
# After Disaster Safety

# Risk Management Center Resources

# **Hurricanes—**Response and Recovery

**Objective:** To assure that personnel involved in hurricane response and recovery operations are aware of common hazards and safe practices.

Hurricanes present several potential causes of severe damage, from rain and flooding to high winds and flying objects. Some of these conditions can persist after the storm has passed, so individuals left in its wake need to be familiar with precautions and hazards associated in recovery operations.

## Worksite Evaluation and Exposure Monitoring:

Evaluate the site to identify any potential safety or health hazards.

- Prior to beginning work in hurricane areas, evaluate the site to identify any potential safety or health hazards and plan and employ appropriate controls to mitigate them.
- Certain tasks may require exposure monitoring, such as those involving work in areas with hazardous materials (e.g. lead, asbestos) or conditions (e.g. gases or fumes, noise). Assure that proper monitoring systems are in place before beginning work on these tasks.

## General Safe Practices:

- Establish an evacuation plan, including safe evacuation routes and a system to alert individuals if evacuation is required.
- Assure that fire protection and suppression equipment is on site and in good working condition.
- Assure that first aid supplies and services are readily accessible for all employees.

# **Hurricanes—**Response and Recovery

## General Safe Practices (continued):

- Maintain good hygiene habits, such as thoroughly washing hands with soap and clean water, alcohol-based sanitizers, or sanitizing wipes.
- Do not consume food or water that has been in contact with contaminated water or objects.
- Use sealable containers for trash or debris disposal.
- Avoid disturbing or creating dust and working upwind of dusty areas or activities when possible.

## Common Hazards and Controls:


- **Flooding:** Hurricanes can be responsible for major flooding events, which can present numerous health and environmental dangers in addition to those caused by the hurricane. Familiarize yourself with common flooding hazards and take any extra precautions as necessary.
- **Structural instability:** A damaged building's structural integrity may be difficult to determine at first glance, so have a competent person inspect a structure's stability if access is necessary. Add temporary structural reinforcements and limit access to necessary personnel and areas.
- **Downed power lines:** Downed or damaged power lines may still be energized, so keep a safe distance from the lines and any structures, objects, or bodies of water they may be in contact with.

# **Hurricanes—**Response and Recovery

## Common Hazards and Controls (continued):

- **Slips, trips, and falls:** Keep designated walkways or travel paths clear from tripping hazards or ledges, and cover or protect holes as they are discovered or created. If working at heights, limit access to trained personnel and use fall protection such as guardrails, safety nets, harnesses, or similar devices.

- **Impact from flying objects:** Use eye or face protection such as safety glasses, safety goggles, or face shields as appropriate.

- **Manual or heavy lifting:** Use safe lifting practices and take frequent breaks when dealing with heavy or water-laden objects.

- **Discovery of unknown chemicals:** Take defensive measures, such as moving to a safe distance upwind from the chemical's source, and contact HAZMAT personnel for risk evaluation and removal of the chemicals. Re-evaluate PPE requirements as necessary.

- **Cuts or lacerations:** Take extra precaution when handling or working with or near sharp objects, and treat and bandage or cover any cuts or lacerations immediately.

- **Personal hygiene:** Maintain good hygiene habits, such as thoroughly washing hands with soap and clean water, alcohol-based sanitizers, or sanitizing wipes. Do not consume food or water that has been in contact with contaminated water or objects.

- **Fatigue, heat, cold stress:** Pay attention to signs of fatigue or stress caused by heat or cold. Allow for adequate rest, sleep, and meal breaks throughout the day.

- **Contact with animals:** Hurricane conditions can displace wild animals, such as snakes, alligators, or rodents, introducing them to populated areas. Pools of stagnant water can also be a breeding ground for disease-carrying insects such as mosquitoes. Take extra precaution if wild animals are discovered and do not handle without proper training, and use insect repellant or netting.

# **Hurricanes—**Response and Recovery

This form documents that the training specified above was presented to the listed participants. By signing below, each participant acknowledges receiving this training.

