

# Hurricane Clean Up and Recovery

## Introduction

Avoiding Dangers Associated with Cleanup and Recovery from Hurricanes is accomplished by adhering to appropriate safety measures. The U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) and Department of Health and Human Services Centers for Disease Control and Prevention (CDC) have issued safety information pages on appropriate safety measures.

The potential for fatal accidents involving electrocution from power lines, as well as serious injuries associated with cleanup and recovery efforts for workers and the public can be avoided when they observe appropriate safety and health precautions while performing cleanup and utility restoration operations. This includes coordinating with control centers responsible for power circuits so that workers do not enter areas where there are live wires.

Information on avoiding hazards and safely cleaning up after a hurricane is available from OSHA and CDC websites to help workers who are involved in recovery and restoration efforts. This paper reviews most of the safety topics in summary form and lists websites for expanded information.

## Common hazards include:

- Cleanup Health Hazards
- Falls
- Heat/Sun
- Fungi
- Flood Cleanup
- Electrical
- Animals-Insects-Reptiles/Snakes
- Bloodborne Pathogens

## Cleanup Hazards

Cleanup work of any kind is hazardous, but flood conditions make it even more so. Following the procedures listed below should help improve your safety while cleaning up.

## Health Tips

Take frequent rest breaks when lifting heavy, water-laden objects. Avoid overexertion and practice good lifting techniques. To help prevent injury, use teams of two or more to move bulky objects; avoid lifting any materials that weigh more than 50 pounds per person, and use proper automated lifting assistance devices if practical.

Cleanup work of any kind is hazardous, but flood conditions make it even more so.

When working in hot/sunny environments, have plenty of drinking water available, use sunscreen, and take frequent rest breaks. Wear light-colored, loose-fitting clothing.

Be sure a first-aid kit is available to disinfect any cuts or abrasions. Protect open cuts and abrasions with waterproof gloves or dressings.

Wash your hands often during the day, especially before smoking, eating, drinking, or applying cosmetics.

### **General Precautions**

- Use a wooden stick or pole to check flooded areas for pits, holes, and protruding objects before entering.
- Ensure that all ladders and scaffolds are properly secured prior to use.
- Conduct a preliminary worksite inspection to verify stability before entering a flooded or formerly flooded building or before operating vehicles over roadways or surfaces. Don't work in or around any flood-damaged building until it has been examined and certified as safe for work by a registered professional engineer or architect.
- Washouts, trenches, excavations, and gullies must be supported or their stability verified prior to worker entry. All trenches should be supported (e.g., with a trench box); if no support is available, the trench must be sloped at no less than a 1:1 (45°) angle for cohesive soil and 1:1½ (34°) angle for granular soils including gravel, sand, and loamy sand or submerged soil or soil from which water is freely seeping.
- Establish a plan for contacting medical personnel in the event of an emergency.
- Report any obvious hazards (downed power lines, frayed electric wires, gas leaks or snakes) to appropriate authorities.
- Avoid deadly carbon monoxide. Use fuel-powered generators, pressure washers, camp stoves and charcoal burning devices outdoors. Do not bring them indoors or use them near an open window.
- Use life-vests when engaged in activities that could result in deep water exposure.
- Use extreme caution when handling containers holding unknown substances or known toxic substances (for example floating containers of household or industrial chemicals). Contact the Environmental Protection Agency for information on disposal at the National Response Center (1-800-424-8802).
- Do NOT use improvised surfaces (e.g., refrigerator racks) for cooking food or for boiling water to avoid exposure to heavy metals.

### **Clothing and Personal Protective Equipment**

Always wear watertight boots with steel toe and insole, gloves, long pants, and safety glasses during cleanup operations; sneakers should NOT be worn because they will not prevent punctures, bites or crush injuries. Wear a hardhat if there is any danger of falling debris.

Wear a NIOSH-approved respirator if working with moldy building materials or vegetable matter (hay, stored grain, or compost).

When handling bleach or other chemicals, follow the directions on the package; wear eye, hand, and face protection as appropriate; and have plenty of clean water available for eyewash and other first-aid treatments.

### **Electrical Hazards**

Do NOT touch downed power lines or any object or water that is in contact with such lines. Treat all power lines as energized until you are certain that the lines have been de-energized.

Beware of overhead and underground lines when clearing debris. Extreme caution is necessary when moving ladders and other equipment near overhead power lines to avoid inadvertent contact.

If damage to an electrical system is suspected (for example, if the wiring has been under water, you can smell burning insulation, wires are visibly frayed, or you see sparks), turn off the electrical system in the building and follow lock-out/tag-out procedures before beginning work. Do not turn the power back on until electrical equipment has been inspected by a qualified electrician. When using a generator, be sure that the main circuit breaker is OFF and locked out prior to starting the generator. This will prevent inadvertent energized power lines from back feed electrical energy from generators and help protect utility line workers from possible electrocution.

