Rhode Island Department Of Health
Office Of Occupational & Radiological Health
Indoor Air Quality Program
HVAC Building Vulnerability Assessment Tool

Statement of Purpose and Use: This building vulnerability assessment tool (BVAT) is to assist building owners and/or managers in locating vulnerabilities of their air-handling systems to introduction of a biological terrorism (BT) agent. Building owners should perform their own building specific risk analysis. The results will dictate what protective measures should be instituted. The use of this tool could also aid in improving the overall quality of the air inside the facility, by reducing the occupants' exposure to everyday, commonplace air contaminants. This tool is designed for use by individuals with functional knowledge of the building's air-handling system. Before correcting any of the vulnerabilities that would affect the operation of the air-handling system, the assistance of an HVAC professional should be obtained. Please complete and return the attached feedback form to assist us in evaluating the effectiveness of this tool. Do not send the completed building vulnerability assessment to the Department of Health. If you have any questions, please call the department at (401) 222-7748.

BUILDING OWNERSHIP: PUBLIC________(See note # 1) PRIVATE______________

BUILDING NAME____

STREET ADDRESS____

CITY/TOWN:_______________________ ZIP CODE___________

DATE(S) OF ASSESSMENT:________________ASSESSOR:__________________________

BUILDING OWNER OR MANAGER:____

PHONE NUMBER_______________________

OWNERS' ADDRESS____

BUILDING USAGE______________________________________

BUILDING OCCUPANCY________________________________

BUILDING VOLUME (or footprint)_________________________

#: OF FLOORS____________

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(1) TYPE OF AIR VENTILATION/CONDITIONING (Check all that apply)

Natural (Functional windows) (See note # 2) [ ] Yes [ ] No

- *Buildings without mechanical ventilation may be more secure against an external release of a chemical or biological contaminant if the windows and doors are closed.*

Individual (Wall, Window or Unit Vents) (See note # 2) [ ] Yes [ ] No

Air Handling Units w/ Ducts (See note # 3) [ ] Yes [ ] No
(If No, skip to section (8))

- *Using the building's air-handling system to spread any airborne contaminant is the most efficient method to expose building occupants to that contaminant.*

(2) AIR HANDLING UNITS (AHU)

- *A contaminant in the air-handling system will spread throughout the building (or zone) in 15 minutes or less.*

How many AHU's service the building?____

AHU ID #	Area Serviced	Control Location

Is the lobby on a separate (dedicated) AHU? (See note # 4) [ ] Yes [ ] No

Is the mailroom on a separate (dedicated) AHU? (See note # 5) [ ] Yes [ ] No

- *Mailrooms, delivery areas, and publicly accessible areas have the greatest risk for introduction of a contaminant. These areas should be kept at a slightly negative pressure and the return air should not be mixed with that of other areas. This can be accomplished by having a separate air-handling unit or by segregating and directly exhausting return air.*

Are the stairways on a separate (dedicated) AHU? (See note # 6) [ ] Yes [ ] No

Can they be placed under positive pressure (or 100% make-up air)? [ ] Yes [ ] No

- *Pressurizing stairways with 100% outside air will provide a safe evacuation pathway.*

How are AHU's controlled? ( ) Computer ( ) Manual ( ) Other_____________________
(See note # 7)

- *The entire air-handling system should be controlled from one location to maximize operation.*

Is there an emergency AHU shutdown plan? [ ] Yes [ ] No

How is the shutdown initiated? Computer ( ) Manual ( ) Other ( )___________________

Is there a manual (over-ride) shut-off switch? [ ] Yes [ ] No

If Yes, where is it located? ____

(3) AIR INTAKES

- *The air intakes provide an ideal pathway for contamination of a building. If these are accessible, it may not even be necessary to enter the building.*

How many intakes service the building? _____________

Intake Location	AHU Supplied	Location Serviced

Are any located at ground level? (See note # 8) [ ] Yes [ ] No

- *Intakes should be located at the highest possible level. To elevate wall mounted or below-grade intakes a plenum or external shaft can be added.*