Organization:_____ Date: _____

Trainer:_____ Trainer's Signature: _____

**Class Participants:**

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*Remember to document attendance in the Training Track application of the Risk Management Center.*

# Construction Safety - Demolition 1

**Required preparations prior to starting:**

- **Site study:** Before beginning the actual work of demolition, a careful study should be made of the structure that is to be torn down, as well as its surroundings. A definite plan or procedure should then be mapped out, and thereafter followed as closely as possible. The following rules should be incorporated as part of this plan.
- **Shoring of other buildings:** This is often necessary, and plans should be made to carry out all operations of this kind promptly.
- **Structures wrecked by fire, flood, explosion or other catastrophe:** It may be necessary to shore up or brace some of the walls of the building that are to be taken down, before the wrecking operations can be safely started.
- **Notify and protect the public:** Before the wrecking operations begin, protection of the public against falling objects should be provided when the building stands close to a street or to a much frequented roadway of any kind. The entire sidewalk adjoining the building should be fenced off, and sidewalk sheds constructed where necessary. Sidewalk sheds should be capable of supporting a load of 150 pounds per square foot. If material is to be piled on the sheds, they should be able to support 300 pounds per square foot.
- **Utilities:** All gas, electricity and water should be shut off at the outset, and all windows, glass doors and other fragile fixtures removed before proceeding with any other work. The lath and plaster then should be stripped off throughout the entire building.
- **Personal protective equipment:** Employees should use hard hats, safety goggles, safety shoes and gloves are particularly recommended. All floor openings should be kept covered, except where in actual use for lowering materials. If this is not feasible, toe-boards and hand rails should be installed around the openings.
- **Proceed systematically:** Proceed story by story, and the work on the upper floors should be completed before any of the supporting members on the lower floors are disturbed.
- **Material removal:** Material should never be thrown to the ground. It should be lowered to the ground or to the top of the sidewalk shed by means of rope and suitable tackle. Debris should be removed by means of wooden or metal chutes.
- **Projective nails:** All projecting nails in boards, planks and timber should be carefully removed, hammered in or bent in a safe way. Good housekeeping is of extreme importance.

# Construction Safety - Demolition 1

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*Remember to load your completed trainings into the Risk Management Center.*

# **Floods—**Environmental Hazards

**Objective:** To assure familiarity and understanding of common environmental hazards present in flooded areas.

Floods present numerous environmental dangers, both during and after the flooding has occurred.

Before entering a flooded area, familiarize yourself with the area to determine any potential hazards you may encounter, and proceed with extreme caution.

## Common hazards:

- **Chemical or toxic environments:** If the flood occurred in close proximity to where agricultural chemicals, industrial chemicals, or other hazardous agents were used or stored, they may have contaminated the floodwater. Also, storage tanks or other containers may be swept downstream, presenting leaking or explosion hazards.
- **Biological waste:** Floodwater can be contaminated by rotting vegetation, dead animals, or untreated sewage.
- **Fire:** Floodwater contaminated with flammable chemicals or materials can ignite if it comes in contact with an existing fire or other source of heat or sparks. Additionally, floods can destroy fire protection systems and inhibit emergency response efforts if a fire were to occur.
- **Electrical hazards:** Flooding may cause downed power lines, and standing water near electrical equipment creates an electrocution hazard.
- **Wild animals:** Flooding can displace wild animals, such as snakes, alligators, or rodents, introducing them to populated areas. Stagnant water can also be a breeding ground for disease-carrying insects such as mosquitoes.
- **Mold:** Standing water may breed mold, which can cause allergy-like symptoms and aggravate existing allergies, asthma, or sinus or lung illnesses.
- **Driving:** It takes as little as six inches of standing water to cause some vehicles to stall and only two feet of moving water to sweep some vehicles away.

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# **Floods—**Health Hazards

**Objective:** To assure familiarity and understanding of common health hazards present in flooded areas.

Floods are extremely dangerous to life and health, even in their aftermath. Everyone involved in response and recovery operations must be aware of the hazards they face.

## Drowning:

Drowning is always a risk in the presence of bodies of water. The risk increases when the water is actively moving.

Never work in or near floodwaters alone, and always use a Coast Guard-approved personal floatation device (**PFD**).

## Exhaustion:

Employees in rescue and recovery operations may face long, stressful shifts.

When possible, shifts should be no longer than eight hours, and additional breaks and meals should be available for longer shifts.

Plan to perform more physically or mentally demanding tasks at the beginning of the shift.

## Hypothermia:

Hypothermia can occur after prolonged exposure to water cooler than 75°F.

Symptoms include uncontrollable shivering, slow or impaired speech, impaired coordination, drowsiness, and exhaustion.

# **Floods—**Health Hazards

## Hypothermia (continued):

**Avoiding hypothermia:**

- Wear clothing appropriate for wet, cold, and windy conditions (e.g., polypropylene base layers), layers, hats, and gloves.
- Take regular breaks in warm, dry areas.
- Be mindful of the weather forecast and plan to work during the warmest part of the day whenever possible.
- Avoid working when fatigued or exhausted.
- Eat warm, high-calorie meals and drink warm, sweet beverages. Avoid caffeine and alcohol.

