
PROTECTING BUILDINGS FROM BIO-TERRORISM

by Alan Barnes, Jr.

BIOLOGICAL ATTACKS ON BUILDINGS

Unlike an explosion or a tornado, a terrorist attack using biological weapons could be invisible and silent, and thus would be difficult to detect at first. As we learned with the recent postal anthrax attacks, the release of a biological agent might not have an immediate and visible impact because of the delay between exposure and onset of illness, or incubation period.

Spreading bio-terror through the mail caught most of us off-guard in October, and many of the existing precautions for biological attacks simply could not protect those exposed to germ warfare through a letter sent via the U.S. mail.

In the wake of the anthrax attacks, however, scores of building managers have begun to see the vulnerabilities in their own buildings, and have taken action. Simple protective measures include adding security guards, physical barriers, and video cameras to protect large ventilation intake ducts; in new buildings, air intakes are being placed high above the ground in protected areas, in an attempt to guard against a deadly agent from being dispersed directly into the ventilation system.

High-efficiency filtration has also been identified as a more expensive, longer-term solution for protecting against most biological agents. Of course, efficient filtering systems can't prevent all exposure from within a building—especially if the source of the germ is a simple letter. Still, filters can stop most powders from spreading through the rest of the building through the ventilation system.

ABOUT THE AUTHOR

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Dozens of specially selected buildings throughout the country have already been outfitted with elaborate ventilation and filtering systems, which provide significant protection against accidents or attacks; many experts believe this kind of protection will become more common in the future. These buildings include schools, hospitals, and jails that are located near chemical depots where accidental releases are a concern, and others are military installations that could be the target of attacks.

Many of the newer commercial and institutional buildings (less than 10 years old) already have in place a good foundation of high tech HVAC system infrastructure that can form the base of a more protective environment against bio-terrorism. These newer buildings are generally of tighter construction, allowing less outside air to infiltrate into the building. They are also, generally speaking, complying with recent ASHRAE (American Society of Heating, Refrigerating and Air-conditioning Engineers, Inc.) ventilation standards that allow for the appropriate amount of ventilation air to be introduced into the building, thereby reducing the risk of sick building syndrome. Another important piece of the high tech infrastructure that newer buildings often have in place is a direct digital control system that controls the operation of the HVAC system. Each of these newer building attributes can help complete the puzzle for providing maximum protection against bio-terrorism.

Some experts believe that the recent bio-terror attacks could push building owners who haven't met these recommended standards to retro-fit their buildings for safety, if not building code compliance.

TAKING ACTION

In the case of a biological attack to a building's ventilation system, initial responders include local, county, and city health officers, hospital staff, members of the outpatient medical community, and a wide range of response personnel in the public health system.

It is extremely important that building owners and managers have the necessary communications and information gathering infrastructure in place at their facility so that they are notified of a biological weapons release as early as possible. Once notified of a release, the building owner or manager could then implement emergency procedures developed for this situation.

The following potential safeguards can be implemented immediately. They range considerably in

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cost and in effectiveness. Therefore each building manager should make his or her own decision as to which measures to implement based on specific needs and circumstances.

PROACTIVE MEASURES

Obviously, if a biological weapon were released *outside* of the building (external release), the steps taken to protect occupants would be different from those necessary due to a release inside the building (internal release). The following section addresses measures for each scenario.

Protecting Against an External Release:

With an external release, the goal is to prevent contaminated outside air from entering the building. Consider the following measures:

- If you have an emergency plan, review it. If you don't have a plan, develop one for responding to an External Release. The plan should help manage a crisis in stages: First, contain the situation; assess and understand exactly what you're dealing with; then make and execute a specific plan for this situation; recover from the emergency as quickly as possible; and then review to improve the process for the next time. In a disaster, your cellular telephones and other technology are likely to fail, and transportation could be impeded, so plan how to handle such problems. Designate an employee to contact and assist emergency personnel; make sure employees that are on medication are personally prepared with extra medicine; encourage all workers to have a comfortable pair of shoes at the work site. Ask employees if they have contingency plans for child or pet care if they can't get home.
- Implement periodic drills to practice agreed-upon emergency procedures.
- "Tighten-up" your facility's construction. If the building was built before the Carter Administration (1976), it is most likely of "loose" construction. If this is the case, the windows, doors, soffits, and other areas where outside air could

infiltrate the building should be sealed. Consult a general contractor who specializes in retrofitting buildings, and ensure that that building is still capable of delivering the appropriate amount of fresh air to its occupants in accordance with ASHRAE Standard 62-99 (go to www.ashrae.org for more information on this standard).

- Identify outside air intakes and place controls on them so that a building operator, if necessary, can close them quickly and easily from a central location. In addition to controls placed on outside air intakes, the dampers themselves should be evaluated. Consider replacing the existing dampers with new, high-efficiency, low leakage dampers.
- All exhaust fans in the building (including vent hoods) should have controls placed on them so that they can be turned off easily and quickly from a central location, by a building operator, if necessary. Shutting down vent hoods and fume hoods, however, should be carefully considered and measures should be undertaken to prevent the internal contaminants that the hoods are removing from entering into the building's air system.
- If the building has an automated control system for the HVAC systems installed, an "External Release Emergency Program" should be created so that a building operator can push a button on his/her control screen that will implement specific measures as described below.

Protecting Against an Internal Release:

The specific course of action a building owner should take with an Internal Release should be determined based on the design of the HVAC systems in the building. If the building has centralized air handling equipment (*i.e.*, several floors are served by a centralized air handler), the procedure as outlined directly below should be followed to "flush" the building with fresh (and presumably uncontaminated) air. It should be determined, however, if the air outside of the building has been contaminated before initiating these courses of action.

With an internal release, the goal is to remove the contaminated air from the building as quickly as possible. Consider the following measures:

- Develop an emergency action plan for responding to an Internal Release to distribute to all building personnel (see above).
- Periodic drills should be implemented to practice the emergency procedures.
- Maintain appropriate levels of security in and

around the building to prevent access to individuals wanting to indulge in criminal behavior. Consider security guards, video monitoring and physical barriers. Consult with a security company for additional recommendations.

- Identify, secure, and camouflage the outside air intakes for the building. Again, consider video monitoring, and physical barriers that would discourage foul play.
- Secure mechanical rooms as well as all building entrances.
- Mailroom personnel should be educated on identifying and handling suspicious packages and letters. Since the anthrax attacks in October, the United States Postal Service has updated its Web site to include information from how to respond to anthrax in the mailroom to identifying suspicious packages and letters. The information should be printed out and posted in all commercial mailrooms.
- Install automatic controls on all exhaust fans and outside air intakes and dampers. If the building has an automated control system for the HVAC systems installed, an "Internal Release Emergency Program" should be created so that a building operator can push a button on his/her control screen that will implement specific measures as described below.

EMERGENCY ACTIONS

In the case of a biological attack, the following actions should be taken in relation to the HVAC system, and should be a part of every building's emergency plan. Please note that the actions taken for external release (outside the building) and internal release (inside the building) are very different.

Emergency Actions for External Release:

- Initiate Emergency Action Plan.
- Notify all occupants that a biological weapon has been released, external to the building, and that no one should leave the building until further notice.
- Have building operator press the "External Release Emergency Program" button programmed into the building automation system, if applicable. This action should automatically shut down air-side economizers, outside air intakes, exhaust fans, and give status of building entrances (closed or open and should alarm if opened).
- Have the building operator shut down all air-side economizer functions within the building manually (if building automation system is not programmed to do so).

- Have the building operator shut down all outside air intakes and exhaust fans manually (if building automation system is not programmed to do so).
- Secure all entrances to the building.
- Monitor public health information system via radio or television to determine when the area is safe again and what medical counsel may be needed.

