

Flood Remediation

2016

This manual is based on open sources, best practices, and other resources. It is not comprehensive for all conditions, but will serve as a guideline for safely performing remedial restoration. The focus is flood damage, but these procedures may be used for addressing other natural disasters. The sooner after the event a team moves into a disaster area, the more self-sufficient they will have to be. Local resources will be scarce. Always have a local point of contact. Sometimes well meaning volunteers add to the problems. Never enter a house without the owner present. Verify the owner has removed all valuables.

Floodwaters carry a variety of contaminants such as bacteria, oil, heavy metals, and pesticides. While initial evaluations may indicate that exposure to such items are below current limits for safe occupancy, proper cleaning and preparation for rebuilding is critical to protect workers and occupants from both short-term hazards and long-term risk.

Other hazards are present in addition to the substances brought in with the floodwaters, especially in homes that were not dried out within a week of the flooding. Safety issues related to wet mechanical and electrical systems, exposure to lead and asbestos released from building materials, and mold growth need to be addressed.

Mold is a serious health hazard if the home is reoccupied without proper cleaning. Although a variety of products and techniques can reduce and control mold, the cleaning and drying process described in this manual also helps to remove other floodwater contaminants.

Flooded buildings can pose a number of health and safety risks, for both individuals who wish to maintain occupancy and those who work to repair them. Eliminating hazards is the best way to protect occupants and workers; however, until conditions can be returned to normal, anyone working in a flooded building should use appropriate personal safety equipment and take appropriate safety precautions.

Safety Practices

In assessing your own situation and making decisions about safety, crews must be the primary concern. Know your limitations. Many well-intentioned volunteers have been injured or killed during operations simply because they did not pay attention to their own physical and mental limitations. You must know your limits and monitor your condition. Fatigue leads to injury.

Buddy System – Always work in pairs or in a group.

Hazards – Be alert for hazards, such as sharp objects, dust, hazardous materials, power lines, leaking natural & LP gas, high water, fire hazards, and unstable structures. If water is present, check the depth before entering. Never enter rising water.

Safety Equipment – Use appropriate personal protection equipment (PPE).

- Hard hat
- Goggles / Safety glasses
- Appropriate respirator (N95 or better rating)
- Work gloves
- Rubber boots
- Heavy duty rubber gloves
- Disposable ‘Tyvek’ type coveralls to protect regular work clothes.

Safety Rules

1. Confirm that all utilities have been turned off before entering a damaged building, especially in wet areas. Stand on dry area while turning electrical switches off in wet areas.
2. When entering a flooded area, assume the area is contaminated. Graves may have been opened; septic and sewer systems will overflow; household cleansers as well as other products often found around a home pose a health risk. LP gas tanks may be loose and leaking. Remember, LP gas gathers close to the ground.
3. Normally stepping on a rusty nail would bring the risk of tetanus. In a flood situation, the nail could also carry hepatitis or potentially deadly diseases. Therefore, anyone responding to a flood disaster must have a current tetanus shot and should consider getting hepatitis shots.
4. It is common in disasters to encounter wild and domestic animals that may be rabid. Snakes, and possibly even alligators, may be in spaces you would not expect them. Never reach into a space you cannot see into. Be cautious of dogs and cats wandering or approaching the area.
5. Examine structures for damage before entering or working – floors, overhead, walls, loose objects that may fall. If there is question about the integrity of a building, wait until local building authorities have inspected the building before entering.
6. Ventilate closed rooms or buildings before entering to allow escaped gas or foul odors to escape and continue to provide ventilation while working. Do not linger in areas where

gas fumes are present. Be especially careful about flames or sparks where fumes are detected.

7. Make certain you have good footing when using ladders and scaffolds. Be extra cautious in wet or slick areas.
8. Remove ladders, scaffolds, or ropes when not in use to prevent children or others from climbing. Do not leave tools and equipment unattended. Guard against leaving piles of lumber, furniture, clothing, debris, etc. where children might play and risk injury.
9. In flooded areas – floors, outdoor pools – probe ahead for holes or submerged objects. Use a wood pole with a dry handle.
10. Avoid fatigue. Do not work on ladders or scaffolds or operate machinery when tired or on medications that cause drowsiness.
11. Wear proper clothing, i.e., boots in wet areas, heavy shoes in construction areas, gloves, hard hats, long pants and sleeves. Protect yourself against the sun or cold. Wear safety equipment as required or provided.
12. Provide sufficient lighting in work areas – daylight or artificial. Look first before entering areas. Check for glass, nails, or other sharp and protruding objects.
13. Be aware of where other volunteers are located and be concerned for their safety before throwing something out a window or using equipment.
14. Assume fallen electrical lines are live until notified by utility companies that current is off (also phone service and cable TV). Continue to use caution because of possible improper use of electric generators in nearby homes.
15. Prevent health hazards by cleaning areas where decay, mildew, or chemicals odors may result from wetness or perishables, such as food.
16. Only experienced persons should operate power machinery. Follow safety requirements when refueling is taking place. Never operate gas power equipment indoors.
17. Designate a first aid coordinator.
18. Make safety and hygiene a priority. Get adequate rest, fluids, and nourishment so you can achieve maximum effectiveness.
19. Personal cleansing
 1. Take boots and gloves to assigned area to be cleaned. Also, clean equipment (tool, shovels, etc.).
 2. Keep clean clothes in a plastic bag at housing site.
 3. Take regular showers and dress in clean clothes.
 4. If appropriate cleaner is not available, bleach solution (2 tablespoons of bleach per one gallon of water) can be used to clean your body. Premix in marked gallon jugs.
 5. Place contaminated clothes in a plastic bag and return clothes to designated location to be laundered in disinfectant—very important.
20. Lifting should always be done in a way that protects the back from strain or other injury.