## Heat illness:

**Types:**

- **Heat cramps:** These muscle spasms are caused by salt imbalance.
- **Heat exhaustion:** This can occur if you work in high temperatures and do not properly hydrate. Symptoms include headaches, dizziness, nausea, excessive perspiration, dehydration, and a body temperature of 100.4°F or greater.
- **Heat stroke:** Untreated heat exhaustion can lead to heat stroke, which causes the body's temperature regulation mechanisms to shut down. Symptoms include body temperature of 104°F or higher, confusion, unconsciousness, and seizures.

**If heat illness occurs:**

- Stop activities, and notify a supervisor or 911.
- Stay with the victim until help arrives.
- Move the victim to a cooler, shaded location.
- Remove outer layers of clothing.
- Fan and mist the victim with water and apply ice towels or bags to their body.
- If the victim is able to drink, provide cool, clean water.

# **Floods—**Health Hazards

## Contaminated water:

Floodwater can contain **infectious organisms**, such as E. coli, salmonella, Hepatitis A, and agents of tetanus and typhoid. Symptoms include fever, vomiting, and muscle aches. Floodwater can also contain chemical and other hazardous agents.

**Avoiding infection:**

- Maintain hygiene, washing in safe water.
- Always assume that floodwater is contaminated until authorities say otherwise.
- If the local water is unsafe, use bottled water, or water that has been boiled or chemically disinfected.
- Keep food and water supplies clear from floodwater or any other contaminants.
- Assure any applicable vaccinations are current before working in or near floodwater (e.g., tetanus shots).
- If skin is broken, seek treatment and protect it from contact with floodwater.
- Use proper personal protective equipment (PPE) to avoid contact with floodwater.

# **Floods—**Health Hazards

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# OSHA & NIOSH Resources

OSHA® FactSheet

# Cleanup Hazards

**Cleanup work of any kind is hazardous, but flood conditions make it even more so. Following the procedures listed below will help to keep you safe and healthy while cleaning up after natural disasters that involve flooding.**

## 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.
- When working in hot environments, have plenty of drinking water available, use sunscreen, and take frequent rest breaks. Wear light-colored, loose-fitting clothing.
- Be sure that 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 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. Do not 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 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 angular gravel and a 1½:1 (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.
- Use fuel-powered generators outdoors. Do not bring them indoors, as they may pose a carbon monoxide (CO) hazard.
- 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 EPA (Environmental Protection Agency) for information on disposal at the National Response Center (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 a 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 dust 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 power 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 lockout/tagout 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 energization of power lines from backfeed electrical energy from generators and help protect utility line employees 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 that an adequate number of fire extinguishers are available and re-evaluate the fire evacuation plan.
- Be sure that all fire exits are clear of debris and sandbags.



**For more complete information:**

OSHA® Occupational Safety and Health Administration

U.S. Department of Labor

**www.osha.gov**

**(800) 321-OSHA**

DSTM 10/2005

OSHA FactSheet

# Demolition and Cleanup

Before starting a demolition, the person or persons in charge must adequately prepare for the task with regard to the health and safety of the workers. These preparatory operations involve the overall planning of the demolition job, including the methods to be used to bring the structure down, the equipment necessary to do the job, and the measures to be taken to perform the work safely. Before doing demolition work, inspect available personal protective equipment (PPE), and select, wear and use the PPE appropriate for the task.

Demolition work involves many of the same hazards associated with construction work. However, demolition also poses additional hazards due to unknown factors such as: deviations from the structure's original design, approved or unapproved modifications that altered the original design, materials hidden within structural members, and unknown strengths or weaknesses of damaged materials. To counter these unknowns, all personnel involved in a demolition project need to be fully aware of these types of hazards and the safety precautions available to control these hazards.

## Preliminary Tasks

A written engineering survey must be performed on each structure being considered for demolition to determine the condition of the framing, floors and walls, and to assess the possibility of an unplanned collapse of any portion of the structure. Brace or shore the walls and floors of structures which have been damaged and which employees must enter. Inspect and maintain all stairs, passageways and ladders. Properly illuminate all stairways.

Shut off or cap all electric, gas, water, steam, sewer and other service lines outside the building line. Notify appropriate utility companies. Temporarily relocate and protect any essential power, water, or other utilities.

Determine the types of hazardous chemicals, gases, explosives, and flammable materials which have been used in any pipes, tanks, or other equipment on the property. Test and purge the hazardous chemicals, gases, explosives, or flammable materials. Survey for asbestos or other hazardous materials.