If Yes, are they secured? (See note # 9) [ ] Yes [ ] No

- *Inaccessible intakes are the best method to prevent deliberate introduction of a contaminant. Fencing, monitoring the area with closed circuit television, or another intrusion control method may also be an effective deterrent.*

If secured, how? (e.g. cameras, fence, etc.)____

If not secured, can they be elevated or secured? [ ] Yes [ ] No

Are any elevated? [ ] Yes [ ] No

If Yes, are they angled and/or grated? (See note # 10) [ ] Yes [ ] No

- *Air intakes should also be covered with sloped screens to prevent objects from being introduced.*

Are any at rooftop level? [ ] Yes [ ] No

If Yes, are they secured with access limited to authorized personnel only? [ ] Yes [ ] No

If not secured, can they be secured? [ ] Yes [ ] No

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(4) RECIRCULATION MODES/RETURN AIR

Return air ducted or open plenum? (See note # 11) [ ] Ducts [ ] Open plenum

- *Secure, ducted returns reduce the possibility of a contaminant being introduced into the return air stream.*

Return air for different zones "mixed"? (See note # 12) [ ] Yes [ ] No

- *Mixing of return air from separate zones will increase the spread of a contaminant throughout the building.*

Return air grills secure? [ ] Yes [ ] No

- *Placing ducted return air vents in conspicuous locations will minimize the possibility of contaminants being secretly introduced.*

If No, can they be secured? [ ] Yes [ ] No

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(5) MECHANICAL ROOMS

Are mechanical rooms/areas kept locked with controlled access? [ ] Yes [ ] No
(See note # 13)

- *Access to the mechanical room allows for easy introduction of any contaminant and the ability to tamper with air handling system controls.*

If not, can they be secured? [ ] Yes [ ] No

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(6) FILTRATION SPECIFICATIONS

What is the maximum filtration capacity?____
(See note # 14)

- *Increasing filter efficiency will reduce occupants' exposure to particulate contaminants and improve building air quality.*

Where is the filtration media? (before or after the return plenum?)__________________________

- *The location of the filters and the integrity of the seals are two factors that contribute to the effectiveness of the filtration media.*

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(7) SYSTEM OPERATION/MAINTENANCE

Is the system maintained by in-house personnel? [ ] Yes [ ] No

Is the maintenance contracted to an outside entity? [ ] Yes [ ] No

Are filters changed on a regular basis? [ ] Yes [ ] No

Is there a schedule for regular cleaning? [ ] Yes [ ] No

Is there a schedule for periodic balancing? [ ] Yes [ ] No

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(8) OTHER CONSIDERATIONS

Is there an area that can be used to "Shelter in Place"? (See note # 15) [ ] Yes [ ] No

- *A "shelter-in-place" room is an area that has minimal air infiltration where occupants can stay in the event of an exterior release.*

Does the building have exhaust fans/systems? [ ] Yes [ ] No

- *All exhaust fans (e.g. in rest rooms, kitchens) should be included on the emergency shutdown switch.*

How many and where are they located? ____

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____

Where are their switches located? ____
(See note # 16)

Does the building have smoke purge fans? [ ] Yes [ ] No
(See note # 17)

How many and where are they located? ____

____

Where are their switches located?____

SUMMARY OF FINDINGS AND ACTIONS REQUIRED

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ASSESSORS:____DATE:_________________

____DATE:_________________

____DATE_________________

____DATE_________________

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Notes And References

#1 The Access to Public Records Act (Chapter 38-2) exempts the following records from public disclosure: trade secrets, scientific and technological secrets, security plans of law enforcement agencies, preliminary drafts and working papers, investigatory records of public bodies, and information requested to be maintained confidential by federal or state law. Accordingly, building vulnerability assessment data would appear to fall within one if not more of these exemptions. In the best interest of public safety, it is advised that any information associated with vulnerability assessment studies be marked "confidential". In addition, it is strongly recommended that managers of public buildings consult with their legal department and security department upon receipt of any request for release of this information.

