



TECH BRIEF

Shelter-in-Place Guidelines Can Enhance Protection Against Airborne Threats

Background

The Decontamination and Consequence Management Division (DCMD) of EPA's National Homeland Security Research Center (NHSRC) is responsible for research into threat agents (chemical, biological, and radiological) that are of concern from the point of view of security. One of the DCMD studies has evaluated the effectiveness of the U.S. Department of Homeland Security (DHS) guidelines for residential safe havens. These guidelines are designed to help people secure their houses against a release of an airborne hazardous material, in the event of a terrorist attack or accident.

DCMD Research

The DHS guidelines include:

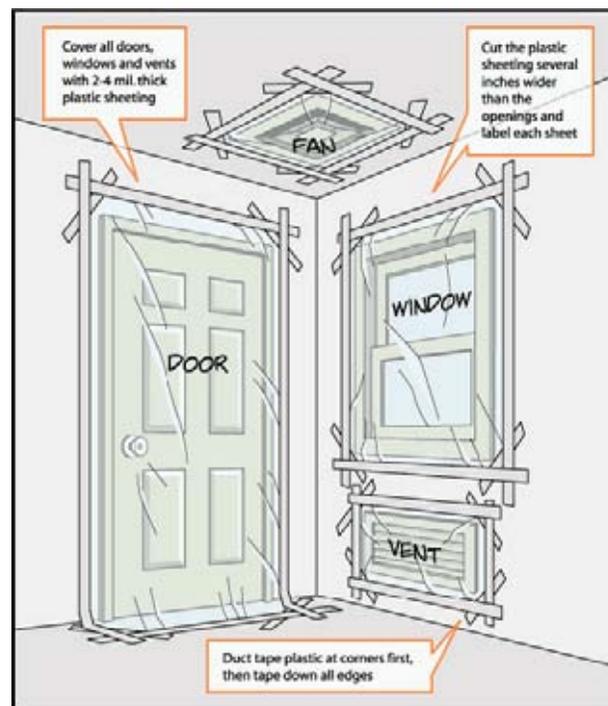
- locking doors and closing windows, air vents, and fireplace dampers
- turning off fans, air conditioning, and forced-air heating systems
- going into an interior room with the fewest windows
- sealing all windows, doors, and air vents with plastic sheeting and duct tape (see illustration)

To test how much extra protection these actions would provide, and how long the air in the interior of a house would remain safe, NHSRC researchers explored two approaches. First, they developed an improved method of determining the rate of airflow into a house at various spots. Second, they applied the DHS guidelines in a test house, creating a realistic in-house shelter, and checked the interior air at intervals.

Research Results

The DCMD study confirmed the usefulness of the DHS guidelines for preparing in-house shelters as protection against airborne chemical, biological, or radioactive hazards. The results of the research indicate that proper sealing can make a substantial difference in the effectiveness of the shelter. It is most beneficial, however, if people enter the shelter before the arrival of a cloud of hazardous agent, and leave the shelter as soon as the cloud passes over. Individuals who arrive or leave too late could, in some instances, actually increase their exposure.

DCMD's research indicated that most people can stay in a residential shelter for up to three hours before the air is likely to become unhealthy. (Individuals with respiratory problems may have less tolerance.) Besides staying in the shelter too long, other conditions that may result in unhealthy air are



a large number of occupants, a low air flow rate, relatively high carbon dioxide emission rates, or activities that result in oxygen depletion. These should be avoided if possible.

The results of the first part of this shelter-in-place study have already been published in the *Journal of Hazardous Materials*, a periodical that deals with environmental control, risk assessment, impact and management. The full text of 'Effectiveness of Expedient Sheltering in Place in a Residence,' by J.J. Jetter and C. Whitfield, is available at: <http://www.epa.gov/nhsrc/pubs/paperSIP010606.pdf>.

Using the Results

This study was conducted specifically to evaluate shelter-in-place measures for residential houses. It was designed to provide information that would be useful to the emergency planners that provide guidance to the public, and could be applied by private citizens as well. (The guidelines can be found at http://www.ready.gov/america/stay_or_go.html.) However, current EPA research is also evaluating the effectiveness of shelters for use in workplaces and public buildings. A report on those findings is expected by the end of 2006.

For more information, please visit the NHSRC Web site at www.epa.gov/nhsrc.

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