Guard wall openings to a height of 42 inches. Cover and secure floor openings with material able to withstand the loads likely to be imposed. Debris dropped through holes in the floor without the use of chutes must be completely enclosed with barricades not less than 42 inches high and not less than 6 feet back from the projected edge of the opening above. Floor openings used for material disposal must not be more than 25% of the total floor area. Use enclosed chutes with gates on the discharge end to drop material to the ground. Design and construct chutes that will withstand the loads likely to be imposed without failing.

Post signs at each level of structures, warning of the hazard of falling materials. Protect entrances to multi-story structures with sidewalk sheds or canopies for a minimum of 8 feet. Canopies must be at least 2 feet wider than the structure entrance and be able to hold a load of 150 lbs./sq. ft. Storage of material and debris must not exceed the allowable floor load.

## Removing Walls and Masonry Sections

Demolition of exterior walls and floors must begin at the top of the structure and proceed downward. Masonry walls must not be permitted to fall on the floors of a building in

masses that would exceed the safe carrying capacities of the floors.
No wall section, one story in height or higher, shall be permitted to stand alone without lateral bracing, unless such a wall was originally designed and constructed to stand without such lateral support, and is safe enough to be self-supporting. All walls must be left in a stable condition at the end of each work shift. Employees shall not work on the top of a wall when weather conditions create a hazard.

Structural or load-supporting members on any floor must not be cut or removed until all stories above such a floor have been removed. In buildings of "skeleton-steel" construction, the steel framing may be left in place during the demolition of masonry. Walkways or ladders must be provided to enable workers to safely reach or leave any scaffold or wall. Walls, which serve as retaining walls to support earth or adjoining structures, must not be demolished until the supporting earth has been properly braced or until adjoining structures have been properly underpinned. Walls, which will serve as retaining walls against which debris will be piled, must not be used unless they are capable of supporting the imposed load. Dismantle steel construction column length by column length, and tier by tier.

## Mechanical Demolition

No workers shall be permitted in any area when using a crane's headache ball or clamshell to remove debris. Only those workers necessary to perform such operations must be permitted in this work area at any time. The weight of the demolition ball must not exceed 50 percent of the crane's rated load. The crane boom and loadline must be as short as possible. The ball must be attached to the loadline with a swivel-type connection to prevent twisting of the loadline, and it must be attached by positive means in such a manner that the weight cannot become accidentally disconnected.

When pulling over walls or portions thereof, all steel members affected must have previously been cut free. All roof cornices or other such ornamental stonework must be removed prior to pulling walls over. During demolition, continuing inspections by a competent person shall be made as the work progresses to detect hazards resulting from weakened or deteriorated floors, or walls, or loosened material. No employee shall be permitted to work where such hazards exist until they are corrected by shoring, bracing, or other effective means.

**This is one in a series of informational fact sheets highlighting OSHA programs, policies or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to Title 29 of the Code of Federal Regulations. This information will be made available to sensory impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.**

**For more complete information:**

OSHA Occupational Safety and Health Administration

**U.S. Department of Labor**
www.osha.gov
(800) 321-OSHA

**DOC 10/2005**

OSHA FactSheet

# 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 who 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 wild 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.

## 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 it sit for at least 30 minutes for disinfection to be completed.) Water storage containers should be rinsed periodically with a household bleach solution.

If water is suspected of being contaminated with hazardous chemicals, cleanup workers may need to wear special chemical resistant outer clothing and protective 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 repellants. 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 floodwater. In addition, children should not be allowed to play in floodwater or with toys that have been in contact with floodwater. Toys should be disinfected.

## 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 that comes into 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 that 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.
- 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 fire department or police.
- If the safety of a food or beverage is questionable, throw it out.
- Seek immediate medical care for all animal bites.



**For more complete information:**

OSHA Occupational Safety and Health Administration

**U.S. Department of Labor**

www.osha.gov

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OSHA® FactSheet

# Mold Hazards during Disaster Cleanup

**Flood and water damage inside buildings after disasters contribute to the growth of mold. Remediation of mold-contaminated building materials can be done safely.**

## What is Mold and Why is it Hazardous?

Mold is a type of fungi. Most molds reproduce by forming spores which are released into the air. When spores land on a suitable moist surface they begin to grow, can penetrate porous materials and release chemicals. Most molds are harmless but some can cause infections, allergy symptoms and produce toxins. Infections are rare in healthy individuals and the effect of toxins is still not well understood. Nevertheless, mold remediation is often necessary to return working spaces to a safe condition and make them suitable for occupancy.

## Mold Clean-up Plan

The most important requirement is to control the source of moisture. Next, survey the types of materials and the size of the area involved. This may become important in determining the strategy for remediation and worker protection. Materials that cannot be dried and fully cleaned are removed using methods that minimize occupant exposure to spores. Mold remediation often involves construction activities.