#2 Buildings that do not have mechanical ventilation meet fresh air requirements by infiltration and natural ventilation. Though less tightly constructed, such buildings can be less vulnerable to external releases when windows are closed. With windows and doors closed, the paths of entry for outside air are smaller and more scattered than in buildings with mechanical ventilation systems. (US ACE "Protecting Buildings and Their Occupants From Airborne Hazards", pg 5)

#3 A terrorist can quickly contaminate a building with a chemical or biological agent by introducing it into the building's ventilation system. This can be done even without access to the interior of the building through the building's air intakes. Even keeping the public a short distance away from the air intake may not provide complete security. For instance, a plastic bag containing anthrax spores could be tossed into an air intake from some distance away. Baffles over the air intake can make this type of attack less likely to succeed, but they might also affect the amount of outside air the building can pull in, and the energy efficiency with which this can be done, so they should not be installed without careful evaluation. (Lawrence Berkeley National Laboratories, "Advice for Safeguarding Buildings Against Chemical or Biological Attack")

Ducted returns offer limited access points to introduce a chemical, biological or radiological (CBR) agent. The return vents can be placed in conspicuous locations, reducing the risk of an agent being secretly introduced into the return system. Non-ducted return air systems commonly use hallways or spaces above dropped ceilings as a return-air path or plenum. CBR agents introduced at any location above the dropped ceiling in a ceiling plenum return system will most likely migrate back to the HVAC unit and, without highly efficient filtration for the particular agent, redistribute to occupied areas. Buildings should be designed to minimize mixing between air-handling zones, which can be partially accomplished by limiting shared returns. Where ducted returns are not feasible or warranted, hold-down clips may be used for accessible areas of dropped ceilings that serve as the return plenum. This issue is closely related to the isolation of lobbies and mailrooms, as shared returns are a common way for contaminants from these areas to disperse into the rest of the building. These modifications may be more feasible for new building construction or those undergoing major renovation. (CDC-NIOSH, "Protecting Building Environments From Airborne Chemical, Biological, or Radiological Attacks", pg. 18)

4 Mailrooms, delivery areas such as loading docks, and areas with public access are the most likely locations for introducing toxic substances to a building. If the HVAC systems for these areas do not mix air into the rest of the building, the spread of the agent will be greatly reduced. Mixing into the general building air can be prevented, either by providing a separate air-handling unit for these areas, or by eliminating return air for these areas and exhausting them directly. (Contamination may still spread along hallways, etc., but this will be much slower). Consider adjusting the HVAC supply and exhaust so that the high-risk areas are slightly de-pressurized with respect to the rest of the building, so that air will flow from other areas into the high-risk areas rather than the other way around. (Lawrence Berkeley National Laboratories, "Advice for Safeguarding Buildings Against Chemical or Biological Attack")
For additional information see US Army Corps of Engineering document "Protecting Buildings and Their Occupants from Airborne Hazards" available at www.usace.army.mil

5 For buildings having access control, there are three entry zones of concern regarding deliberate internal releases of hazardous materials. These entry zones are 1) the lobby, in which people await entry into the secure area of the building; 2) the mailroom, in which mail is received for distribution; and 3) the area in which supplies or equipment are received and held temporarily awaiting distribution. If people, mail, or supplies/equipment enter the building before being screened, the ventilation system of the entry area or lobby area in which they await screening should be isolated from the rest of the building. This is to prevent the movement of airborne hazards to the protected areas of the building if a release occurs before security screening. This isolation is achieved by:

- A separate air-handling unit for the entry area
- Exhaust fans(s) to create a slight negative pressure differential in the entry area
- Full-height walls surrounding the entry area
- An air-lock or vestibule for exterior doors to maintain the pressure differential as people enter and exit. If entries are infrequent, an air-lock is not essential, particularly for mailrooms or supplies receipt areas. (US Army Corps of Engineers, "Protecting Buildings and Occupants From Airborne Hazards", pg. 8)

For additional information see Lawrence Berkeley National Laboratories " Protecting Buildings From a Biological or Chemical Attack: actions to take before or during a release" Available at http://www.securebuildings.lbl.gov/info

