environmental contamination caused by terrorist attacks on our nation's water infrastructure, buildings and outdoor areas.

NHSRC conducts research related to

- Detecting and containing contamination from chemical, biological, and radiological agents
- Assessing and mitigating exposure to contamination
- Understanding the health effects of contamination
- Developing risk-based exposure advisories
- Decontaminating and disposing of contaminated materials.

Retrofit Technologies and Devices Evaluated

The retrofit options include stand-alone technologies as well as devices that are installed and implemented as purchased. Technologies include enhanced particle filtration, sorbent-based gaseous air cleaning, ultraviolet germicidal lamps, photocatalytic oxidative air cleaning, and work area air capture and filtration equipment.

The retrofit strategies include ventilation system recommissioning; building envelope tightening; building pressurization; relocation of outdoor air intakes; shelter-in-place planning; isolation of vulnerable spaces, such as lobbies; air handling system shutdown and purge cycles; and automated heating, ventilation, and air conditioning (HVAC) changes in response to contaminant sensing.

Conclusions

The following conclusions are presented in the report:

- For retrofits to provide the desired level of protection, the building HVAC system must be operating properly. A first step in retrofitting a building is to check airflow rates, system controls, filter fit and sealing, and maintenance procedures.
- The filtration and air cleaning retrofit options have the advantage of always being operational. These technologies do not rely on an advanced warning of a release with a human or automated response action.
- The report provides an established test method for selection of appropriate particulate matter filters. Gaseous air cleaning and other air-cleaning options do not yet have a standard test method.
- Many retrofit options require rapid operational decisions during a release in order to provide effective protection (for example, whether to shut down an air system or use the air system to purge the building and whether to send building occupants to a shelter-in-place zone or to evacuate).

To make retrofit choices for a particular building, it is necessary to assess the risks associated with the building and the building's vulnerabilities. The level of protection and associated costs can then be determined. Many release and building occupancy scenarios can be considered. Each building is unique, and detailed study is required to determine the level of protection desired and how best to achieve that level of protection in a cost-effective manner.

Follow this link to download the full report and the associated software:

http://cfpub.epa.gov/si/si_public_record_report.cfm?dirEntryId=161506

or visit the NIST Web site at <http://www2.bfrl.nist.gov/software/LCCchembio/index.htm>.

For more information on EPA's Homeland Security Research visit our website at www.epa.gov/nhsr

EPA Technical Contact: Jacky Rosati (919) 541-9429, rosati.jacky@epa.gov

EPA Communications Contact: Kathy Nickel (513) 569-7955, nickel.kathy@epa.gov

NIST Communications Contact: John Blair (301) 975-4261, john.blair@nist.gov