> **Note:** Drying can involve the use of fans, blowers and/or dehumidifiers. However, the more humid the air, the less effective the blowers will be.
> **Note:** It is often more cost-effective to remove and replace the building materials than to dry and clean mold-contaminated materials.

## Types of Building Materials: Porous (water absorbing), Non-porous, or Semi-porous

***Non-porous*** materials (e.g., metal, glass, hard plastics, etc.) can be dried out, fully cleaned and reused. Clean hard and non-porous materials using a detergent. Surfaces can be rinsed with a disinfectant made of ½ cup liquid household bleach mixed into one gallon of water (**Caution:** DO NOT mix bleach with cleaning products that contain ammonia).

***Semi-porous*** materials (e.g., wood and concrete) can be cleaned if they are structurally sound.

***Porous*** materials (e.g., drywall, carpets, insulation, ceiling tile, etc.) are different because mold penetrates into them making it very difficult to fully clean. As a general rule, if a porous material has been wet for over 48 hours it is best to remove and replace.

## How Big an Area is Involved in Mold Remediation?

### *Small Areas of Mold Remediation (i.e., < 30 ft.$^2$)*

As a general rule, small areas of water damage require less control when remediating.

- The work area should be unoccupied; removing people from adjacent spaces is not necessary but is recommended for infants, persons recovering from surgery, immune suppressed people, or people with asthma, hypersensitivity pneumonitis and severe allergies.
- Containment of the work area is not necessary.
- Cover surfaces in the work area that could become contaminated with secured plastic sheets to contain dust and debris, and prevent further contamination.

### *Large Areas of Mold Remediation (i.e., 30-100 ft.$^2$)*

- The work area and areas directly adjacent to it should be unoccupied.
- Cover surfaces in the work area and adjacent areas that could become contaminated with secured plastic sheets to contain spores, dust and debris to prevent further contamination.
- Seal ventilation ducts/grills in the work area and areas directly adjacent with plastic sheeting.
- If remediation procedures are expected to generate a lot of dust (e.g., abrasive cleaning of contaminated surfaces, demolition of plaster walls) or the visible concentration of mold is heavy (i.e., blanket versus patchy coverage) follow the extensive contamination procedures below.

### *Extensive and Visible Mold Contamination*

- Develop a suitable mold remediation plan. The plan should address: work area isolation, the use of exhaust fans with high-efficiency particulate air (HEPA) filtration, and the design of airlocks/ decontamination room.

- Consult with industrial hygienists or other environmental health and safety professionals with experience performing mold remediation before beginning this level of remediation.

## How to Protect Workers during Mold Remediation

Worker protection uses engineering controls, work practices and personal protective equipment (PPE) during mold remediation. Inhalation is the route of exposure of most concern to cleanup workers.

### *Engineering Controls*

- Re-wetting materials with a mist of water to suppress spores, dust and debris.
- Wrap and seal the items that will be discarded in plastic bags or sheets to reduce the spread of spores.
- Provide natural or local exhaust ventilation during all cleaning steps.

### *Work Practices*

- Do not eat, drink, or smoke in work areas.
- Avoid breathing dusts.
- After an area has been cleaned and is completely dry, vacuum the area with a HEPA vacuum. HEPA vacuums are also recommended for cleaning up dust that may have settled on surfaces outside the work area.
- The work area and areas used by remediation workers for egress should be cleaned with a damp cloth or mop and a detergent solution. Set up a decontamination area.
- Leave the area clean, dry and free of visible debris.
- After working, wash thoroughly, including hair, scalp and nails.

### *Personal Protective Equipment (PPE)*

- Respirators:
  - For areas smaller than 100 ft.$^2$; use an approved respirator, at a minimum, either a half-face or full-face N, R, or P-95 respirator.
  - For areas greater than 100 ft.$^2$, areas where mold is heavy (blanket coverage rather than patchy), or areas where substantial dust is generated during cleaning or debris removal (e.g., abrasives are used to clean surfaces); use an approved respirator, at a minimum, either a half-face or full-face N, R, or P-100 respirator.
  - Charcoal-impregnated filters may be used for odors.
- Non-vented goggles.
- Long gloves made of material that will protect workers from chemicals used for surface cleaning.
- Protective clothing (e.g., disposable coveralls) to prevent contamination and skin contact with mold and chemicals. For areas greater than 100 ft.$^2$, ensure that protective clothing covers entire body including head and feet.