#6 For any indoor release, whether chemical or biological: if evacuation can be done safely, evacuate the building to a meeting point upwind of the building. Biological release (or unknown): Shut off HVAC and close outdoor air dampers (or, if this is not possible, put them into full recirculation mode). Local exhausts, such as those serving bathrooms and kitchens, must also be shut off—they are often controlled separately from the HVAC system. These actions will prevent the building from becoming a source of contamination for people outside. If possible, stairwells should be pressurized with 100% outdoor air to provide an evacuation route. Other HVAC, and bathroom and utility room fans, should be shut off. (Lawrence Berkeley National Laboratories, "Advice for Safeguarding Buildings Against Chemical or Biological Attack")

#7 It should be possible to immediately shut off the HVAC system (including closing dampers that admit outdoor air and closing exhaust dampers), or to put the entire system on 100% fresh (outdoor) air. Dampers should be checked for leakage, and replaced or repaired if necessary. Areas served by different air handling units should be surveyed and clearly shown on floor plans so that building operators know which supply and exhaust systems serve which areas. Maintain an updated copy of the ventilation plans in the room(s) from which the HVAC can be controlled.

There should be at least one secure location (preferably more) from which the whole HVAC system can be controlled, so that it is not necessary to move through a contaminated building to manipulate the system. (Lawrence Berkeley National Laboratories, "Advice for Safeguarding Buildings Against Chemical or Biological Attack")

#8 Intakes should be placed at the highest practical level on the building. For protection against malicious acts, the intakes should also be covered by screens so that objects cannot be tossed into the intakes or into air wells from the ground. Such screens should be sloped to allow thrown objects to roll or slide off the screen, away from the intake. Many existing buildings have air intakes that are located at or below ground level. For those that have wall-mounted or below-grade intakes close to the building, the intakes can be elevated by constructing a plenum or external shaft over the intake. (US Army Corps of Engineers, "Protecting Buildings and Their Occupants From Airborne Hazards", pg 7)
For Further information see CDC-NIOSH Guidance Document "Protecting Building Environments from Airborne Chemical, Biological, or Radiological Attacks" Available at http://www.cdc.gov/niosh/bldvent/2002-139.

9 The best method of preventing access to air intakes depends on the building's design and its physical relationship to publicly accessible areas. Possibilities include fencing off outdoor areas near intakes, or restricting access to the grounds on which the building sits. If the building has a video surveillance system, air intakes can be monitored. (Lawrence Berkeley National Laboratories, " Protecting Buildings from a Biological or Chemical Attack: actions to take before or during a release", pg. 26)

Physically inaccessible outdoor air intakes are the preferred protection strategy. When outdoor air intakes are publicly accessible and relocation or physical extensions are not viable options, perimeter barriers that prevent public access to outdoor air intakes may be an effective alternative. Iron fencing or similar see-through barriers that will not obscure visual detection of terrorist activities or a deposited CBR source are preferred. The restricted area should also include an open buffer zone between the public areas and the intake louvers. Thus, individuals attempting to enter these protected areas will be more conspicuous to security personnel and the public. Monitoring the buffer zone by physical security, closed circuit television (CCTV), security lighting, or intrusion detection sensors will enhance this protective approach. (CDC-NIOSH, "Protecting Building Environments from Airborne Chemical, Biological, or Radiological Attacks", pg. 9)

10 The entrance to the intake should be covered with a sloped metal mesh to reduce the threat of objects being tossed into the intake. A minimum slope of 45 degrees is generally adequate. (CDC-NIOSH, "Protecting Building Environments from Airborne Chemical, Biological, or Radiological Attacks" pg. 9)

