As seen in WASHINGTON BUSINESS JOURNAL

Volume 21, Number 50 washington.bizjournals.com April 11-17, 2003

When trouble's in the air, buildings must be prepared

In this time of frequent warnings about potential terrorist attacks and "orange alert status," many building managers have instituted plans to protect the facility, occupants and indoor environment from dirty bombs, biological or chemical agents and radioactive particulate.

Expert Opinion

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These plans, however, may be giving us a false sense of security.

The most obvious and direct path to the inside of a building is through the outside air intakes for the heating, ventilating and air conditioning (HVAC) system. A hazardous airborne substance can be introduced and distributed efficiently throughout the building by the very system that maintains a comfortable and healthy environment during normal conditions.

Most facility managers realize this and plan to shut down the HVAC system if hazardous airborne substances are detected near the building.

However, there are more subtle ways hazardous substances enter a building.

Biological, chemical and radioactive particulate is spread by air movement, and even energy-efficient buildings do not have airtight exterior envelopes.

There are many openings that allow air to flow into buildings. Gaps around exterior doors, loading docks, elevator shaft vents and other openings can admit airborne hazardous substances in sufficient quantities to contaminate the indoors.

In most buildings, the HVAC system maintains a slight positive pressure inside the building, which means the air leaking through these openings moves from the inside to the outside.

However, when the HVAC system is shut down, a pressure differential between the inside and outside — from wind or air convection currents within the building — draws outside air in through these openings. Unfortunately, few facilities have plans to protect against this type of contamination.

VENTING SOLUTIONS

You must do more than just shut down the HVAC system.

First, identify improvements to maximize the integrity of the exterior envelope.

All exterior doors (including inside doors on vestibules), loading-dock doors, roof doors and roll-up doors should be fitted with weather-tight seals, frames with gaskets and sweeps.

All HVAC openings in the exterior walls and roof should be fitted with high-quality, low-leakage automatic dampers that close tightly when the HVAC system is shut down.

Elevator-shaft vents should be equipped with low-leakage automatic dampers, and these dampers must be connected to the fire alarm system for control in a fire.

Finally, the glazing and mullion system should be thoroughly caulked and sealed. Note that these measures also improve the energy efficiency of the building and offer some annual energy-cost savings.

But remember, these adjustments only delay the contamination of the indoor environment.

To minimize the introduction of hazardous substances, the HVAC system must be modified to maintain an inside positive pressure with respect to the outside ambient pressure. The HVAC system should be retrofitted with specialty systems to filter the outside air required for pressurization.

Control strategies that shut down all building exhaust systems and close all dampers should be implemented.

These modifications, in conjunction with improvements to the exterior envelope, allow the HVAC system to pressurize the building with clean, filtered air.

Additional methods can further increase the safety of the occupants.

Airlock-style vestibules can be designed to control access to the building. Cameras can be installed to monitor mechanical spaces inside, on the roof and around the outside air intakes.

Security structures can be constructed at the intakes to prevent materials from being placed near or thrown into the intakes.

Access to the building's infrastructure systems can be strictly controlled through security escorts, and service contractor backgrounds can be scrutinized.

Unfortunately, implementing these strategies is neither easy nor inexpensive.

Designing and installing buildingwide or limited-area pressurization control systems is an engineering challenge. Even selecting filtration equipment requires an evaluation of the potential contaminants most likely to be encountered or which you determine are economically viable to filter.

NO AIRTIGHT GUARANTEE

The overall goal of these measures is to minimize the extent of contamination and to provide an environmentally controlled building or area in the building for the occupants until they can be evacuated safely. Even so, in the event of an attack, there is no guarantee all hazardous materials can be prevented from entering a building.

Because it is impossible to predict the location and severity of a terrorist attack, many building managers have difficulty justifying the expense for modifications. But these improvements should be viewed as another type of insurance.

Would you operate without fire insurance even though the potential for fire loss today is minimal? No.

Consider this: If your building became contaminated it could be days, weeks or months before it was suitable for occupancy. Can your business afford to close its facility and incur the considerable expense of abatement and cleaning?

You cannot design a system that will provide guaranteed protection from all potentially dangerous substances and situations, so why bother? Because the technology and knowledge is available to make safer buildings and we have a responsibility to provide safer environments for the people who live or work in our buildings.

Air movement can be managed and controlled both into a building and within a building. That means the paths used by hazardous substances to gain access to a building also can be managed and controlled.

That makes sense from a personnel safety viewpoint, and if there is an attack it makes sense economically when you consider the cost of losing the use of a building for an extended time as well as the costs to clean it up.

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