## Additional Information

Visit OSHA's Safety and Health Topics webpage on Mold at:
www.osha.gov/SLTC/molds/index.html

New York City Department of Health and Mental Hygiene Guidelines on Assessment and Remediation of Fungi in Indoor Environments:
www.nyc.gov/html/doh/html/epi/moldrpt1.shtml



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OSHA FactSheet

# Working Safely Around Downed Electrical Wires

Electrical hazards exist in some form in nearly all occupations. However, those hazards multiply for workers involved in cleanup and recovery efforts following major disasters and weather emergencies. One particular life-threatening danger exists around downed and low-hanging electrical wires.

## Safety First

Above all else, always consider all equipment, lines and conductors to be energized. Be cautious and if you notice downed wires or damaged electrical equipment, contact appropriate utility personnel. Remember that circuits do not always turn off when a power line falls into a tree or onto the ground. Even if they are not sparking or humming, fallen power lines can kill you if you touch them or even the ground nearby.

## Energy

Downed wires can energize other objects, including fences, water pipes, bushes and trees, buildings, telephone/CATV/fiber optic cables and other electric utilities. Even manhole castings and reinforcement bars (re/bar) in pavement can become energized by downed wires. During storms, wind-blown objects such as canopies, aluminum roofs, siding, sheds, etc., can also be energized by downed wires.

## Backfeed

When electrical conductors are inadvertently energized by other energy sources, backfeed occurs. Some of those sources include:

- Circuit ties/switch points
- Lightning
- Generators
- Downstream events

Simply testing for energy sources is not sufficient since hazardous electrical events can happen without warning. Ensure that proper lockout/tagout procedures are always followed.

## Rules to live by

- Do NOT assume that a downed conductor is safe simply because it is on the ground or it is not sparking.
- Do NOT assume that all coated, weather-proof or insulated wire is just telephone, television or fiber-optic cable.
- Low-hanging wires still have voltage potential even if they are not touching the ground. So, “don’t touch them.” Everything is energized until tested to be de-energized.
- Never go near a downed or fallen electric power line. Always assume that it is energized. Touching it could be fatal.
- Electricity can spread outward through the ground in a circular shape from the point of contact. As you move away from the center, large differences in voltages can be created.
- Never drive over downed power lines. Assume that they are energized. And, even if they are not, downed lines can become entangled in your equipment or vehicle.
- If contact is made with an energized power line while you are in a vehicle, remain calm and do not get out unless the vehicle is on fire. If possible, call for help.
- If you must exit any equipment because of fire or other safety reasons, try to jump completely clear, making sure that you do not touch the equipment and the ground at the same time. Land with both feet together and shuffle away in small steps to minimize the path of electric current and avoid electrical shock. Be careful to maintain your balance.

**This is one in a series of informational fact sheets highlighting OSHA programs, policies or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to Title 29 of the Code of Federal Regulations. This information will be made available to sensory impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.**

**For more complete information:**

OSHA Occupational Safety and Health Administration

**U.S. Department of Labor**

www.osha.gov

(800) 321-OSHA

**DOC 7/2005**

# NIOSH Hazard Based Interim Guidelines: Protective Equipment for Workers in Hurricane Flood Response

The purpose of this interim National Institute for Occupational Safety and Health (NIOSH) fact sheet is to provide general guidance for personal protective equipment (PPE) for workers responding in hurricane flood zones. This guidance is based on best available information as of September 9, 2005 and will be updated as additional information is available. PPE selection and use is site and task specific. General guidelines must be adapted to specific conditions.

This guidance represents professional judgment based on experience from responses to past storms and floods. Additional interim recommendations will be added for **clean-up** and **restoration** operations.

These interim recommendations focus on the following hazards associated with **response** activities:

Hazard 1 Sharp jagged debris
Hazard 2 Floodwater exposure
Hazard 3 Electrical hazards
Hazard 4 Contact with blood/body fluids and handling animal and human remains

Note: This guidance is not a comprehensive list of hazards and does not include important hazards such as stress or fatigue that are not addressed via PPE.

## Background:

Disaster sites pose many occupational health and safety concerns. These hazards and exposures are a function of the unstable nature of the site, the potential for worker exposure to unknown hazardous substances and the type of work performed. An accurate assessment of all hazards may not be possible because they may not be immediately obvious or identifiable. Where possible, NIOSH has made default recommendations for PPE that we believe will meet the probable hazards.

## General PPE Guidance:

For most work in flooded areas, or areas that have been subjected to flooding, response personnel will need the following personal protective equipment: hard hats, goggles or safety glasses, heavy work gloves, watertight boots with steel toe and insole (not just steel shank), and hearing protection where excessive noise from equipment poses a risk of hearing damage. PPE should be provided in a range of sizes to ensure proper fit.