11 Ducted returns offer limited access points to introduce a CBR agent. The return vents can placed in conspicuous locations, reducing the risk of an agent being secretly introduced into the return system. Non-ducted return air systems commonly use hallways or spaces above dropped ceilings as a return-air path or plenum. CBR agents introduced at any location above the dropped ceiling in a ceiling plenum return system will most likely migrate back to the HVAC unit and, without highly efficient filtration for the particular agent, redistribute to occupied areas. Buildings should be designed to minimize mixing between air-handling zones, which can be partially accomplished by limiting shared returns. Where ducted returns are not feasible or warranted, hold-down clips may be used for accessible areas of dropped ceilings that serve as the return plenum. This issue is closely related to the isolation of lobbies and mailrooms, as shared returns are a common way for contaminants from these areas to disperse into the rest of the building.
These modifications may be more feasible for new building construction or those undergoing major renovation. (CDC-NIOSH "Protecting Building Environments from Airborne Chemical, Biological, or Radiological Attacks", pg. 18)

12 Mailrooms, delivery areas such as loading docks, and areas with public access are the most likely locations for introducing toxic substances to a building. If the HVAC systems for these areas do not mix air into the rest of the building, the spread of the agent will be greatly reduced. Mixing into the general building air can be prevented, either by providing a separate air-handling unit for these areas, or by return air for these areas and exhausting them directly. (Contamination may still spread along hallways, etc.,.. but this will be much slower). Consider adjusting the HVAC supply and exhaust so that the high-risk areas are slightly de-pressurized with respect to the rest of the building, so that air will flow from other areas rather than the other way around. (Lawrence Berkeley National Laboratories, "Advice for Safeguarding Buildings Against Chemical or Biological Attack")

#13 A terrorist with access to a building's HVAC (heating, ventilation, and air conditioning) equipment can quickly contaminate the entire building, or at least the entire ventilation zone, with a chemical or biological agent. The rooms that contain HVAC equipment should be locked, and keyed so that they can be opened by authorized staff only. Many release scenarios, such as a release into an HVAC return plenum, rely on the HVAC system to quickly distribute the agent even if the equipment itself is not accessible; however, access to the HVAC equipment would enable a terrorist to put the building into the most damaging possible operating mode, e.g. by closing dampers and operating fans so as to expose the largest number of people to the highest possible concentrations. Also, a terrorist could damage control actuators so that the HVAC operation to reduce casualties cannot be performed after the release has been detected. (Lawrence Berkeley National Laboratories, " Protecting Buildings from a Biological or Chemical Attack: actions to take before or during a release", pg 27)

#14 Increasing filter efficiency is one of the few measures that can be implemented in advance to reduce the consequences of both an interior and exterior release of a particulate CBR agent. However, the decision to increase efficiency should be made cautiously, with a careful understanding of the protective limitations resulting from the upgrade. The filtration needs of a building should be assessed with a view to implementing the highest filtration efficiency that is compatible with the installed HVAC system and its required operating parameters. In general, increased filter efficiency will provide benefits to the indoor environmental quality of the building. However, the increased protection from CBR aerosols will occur only if the filtration efficiency increase applies to the particle size range and physical state of the CBR contaminant. It is important to note that particulate air filters are used for biological and radiological particles and are not effective for gases and vapors typical of chemical attacks.

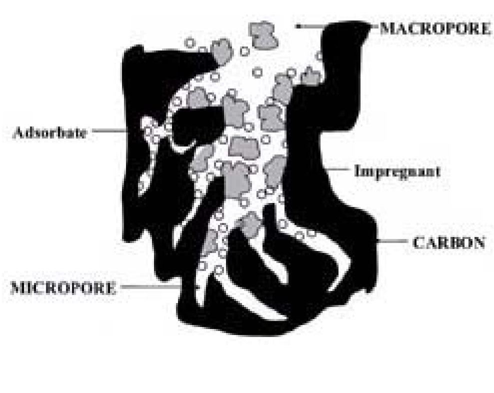
#14 Continued:

These types of compounds require adsorbent filters (i.e., activated carbon or other sorbent-type media) and result in substantial initial and recurring costs. Upgrading filtration is not as simple as merely replacing a low-efficiency filter with a higher efficiency one. Typically, higher efficiency filters have a higher pressure loss, which will result in some airflow reduction through the system. The magnitude of the reduction is dependent on the design and capacity of the HVAC system. If the airflow reduction is substantial, it may result in inadequate ventilation, reductions in heating and cooling capacity, or potentially frozen coils. To minimize pressure loss, deep pleated filters or filter banks having a larger nominal inlet area might be feasible alternatives, if space allows. Also, high-pressure losses can sometimes be avoided by using prefilters or more frequent filter changeouts. Pressure loss associated with adsorbent filters can be even greater. The integrity of the HVAC system's filter rack or frame system has a major impact upon the installed filtration efficiency. Reducing the leakage of unfiltered air around filters, caused by a poor seal between the filter and the frame, may be as important as increasing filter efficiency. If filter bypass proves to be significant, corrective actions will be needed. Some high efficiency filter systems have better seals and frames constructed to reduce bypass.

During an upgrade to higher efficiency filters, the HVAC and filtration systems should be evaluated by a qualified HVAC professional to verify proper performance. While higher filtration efficiency is encouraged and should provide indoor air quality benefits beyond an increased protection from CBR terrorist events, the overall cost of filtration should be evaluated. Filtration costs include the periodic cost of the filter media, the labor cost to remove and replace filters, and the fan energy cost required to overcome the pressure loss of the filters. While higher efficiency filters tend to have a higher life cycle cost than lower efficiency filters, this is not always the case. With some higher efficiency filter systems, higher acquisition and energy costs can be offset by longer filter life and a reduced labor cost for filter replacements. Also, improved filtration generally keeps heating and cooling coils cleaner and, thus, may reduce energy costs through improvements in heat transfer efficiency. However, when high efficiency particulate air (HEPA) filters and/or activated carbon adsorbers are used, the overall costs will generally increase substantially. (CDC-NIOSH," Protecting Building Environments from Airborne Chemical, Biological, or Radiological Attacks", pg. 16-18)

The current standard for filtering biological agents from an air stream is the High Efficiency Particulate Air (HEPA) filter. A component of all filtration units used by the military and the nuclear industry, the HEPA filter is normally placed upstream of the carbon filter to remove not only biological agents and solid aerosols but also liquid aerosols. It also protects the carbon filter from atmospheric dust. The minimum filtration efficiency for HEPA filters is specified as 99.97% (a decontamination factor of 3,333) at the 0.3 micrometer (micron) particle size. Most HEPA filters have efficiencies of 99.99% at 0.3 micron and removal efficiency is greater for particles that are outside this size range as long as the filter is operated at or below its rated velocity. HEPA efficiency holds for particles down to about 0.01 micron. (SBCCOM, "Basic Information on Building Protection", Aerosol Filtration)

The standard for filtering chemicals—that is, molecular filtration—is a packed bed of activated, impregnated carbon granules. A carbon filter employs two different processes to remove molecules from an air stream—physical adsorption and chemical reaction. Physical adsorption, the trapping of molecules in the micropores of the carbon, is effective against chemicals of low vapor pressure. Activated



carbon is a very effective sorbent because its pore sizes vary and have a large surface area. Typically the pores in activated carbon have effective surface areas of about 1,200 square meters per gram. The carbon in a single 200 cubic-ft-per-minute military filter provides more than 5 square miles of active surface area. Physical adsorption works well only against large molecules. As a rule of thumb, compounds of vapor pressure less than 10 mm Hg at the temperature of the filter bed are strongly adsorbed and retained in the pores of the carbon. To filter chemicals of higher vapor pressure, carbon is impregnated with salts of copper, zinc, silver, molybdenum, and triethylene diamine (TEDA), which react to form products that are innocuous or that can be physically adsorbed. Carbon filters used for collective protection are designed for high efficiency and capacity. Efficiency is the percentage of agent removed in a single pass, and capacity is the quantity of agent a filter can remove before it ceases to filter at the specified efficiency of 99.999%. A standard carbon filter can be expected to physically adsorb about 20% of its weight in agent or to remove about 5 to 10% of its weight in reactive gas. The service life of an impregnated carbon filter is defined by both its reactive gas life and physical adsorption life.

