



## **Hurricane Aftermath—Health and Housing Flooding**

Flooding and the serious water intrusion that accompanies it is perhaps the most serious healthy homes impact of a hurricane strike. Large and widespread mold infestations, bacterial growth, pest infestations, release of toxic substances from wet building materials, and deteriorated structural integrity can all follow water intrusion of residential buildings. The water itself can carry an unknown mix of toxic chemicals, waste, and bacteria that can contaminate houses and apartments, personal belongings, and yards, even after the flood recedes.

To minimize the impacts of flooding and water intrusion for homes and apartment buildings in which structural integrity has *not* been weakened beyond repair, property owners should take the following steps:

- Before entering any house or apartment building, protect yourself by wearing rubber boots, rubber gloves, goggles, and a respirator.
- Children, the elderly, and persons with compromised immune systems should not return to flood-damaged buildings until all repair and rehabilitation work is completed. People with severe asthma should also avoid flood-damaged structures.
- Remove all standing water as quickly as possible, even if the amount of standing water is small. Standing water can be a breeding ground for bacteria and some pests, it can harbor dangerous contaminants, and it can provide a source of moisture for mold growth.
- Remove all wet materials and personal belongings from the house or apartment building. This includes all wet wallpaper, wallboard, carpeting, throw rugs, bedding, mattresses, box springs, stuffed toys, clothing, and any other wet materials that cannot be adequately dried and wiped clean. All of these materials can become food sources for mold, they can “off-gas” significant amounts of toxic chemicals. Inadequate drying of these materials can attract large cockroach infestations. Where possible, professional contractors trained in materials removal and mold clean-up should perform this work.
- Remove all porous materials that demonstrate significant mold growth. Again, where possible, professional contractors trained in these tasks should perform this work.
- Take appropriate measures to dry out the entire structure of the house or apartment building. As soon as safe, reliable power is restored, fans; dehumidifiers; window air conditioners; and undamaged, uncontaminated, properly filtered HVAC systems can be used to dry out a building. All houses and apartments buildings should also have ventilation systems repaired if damaged.

- The scope of the flood damage and resultant mold growth following Hurricanes Katrina and Rita are unprecedented in many areas along the Gulf Coast. However, for those homeowners who suffered only minimal water intrusion from minor flooding or other damage to their homes, cleaning all nonporous, wipeable materials and surfaces with a hot water and detergent solution can help. If a hot water and detergent solution does not clean these surfaces, a very dilute bleach solution (1 cup bleach to 9 cups water) can be used. *Remember that this pertains **only** to homes where mold growth is impacting small, easily contained areas. If using a dilute bleach solution, **NEVER MIX BLEACH WITH ANY OTHER CLEANING PRODUCT OR DETERGENT!***
- Chemical fungicides should be used only as a *last resort* against mold, and only the lowest-toxicity fungicides should be used in these circumstances. Mold removal efforts should focus on a) removing all water-damaged materials from the home, b) removing all materials demonstrating significant mold growth, and c) removing all sources of standing water and excessive moisture from the home.

### **Resources**

- For information on making homes healthy following a hurricane strike, visit the EPA's Hurricane Katrina response page, linked from [www.epa.gov](http://www.epa.gov).
- For specific information on returning home following a major flood event, visit [www.cmhc-schl.gc.ca/en/burema/coem/flood/flwhbeaf/index.cfm](http://www.cmhc-schl.gc.ca/en/burema/coem/flood/flwhbeaf/index.cfm).
- The Alliance for Healthy Homes and the National Center for Healthy Housing provide more detailed information on health and housing on their websites, [www.afhh.org](http://www.afhh.org) and [www.centerforhealthyhousing.org](http://www.centerforhealthyhousing.org).



## **Hurricane Aftermath—Health and Housing Carbon Monoxide Poisoning**

Carbon monoxide is a serious health threat to residents returning home following hurricanes and flooding, especially those who live in houses and apartment buildings that use natural gas for heating and cooking. Carbon monoxide can kill through asphyxiation and exposure to sub-lethal doses over time can cause brain and heart damage.

To avoid carbon monoxide poisoning, residents should take the following steps:

- Do not use gasoline-powered generators, open flame camp stoves and lanterns, or charcoal or gas grills in any building. Unvented combustion devices can cause rapid and dangerous increases in carbon monoxide concentrations in indoor air.
- Be sure outdoor generators are operated more than ten feet away from windows, doors, and other openings to houses and apartment buildings.
- If at all possible, buy and install a carbon monoxide detector, commonly available at local hardware stores that have reopened.
- If dizziness, nausea, or weakness present themselves at any time during the course of building repair and cleanup, **seek fresh air immediately**. If symptoms persist, contact emergency medical personnel.