Be aware that de-energized power lines may become energized by a secondary power source such as a portable backup generator.

Any electrical equipment, including extension cords, used in wet environments must be marked, as appropriate, for use in wet locations and must be undamaged. Be sure that all connections are out of water.

All cord-connected, electrically operated tools and equipment must be grounded or be double insulated.

Ground-fault circuit interrupters (GFCIs) must be used in all wet locations. Portable GFCIs can be purchased at hardware stores.

### **Fire Protection**

Immediately evacuate any building that has a gas leak until the leak is controlled and the area ventilated.

Be sure an adequate number of multi-rated fire extinguishers are available and re-evaluate the fire evacuation plan.

Be sure all fire exits are clear of debris and sand bags.

### **Flood Cleanup**

Flooding can cause the disruption of water purification and sewage disposal systems, overflowing of toxic waste sites, and dislodgement of chemicals previously stored above ground. Although most floods do not cause serious outbreaks of infectious disease or chemical poisonings, they can cause sickness in workers and others who come in contact with contaminated floodwater. In addition, flooded areas may contain electrical or fire hazards connected with downed power lines.

**Floodwater**

Floodwater often contains infectious organisms, including intestinal bacteria such as E. coli, Salmonella, and Shigella; Hepatitis A Virus; and agents of typhoid, paratyphoid and tetanus. The signs and symptoms experienced by the victims of waterborne microorganisms are similar, even though they are caused by different pathogens. These symptoms include nausea, vomiting, diarrhea, abdominal cramps, muscle aches, and fever. Most cases of sickness associated with flood conditions are brought about by ingesting contaminated food or water. Tetanus, however, can be acquired from contaminated soil or water entering broken areas of the skin, such as cuts, abrasions, or puncture wounds. Tetanus is an infectious disease that affects the nervous system and causes severe muscle spasms, known as lockjaw. The symptoms may appear weeks after exposure and may begin as a headache, but later develop into difficulty swallowing or opening the jaw.

Floodwaters also may be contaminated by agricultural or industrial chemicals or by hazardous agents present at flooded hazardous waste sites.

Flood cleanup crew members that must work near flooded industrial sites also may be exposed to chemically contaminated floodwater. Although different chemicals cause different health effects, the signs and symptoms most frequently associated with chemical poisoning are headaches, skin rashes, dizziness, nausea, excitability, weakness, and fatigue.

Pools of standing or stagnant water become breeding grounds for mosquitoes, increasing the risk of encephalitis, West Nile Virus or other mosquito-borne diseases. The presence of displaced wild and domesticated animals in populated areas increases the risk of diseases caused by animal bites (e.g., rabies) as well as diseases carried by fleas and ticks. Other displaced creatures may be present such as insects/spiders and reptiles/snakes. Be watchful for these and take necessary precautions to stay aware from them.

**Protect Yourself**

After a major flood, it is often difficult to maintain good hygiene during cleanup operations. To avoid waterborne disease, it is important to wash your hands with soap and clean, running water, especially before work breaks, meal breaks, and at the end of the work shift. Workers should assume that any water in flooded or surrounding areas is not safe unless the local or state authorities have specifically declared it to be safe. If no safe water supply is available for washing, use bottled water; water that has been boiled for at least 10 minutes or chemically disinfected water. (To disinfect water, use 5 drops of liquid household bleach to each gallon of water and let sit for at least 30 minutes for disinfection to be completed.). These methods will kill most pathogens but will not remove hazardous chemicals. If water is not available, use alcohol-based products made for washing hands. Water storage containers should be rinsed periodically with a household bleach solution.

Remember that a building's own water systems can become contaminated in a flood. Hot water heaters, circulating pumps or other water system openings can become contaminated with floodwaters. When this occurs building drinking water may not be safe even though the local water supply has been cleared for consumption. Building water should be flushed and tested for the same chemical and biological contaminants that are tested in public water supplies.

Testing should include Legionella bacteria, which can proliferate in hot water systems. Water tests should be collected at multiple locations so distribution piping is included.

If water is suspected of being contaminated with hazardous chemicals, cleanup workers may need to wear special chemical protective outer clothing and goggles. Before entering a contaminated area that has been flooded, you should don plastic or rubber gloves, boots, and other protective clothing needed to avoid contact with floodwater.

Decrease the risk of mosquito and other insect bites by wearing long-sleeved shirts, long pants, and by using insect repellents. Wash your hands with soap and water that has been boiled or disinfected before preparing or eating foods, after using the bathroom, after participating in flood cleanup activities, and after handling articles contaminated by flood waters.

### **What to do if Symptoms Develop**

If a cleanup worker experiences any of the signs or symptoms listed above, appropriate first-aid treatment and medical advice should be sought. If the skin is broken, particularly with a puncture wound or a wound in contact with potentially contaminated material, a tetanus vaccination may be needed if it has been five years or more since the individual's last tetanus shot.