For additional information on what equipment you need for protection against exposure to specific hazards, contact your local OSHA office or consult the NIOSH Pocket Guide to Chemical Hazards (http://www.cdc.gov/niosh/npg/npg.html).

## General Worker Safety Guidance:

Workers involved with hurricane or flood response should be aware of the potential dangers involved and the proper safety precautions.

CDC has developed general guidance for what workers should bring with them to the flood area: http://www.cdc.gov/travel/other/hurricane/hurricane_relief_workers.htm.

OSHA has worker safety guidance at the following link: http://www.osha.gov/OshDoc/hurricaneRecovery.html.

**Update: NIOSH Warns of Hazards of Flood Cleanup Work**
NIOSH Publication No. 94-123 identifies several hazards associated with the aftermath of a flood. (http://www.cdc.gov/niosh/flood.html).

Because the level of experience will vary among workers, response workers must work together and look out for one another to ensure safety.

In addition, response workers are at serious risk for developing heat stress. Excessive exposure to hot environments can cause a variety of heat-related problems, including heat stroke, heat exhaustion, heat cramps, and fainting. The need to use PPE can exacerbate heat exposures. Response workers should be familiar with heat stress symptoms.

OSHA has a pocket card on heat stress available at: http://www.osha.gov/Publications/osha3154.pdf
See http://www.cdc.gov/niosh/topics/heatstress/ for additional NIOSH information.

NIOSH urgently requests your assistance in disseminating this interim document to all workers involved in flood response.

# HAZARD 1: Sharp, jagged debris

## Risks:

Workers handling hurricane related debris may suffer wounds. Tetanus is a potential health threat for persons who sustain wound injuries. Also, any wound has the potential for becoming infected, and floodwater exposures may add to this concern.

## General PPE Recommendations:

Use heavy gloves to protect the hands when handling debris to minimize the chances of cuts and scrapes. Gloves designed to protect the skin from chemical exposure are not typically strong enough to protect from debris. Multiple layers of gloves (double gloving) may be necessary. Long pants, long sleeve shirts, boots, eye protection (safety glasses, goggles, or faceshields), and headgear are also appropriate.

## Additional Information:

Any wounds, cuts, or animal bites should be immediately cleansed with soap and clean water. Familiarity with basic first aid is advised to self-treat any injury until medical attention can be obtained. Additional information resources include:

Interim Immunization Recommendations for Emergency Responders
http://www.bt.cdc.gov/disasters/hurricanes/responderimmun.asp

Emergency Wound Care After a Natural Disaster
http://www.bt.cdc.gov/disasters/woundcare.asp

# HAZARD 2: Floodwater exposure

## Risks:

Floodwaters may contain bacteria from human and animal wastes. The most likely symptoms from an infection are stomach-ache, fever, vomiting and diarrhea. While skin contact with flood water does not, by itself, pose a serious health risk, emergency response personnel and the public should avoid direct contact with standing water when possible to minimize the chance for infection. Chemical contamination of floodwaters can also occur and contamination levels may be higher nearer to sources such as industrial locations.
Work in and around moving or standing water in flooded areas presents a risk of drowning. Standing or working in

water which is cooler than 75 degrees F (24 degrees C) will remove body heat more rapidly than it can be replaced, resulting in hypothermia.

## General PPE Recommendations:

Double gloving with a waterproof glove under a heavy work glove is the best way to protect the hands from both cuts and scrapes and floodwater exposure. Boots and rain gear can be used to prevent lower body skin exposures.

It is important to minimize contaminating the inside of the gloves. Gloves not disposed of should be cleaned with soap and water and dried between uses.

Floodwaters are associated with strong odors, but preliminary estimates and disease outbreak tracking do not suggest the need for a general recommendation for default respirator use by all personnel at this time. As with all emergency operations, site specific information should be used to tailor recommendations to the hazards and exposures at hand. For example, use of N95 respirators might be advisable adjacent to aerated floodwater where mists are created- such as potential tasks associated with repair of pumping facilities or discharge pipes. CDC will provide additional updates as more information becomes available.

Avoid working alone and wear a Coast Guard-approved life jacket or buoyant work vest when entering flood waters or working over or near flood waters. Refer to OSHA guidance:
http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10669

For additional information on what equipment you need for protection against chemical exposures, contact your local OSHA office or consult the NIOSH Pocket Guide to Chemical Hazards.
(http://www.cdc.gov/niosh/npg/npg.html).