Property owners should:

- Check and, if necessary, repair all damaged water heaters, furnaces, and other combustion appliances such as natural gas-powered ovens and stoves.
- Repair any damaged vents and chimneys, and be sure that all vents and chimneys are clear of debris or other obstructions.

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## **Hurricane Aftermath—Health and Housing Pest Infestations and Integrated Pest Management**

Pest infestations often follow in the wake of a natural disaster that damages houses and apartment buildings. Mice, rats, and cockroaches are three common pest infestations that can plague any damaged residential structure.

To prevent pests and to combat pest infestations that have already occurred, property owners should use integrated pest management (IPM) strategies:

- Remove all standing water as quickly as possible, even if the amount of standing water is small. Standing water can be a breeding ground and a source of sustenance for some pests.
- Remove all wet materials and personal belongings from the house or apartment building. This includes all wet wallpaper, wallboard, carpeting, throw rugs, bedding, mattresses, box springs, stuffed toys, clothing, and any other wet materials that cannot be adequately dried. Inadequate drying of these materials can attract large cockroach infestations.
- Take appropriate measures to dry out the entire structure of the house or apartment building. As soon as safe, reliable power is restored, fans; dehumidifiers; window air conditioners; and undamaged, uncontaminated, properly filtered HVAC systems can be used to dry out a building. All houses and apartment buildings should also have ventilation systems repaired if damaged.
- Repair and/or fill all holes, cracks, broken windows and doors, and other points of entry to the house or apartment building.
- Discard all spoiled food, and keep any edible food properly stored in tightly sealed containers.
- If pest infestations are already present, avoid the use of high-toxicity pesticides. Instead, use gel baits and bait stations for cockroaches and ants, and employ traps and tamper-proof bait boxes for mice and rats.
- When baiting rodents, use only those lower-toxicity pesticides that have known and readily available antidotes. **Do not** use bulk rat poison pellets to combat rodents; these pellets are highly toxic and do not contain any bittering agents or other safeguards to prevent children or pets from ingesting them.

## **Resources**

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- Beyond Pesticides provides in-depth information on combating specific pests without high-toxicity pesticides. Visit [www.beyondpesticides.org](http://www.beyondpesticides.org).



## **Hurricane Aftermath—Health and Housing Damaged Lead-Based Paint**

Damaged and deteriorating lead-based paint can be a concern in hurricane impact zones where houses and apartment buildings were built during or before 1978. Damage to lead-based paint can occur during a hurricane from direct physical impacts to the structure, and rapid deterioration of the paint can stem from water intrusion due to flooding or leaks following roof or exterior wall damage. Lead exposure causes a wide range of serious neurological, physical, and behavioral problems, especially in children.

To protect against poisoning from damaged or deteriorated lead-based paint, property owners should take the following steps:

- If a house or apartment building was constructed prior to 1978, property owners should assume that the structure contains lead-based paint.
- Take appropriate measures to dry out the entire structure of the house or apartment building. As soon as safe, reliable power is restored, fans; dehumidifiers; window air conditioners; and undamaged, uncontaminated, properly filtered HVAC systems can be used to dry out a building. All houses and apartment buildings should also have ventilation systems repaired if damaged. Inadequate drying can lead to the rapid deterioration of lead-based paint.
- Avoid all contact with paint dust, and keep children away from areas where paint has been damaged.
- If paint has been damaged, remove it using lead-safe work practices such as wet scraping and wet sanding. Be sure to seal off any areas where repair work is being done, and cover the entire floor with plastic sheeting. Make sure to wear clothing you can dispose of after repair work is completed, and be sure that all areas have been cleaned with hot, soapy water. **Never** use sandblasting to remove paint from houses or apartment buildings constructed before 1978, **never** use heat guns or torches, and **never** use dry sanding or power sanding methods unless the equipment is properly fitted with HEPA-filtered vacuum devices. Where possible, use contractors specifically trained in lead-safe work practices.
- Following any repair, renovation, or remodeling work, ensure the house or apartment building has been properly and thoroughly cleaned, and ensure that a lead dust test has been conducted to ensure that invisible hazards do not remain.

- During any repair, renovation, or remodeling work, temporarily relocate all building occupants to ensure their safety.

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