### **Tips to Remember**

- Before working in flooded areas, be sure your tetanus shot is current (given within the last 10 years). Wounds that are associated with a flood should be evaluated for risk; a physician may recommend a tetanus immunization.
- Consider all water unsafe until local authorities announce that the public water supply is safe and building water is tested. Private wells will need to be tested and disinfected after floodwaters recede.
- Do not use contaminated water to wash and prepare food, brush your teeth, wash dishes, or make ice.
- Keep an adequate supply of safe water available for washing and potable water for drinking.
- Be alert for chemically contaminated floodwater at industrial sites.
- Use extreme caution with potential chemical and electric hazards, which have great potential for fires and explosions. Floods have the strength to move and/or bury hazardous waste and chemical containers far from their normal storage places, creating a risk for those who come into contact with them. Any chemical hazards, such as a propane tank, should be handled by the authorized public authorities.
- If the safety of a food or beverage is questionable, throw it out. Canned or bottled foods or beverages that are to be used should first have labels removed, clean and disinfect all outside surface are and re-label the contents.
- Seek immediate medical care for all animal, insect, and reptile bites.

## Fungi

Flood conditions contribute to the growth and transmission of many kinds of fungi some of which can cause sickness. Cleanup workers are at increased risk of exposure to airborne fungi and their spores because they often handle moldy building materials, decaying vegetable matter, rotting waste material, and other fungus-contaminated debris. The fungal material is carried into the respiratory tract when airborne dust particles are inhaled.

There are many different kinds of fungi, including mildew, molds, rusts, and yeasts. Most of these are harmless, but some can cause respiratory and other disorders when workers inhale or come into contact with fungi. Inhalation is the route of exposure of most concern to flood cleanup workers.

When buildings are exposed to water infiltration fungi will grow on any surface, which is a good nutrient. Good nutrients include a wide variety of common building materials like drywall ceiling tiles, wood and carpet. If clean up begins within 48 hours following water impact there is minimal risk from fungi exposure. After 48 hours mold growth will occur and proliferate as long as there is nutrients and wet conditions. In a flood situation this is especially a problem since we are often without power for an extended period of time.

If there is extensive visible mold growth (greater than 1000 square feet of building material) consideration should be given to obtaining professional assistance. A mold specialist will design a clean up plan to address a buildings specific need. A mold remediation design will specify scope and methodology. A proper executed remediation will offer the following benefits:

- Ensure mold does not return after building reconstruction.
- Ensure that areas of the building not water impacted are not contaminated during remediation.
- Ensure following remediation buildings are safe to re-occupy.
- Ensure activities are efficient which controls cost and reduces remediation time.
- If some fungi clean up is planned we offer the following recommendations:
- Individuals who have mold allergies or pre-existing pulmonary conditions like asthma or emphysema should not be exposed to mold affected materials.
- If individuals have signs and symptoms of mold exposure they should cease clean up work. Symptoms would include allergic reactions such as nasal stuffiness, eye irritation, and wheezing.
- Individuals conducting clean up should minimize fungal exposure by wearing respirators, gloves, and eye protection. Use an N-95 NIOSH-approved disposable respirator.
- Repeated or prolonged contact of the skin with floodwater and continuous sweating can lead to fungal skin infections. These can be minimized or avoided by washing the skin with warm, soapy water and keeping it as dry as possible.
- Consider discarding all water-damaged materials. Articles that are visibly contaminated with mold should be discarded. When in doubt, throw it out.

- Surfaces that have a light covering of mold should be scrubbed with warm, soapy water and rinsed with a disinfectant made of ½ cup liquid household bleach mixed in one gallon of water. Prior to mixing and use wear appropriate protective eye wear, face and skin on fingers/hands.
- After working with mold-contaminated materials, wash thoroughly, including the hair, scalp, and nails.

In addition, repeated or prolonged contact of the skin with floodwater and continuous sweating can lead to fungal skin infections. These can be minimized or avoided by washing the skin with warm, soapy water and keeping it as dry as possible.

### **What to do if Symptoms Develop**

If a cleanup worker experiences severe allergic or skin symptoms, or severe flu-like symptoms, he or she should seek medical advice. A health care provider can determine whether medication or any other precautions are necessary.

### **Falls**

After a hurricane, danger often remains.

Falls from unstable working surfaces AND ladders, and falling objects pose significant danger to recovery workers. Fall protection is required for those working six feet or more above the ground.

### **Resources/references:**

*Aires Consulting Group, Inc. 800-247-3799 [www.airesconsulting.com](http://www.airesconsulting.com)*

*Information/Referral and On Site Hazard Assessment*

*OSHA [www.osha.gov](http://www.osha.gov)*

*National Disaster Recovery*

*CDC [www.bt.cdc.gov/disasters/hurricanes/index.asp](http://www.bt.cdc.gov/disasters/hurricanes/index.asp)*

*Hurricanes Health and Safety*

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301 E. Fourth Street, Cincinnati, OH 45202 F13783-LP (01/13)