Filter life is site-specific, as both capacities are affected by the environmental air quality. Physical adsorption life is reduced by adsorption of air pollutants. Capacity for reactive gases diminishes gradually over time and is typically lost within about three to four years of exposure to humidity. The rate at which the reactive life degrades varies with the temperature and amount of water adsorbed by the carbon bed, and degradation begins once a filter is opened to the atmosphere. (SBCCOM, "Basic Information on Building Protection", Molecular Filtration)

The size and capacity of a filter system needed for external filtration is determined by the leakage rate of the building. To achieve the highest level of protection, 100 percent of the air entering the building must be supplied through the filter system. This can be assured only by providing filtered air at a volume great enough to prevent infiltration through all openings, to overcome the forces of wind and stack effect. Although data are available for estimating the leakage rates of various types of buildings, these have proven to be unreliable for estimating filtration system capacity. The best method is to conduct a fan-pressurization test using commercially available blower-door systems with the building temporarily configured as it would be in its protected mode. Fan-pressurization tests require that the openings in the proposed protective envelope be taped to approximate the effect of dampers and seals that are to be added. In the case of new construction, estimates can be made using a fan pressurization database available at ECBC and the Corps of Engineers Protective Design Center. Later, a fan-pressurization test can be performed at a point in construction prior to installation of filter units. (SBCCOM, "Basic Information on Building Protection", Filter Unit Sizing for Pressurization)

For more information see "Filtration and Air-Cleaning Systems to Protect Building Environments" available at http://www.cdc.gov/niosh

15 "Shelter-in-place" rooms can be created or identified, where people can stay in the event of an outdoor release. The goal is to create areas where outdoor air infiltration is very low. Usually such rooms will be in the inner part of the building (no windows to the outside). They should have doors that are fairly effective at preventing airflow from the hallways (e.g. they should have no gap or only a very small gap at the bottom of the door). Bathrooms are usually a bad choice, because they often have an exhaust duct that leads directly to the outside. If the exhaust fan is left on then air will be drawn into the bathroom from other parts of the building, which will become contaminated. If the exhaust fan is turned off, then the duct can allow outside air to directly enter the bathroom. Exhaust fans for bathrooms and utility rooms are often controlled separately from the HVAC system.

#15 Continued:

Opening and closing a conventional door can pump large amounts of air into the room; replacing the door with a sliding door, if practical, can reduce this effect. Additionally, it may be possible to provide purified air to the safe area, depending on whether the pollutant can be removed by the building's air filtration system. Modifications to the HVAC system can add filters and an air supply that are dedicated to the safe area. (Lawrence Berkeley National Laboratories, "Advice for Safeguarding Buildings Against Chemical or Biological Attack")

Sheltering in place is a protective action for use against an external release for which there is forewarning. This protective action requires that all fans that produce air exchange—fresh-air fans, exhaust fans, and air-handling units—be turned off before the cloud of hazardous material envelops the building. In large buildings, controls or switches for deactivating these fans are often in diverse locations that may not be easily accessible in the short period available after a warning is received. To be effective, sheltering must be implemented rapidly; therefore it is important to have the ability to turn off these fans quickly. This can be achieved by adding a single-switch control, installing relays for turning off all fans affecting outside air exchange or if the building is so equipped, modifying the fire alarm control panel to de-energize the ventilation system and close the outside air dampers.

The switch should be located where it is readily accessible to the facility manager or building security personnel. This protection can be enhanced by installing automatic dampers on outside air intakes and on exhaust fans not already equipped with back-draft dampers. (US ACE, "Protecting Buildings and Their Occupants From Airborne Hazards" pg.9)
For additional information see NICS Document "Shelter in Place at your Office" available at www.nicsinfo.org

#16 There should be at least one secure location, safe from unauthorized intrusion, from which the whole HVAC system can be controlled, so it is not necessary to move through a contaminated building to manipulate the system. Multiple control locations are desirable. These locations should include floor plans that show which ventilation zones are served by which air-handling units. At a minimum, the HVAC control location or locations should allow shutting off the HVAC (including closing dampers) and making the system deliver 100% outdoor air. Ideally, the air handling units should be individually controllable, and additional fans such as kitchen and bathroom exhausts should be controllable from the same location. (LBNL "Protecting Buildings From a Biological or Chemical Attack: actions to take before or during a release", pg. 29)