Emergency Actions For Internal Release

- Initiate Emergency Action Plan.
- Notify occupants that they should leave the building as quickly and as orderly as possible once it is certain that no biological weapons have been released externally.
- Have building operator press the "Internal Release Emergency Program" button programmed into the building automation system, if applicable. This action should put the building into a fresh air "flush" mode that will automatically open up all outside air dampers, turn on all exhaust fans and turn on any applicable air-side economizer.
- Notify health services and the FBI.
- Monitor public health information system via radio or television to determine when the area is safe again and what medical counsel may be needed.
- If the building has separate air handling systems with minimal outside air on each floor, then an "isolation" strategy should be implemented. This strategy would entail shutting down all HVAC systems completely thereby reducing the possibility that contaminated air could travel to uncontaminated areas. If the building HVAC system design allows, only the isolated area where the release occurred should be flushed with fresh air. The occupants should be evacuated as soon as possible. Many large buildings have smoke partitions that are required to have dampers with operators at all penetrations. It would be relatively easy to include a link from these smoke dampers to a control system that would close all of them in an emergency. Some buildings also have emergency smoke evacuation systems that could also be utilized to limit exposure.

POST-CONTAMINATION PROCEDURES

In the aftermath of the postal anthrax attacks in October, it became clear that one of the biggest obstacles to re-occupying a contaminated building is psychological.

In Florida, anthrax turned American Media Inc.'s headquarters into a 70,000-square-foot white

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elephant. None of the employees wanted to return after a photo editor was killed by inhalation anthrax; the company decided to relocate, and put the building on the market.

However, simply selling the building because traces of anthrax were discovered inside is not an option for other anthrax-contaminated buildings. Imagine abandoning the U.S. Senate office building in Washington, D.C., or the NBC headquarters at 30 Rockefeller Plaza in New York, both treasured and historical American buildings.

In November 2001, the Centers for Disease Control posted guidelines for the decontamination of anthrax-contaminated sites, saying simple chlorine scrubs should be adequate for most buildings, especially in small areas with light contamination. The CDC added that the bleach must be in direct contact with anthrax spores for at least two minutes to kill them.

Such a bleach solution was used to clean the NBC offices; however, at ABC and on Capitol Hill, cleanup officials used a bacteria-killing agent developed by Sandia National Laboratories, which is run by Lockheed Martin Corp. (LMT) for the Department of Energy. The Sandia-developed new substance is nontoxic—it is made of materials including hydrogen peroxide—and can be used in various forms, such as foam, fog, gas, and/or spray.

In buildings where a fatal inhalation anthrax case occurred, the CDC determined that the building must be shut down and subjected to more vigorous decontamination.

SUMMARY

As with any emergency, proper preparation and precaution will go a long way in protecting our buildings against biological attacks. Make sure your employees are knowledgeable about bio-terror, and give them ample time to feel comfortable with your emergency procedures._{REI}

AUTHOR'S NOTE:

This document is intended to be used as a general guideline for building owners. It is not intended to include every possible solution for each and every building. Every building is unique and offers specific challenges for the building owner in regards to protecting occupants from biological weapons. Aircond assumes no liability or risk in offering these recommendations to building owners. The recommendations made in this document are based on research and information received from the FBI, CDC (Centers for Disease Control), United States Postal Service, BOMA (Building Owners and Managers Association), and from our many years of expertise in the field of commercial and industrial HVAC design, installation, maintenance, and repair. This article tries to give the building owner a practical set of recommendations geared towards protecting occupants from a biological weapons release. A chemical weapons release is not addressed here in this article. In fact, some of the recommendations made here for protections against biological weapons release would be ineffective against a chemical weapons release.

NOTES

If you would like more specific recommendations for your particular building, contact your current HVAC service provider.

If you would like more information or recommendations from other sources regarding biological and/or chemical weapons protection, explore the following Web sites:

- Federal Bureau of Investigation: www.fbi.gov
- Centers for Disease Control: www.cdc.gov
- Building Owners and Managers Association:
www.boma.org