## Additional Information:

Wearing wet gloves or PPE can cause dermal irritation. Long exposures to wet conditions can compromise the function of the skin barrier. Repeated use of impermeable gloves, especially in hot and humid conditions, can aggravate skin rashes. Cotton liners are sometimes used under protective gloves to improve comfort and to prevent dermatitis. Latex gloves should be avoided because of the risk of developing skin sensitivity or allergy.

Open wounds and skin conditions such as eczema and psoriasis may increase your risk of infection. Contamination of wounds with water (fresh or sea water) can lead to infections caused by waterborne organisms. See:
http://www.bt.cdc.gov/disasters/emergwoundhcp.asp

If skin contact with floodwaters does occur, CDC strongly advises the use of soap and water to clean exposed areas. Waterless alcohol-based hand rubs can be used when soap or clean water is not available. Hands should be washed after removal of gloves.

There is a wide range of damage, work scenarios, and tasks associated with hurricane response, and exposure assessments are not yet available. Local information should be used to tailor recommendations to the hazards and exposures at hand.

Firefighters and others involved with responding to fires should use appropriate respiratory protection. Post fire clean-up operations occurring at industrial or chemical facilities may warrant use of protective equipment.

As conditions dry out, there is some likelihood that demolition operations may generate dust exposures for construction and restoration workers. It is likely that other special tasks (e.g. welding and cutting) may generate airborne hazards and that respiratory protection will be needed. CDC will provide additional updates as more information becomes available.

# HAZARD 3: Electrical Hazards

## Risks:

Electrical, overhead power lines, power junctions, and downed electrical wires and cables can cause electrocution and burns. Fallen lines can also energize other objects such as fences, ladders, or metal building parts. Use of improperly sized or operated portable generators can during electrical outages can also cause “backfeed” injuries to

workers performing repair work in neighboring buildings. Only trained electricians and utility workers should approach or handle electrical lines. All other response workers should avoid going near all downed lines and should treat them as if energized.

## General PPE Recommendations:

Special electrically resistant PPE including headgear, gloves, boots, and appropriate eye protection are used by electricians and utility workers.

## Additional information:

Special electrical PPE is only one aspect of electrical safety practice. Special training and practices to test, de-energize, isolate, and/or lockout hazardous energy sources are important. See the NIOSH electrical safety page at: http://www.cdc.gov/niosh/injury/traumaelec.html

OSHA has electrical safety factsheets at:
http://www.osha.gov/OshDoc/data_General_Facts/downed_electrical_wires.pdf
http://www.osha.gov/OshDoc/data_Hurricane_Facts/elect_safety.pdf

CDC has a factsheet on “backfeed” and power outage safety at: http://www.bt.cdc.gov/poweroutage/workersafety.asp

# Hazard 4: Contact with blood/body fluids and handling animal and human remains

## Risk:

There is no direct risk of contagion or infectious disease from being near human remains for people who are not directly involved in recovery or other efforts that require handling dead bodies. However, workers who must have direct contact with human remains can have exposure to blood borne pathogens. Blood, bloody fluids, body fluids, and tissues are potential sources of blood-borne infections from pathogens including Hepatitis B, Hepatitis C, and HIV. Exposures to medical providers and responders may occur via a cut or puncture wound; through mucous membranes (eye, nose, mouth); and through non-intact skin (dermatitis/rashes, injuries, abrasions).

## General PPE Recommendations:

Workers who will have direct contact with the victims, or surfaces contaminated with blood or body fluids should use universal precautions. These require use of protective barriers such as gloves, face-shields, or protective eyewear. See: http://www.cdc.gov/ncidod/hip/blood/UNIVERSA.HTM

The CDC has developed interim health recommendations for workers who handle human remains. http://www.bt.cdc.gov/disasters/handleremains.asp.

Additional information is available from the Pan American Health Organization at:
http://www.paho.org/english/dd/ped/ManejoCadaveres.htm

Workers who have direct contact with the victims, bodies, or surfaces contaminated with blood or body fluids should use universal precautions identified in the interim CDC recommendations:
http://www.bt.cdc.gov/disasters/handleremains.asp

CDC recommends surgical masks for handling human remains. http://www.bt.cdc.gov/disasters/handleremains.asp.

Organic vapor respirators can be used for nuisance odor control where needed. One option that provides odor control and universal precaution splash and eye protection is to use a full facepiece respirator with N95 and organic vapor cartridges.

## Additional information:

See the NIOSH bloodborne pathogens page at: http://www.cdc.gov/niosh/topics/bbp/

CDC recommends N95 particulate respirators for handling swine and poultry animal carcasses.
http://www.bt.cdc.gov/disasters/animaldisposal.asp