#17 Many buildings have a smoke control or smoke removal system ….If such a system is present, it should be used; it will probably be very effective. Smoke removal systems often have their own duct-work and exhaust registers, rather than using the HVAC system; in such cases, it is the smoke systems exhaust ducts that will act as sources of agent to the outside. Although chemical contamination can be removed effectively using a smoke control system, it differs from smoke in an important way: unlike smoke, chemical warfare agents are not buoyant. Smoke infiltration barriers that rely on buoyancy will not be effective, and staying low to the floor will not generally reduce occupant exposures. (Lawrence Berkeley National Laboratory, "Protecting Buildings From a Biological or Chemical Attack: actions to take before or during a release", pg. 23)

BIBLIOGRAPHY/ REFERENCES

Lawrence Berkeley National Laboratories "Advice for Safeguarding Buildings Against Chemical or Biological Attack" Available at http://www.securebuildings.lbl.gov/info

CDC-NIOSH Guidance Document, "Protecting Building Environments from Airborne Chemical, Biological, or Radiological Attacks" Available at http://www.cdc.gov/niosh/bldvent/2002-139.

CDC-NIOSH Guidance for "Filtration and Air-Cleaning Systems to Protect Building Environments from Airborne Chemical, Biological, or Radiological Attacks" Available at http://www.cdc.gov/niosh

Lawrence Berkeley National Laboratories " Protecting Buildings From a Biological or Chemical Attack: actions to take before or during a release" Available at http://www.securebuildings.lbl.gov/info

US Army Corps of Engineering document "Protecting Buildings and Their Occupants from Airborne Hazards" available at www.usace.army.mil

NICS Document "Shelter in Place at your Office" available at www.nicsinfo.org

ASHRAE "Risk Management Guidance for Health, Safety, and Environmental Security under Extraordinary Incidents" Available at http://www.ashrae.org/

Chemical and Biological Arms Control Institute "Bioterrorism in the United States: Threat, Preparedness, and Response" Available at http://www.cbaci.org/

CDC-MMWR "Biological and Chemical Terrorism: Strategic Plan for Preparedness and Response" Available at www.cdc.gov

NIOSH "Filtration and Air-Cleaning Systems to Protect Building Environments from Airborne Chemical, Biological, or Radiological Attacks" Available at www.cdc.gov/niosh

CDC "Public Health Assessment of Potential Biological Terrorism Agents" Available at http://www.bt.cdc.gov/planning/index

CIA "CBR Incident Handbook" Available at http://www.cia.gov/cia/siteindex

EPA "Building Air Quality: A Guide for Building Owners and Facility Managers" Available at http://www.epa.gov/iaq/largebldgs

SBCCOM "Basic Information on Building Protection" Available at http://buildingprotection.sbccom.army.mil/basic

DOJ "Emergency Response to Domestic Biological Incidents Threat and Risk Assessment for Weapons of Mass Destruction" Available at http://www.usdoj.gov/

FEMA "Emergency Management Guide for Business and Industry" Available at http://www.fema.gov/library/bizindex

BVAT Feedback Form

When returning this feedback form by mail (RI Department of Health, Office of Occupational Health, 3 Capitol Hill, Rm. 206, Providence RI 02908, or by fax (401) 222-2456 **do not** include any identifying information such as name, address, facility or the completed BVAT.

How many buildings were assessed with this BVAT? _____

Please rate the following section on the value of the BVAT?
Rate 1-5 (1 low, 5 high)

Overall _____

(1) Type of air ventilation/conditioning _____

(2) Air Handling Units _____

(3) Air Intakes _____

(4) Recirculation/Return Air _____

(5) Mechanical Rooms _____

(6) Filtration Specifications _____

(7) System Operation/Maintenance _____

(8) Other Considerations _____

(9) Notes and References _____

(10) Health Department Assistance _____

Do you intend to perform any changes based upon this BVAT? Yes/No

Do you have any suggestions how we could improve this BVAT?