To lift safely:

 - Bend your knees and squat.
 - Keep the load close to your body.
 - Keep your back straight.
 - Push up with your legs.

Helpful Hints

1. Wear suitable rain gear and rubber boots while spraying or pressure washing.
2. Use rubber gloves and wear goggles when handling bleach and other disinfectants.
3. Wear heavy-duty rubber gloves with work gloves over them.
4. Work within your strengths and limitations – physical (strength and health), emotional (stress management), and mental (knowledge and skills).
5. Use hand sanitizer before consuming anything or wash hands with bleach and water mix. (one tablespoon bleach to one gallon water).
6. Disinfect tools used each day upon completion of work. At the end of the day, dispose of all used mop heads and sponges.
7. Do not drink water in area until verified safe.
8. Eat regularly and increase water intake according to heat and workload. Take snacks and bottled water to site. Take appropriate precautions to clean hands before getting snacks, water, and meals.
9. Rest when you can. Some people can work longer than others. Gauge yourself. Do not be intimidated by what others do if it affects your strength and usefulness. Sleeping may be difficult. Try to arrange what is best for you.
10. Dispose of any articles that are punctured (such as gloves and boots).
- 11. Do not open refrigerators and freezers. Duct tape doors and keep them shut.**
12. If you are unfamiliar with motorized tools, do not attempt to use them until properly trained.
13. Make safety a priority so that you can achieve maximum effectiveness, not only for you but also your team.

Cleaning Procedures

1. Explain to the homeowner what we do when we mud out a home.
2. Explain to the homeowner the health hazard that may be present if the interior walls have had water and mud between them. Explain that the type of mold that grows from floodwaters and mud can cause serious health problems.
3. Walk carefully through the structure. Floors may be slippery or weakened.
4. Allow homeowner to decide which articles are to be salvaged and which are to be discarded.
5. Be sensitive to homeowner's loss, which will most often be everything due to the contamination of the water, mud, and other substances.
6. Shovel out mud and silt before it dries.
7. Use dollies and hand trucks to remove heavy items.
8. Mattresses and upholstered furniture should be removed and discarded.
9. Remove all built-in cabinets if the water line is above the counter top.
10. Remove and dispose of all floor coverings down to the subfloor.
11. After all articles are removed, determine how much wall removal is necessary.
12. The general guideline is to cut and remove walls 12 inches above flood level.
13. Sweep and vacuum thoroughly.
14. Power / pressure wash entire area beginning at the flood level and work downward if there is a basement. Use a wet vacuum, mops, squeegees, and brooms to remove excess water.
15. Use fans, dehumidifiers, and supplemental heat, if available, to aid the drying process.
16. Disinfect entire area beginning at flood level. Use a pump-up garden sprayer, backpack sprayer, or other type sprayer to lightly spray affected area. Use an appropriate mold remediation product such as Shock Wave at approximately 2 oz per gallon of water. Follow manufacturer directions. NOTE: bleach products are NOT effective in preventing mold on porous substances such as wood. Check product labels carefully to determine if they are effective in your situation.
17. Allow the area to dry thoroughly before beginning repairs. Drying time may take from a few weeks to several months. Again, fans, dehumidifiers, and supplemental heat may hasten this process. Confirm with local officials (building department/inspector) what moisture level should be reached before beginning to rebuild.
18. To sanitize: use one tablespoon bleach to one gallon water. This is recommended for dishes and does not need to be rinsed
19. To disinfect: apply an appropriate acceptable mold remediation product, such as Shock Wave, with garden sprayer, etc. See # 16 above.

Mud-Out Equipment List

Respirators appropriate for tasks – N95 (disposable, half face, or full face)
Fire extinguisher
First aid kit
Gas-powered pressure washer (minimum 2000 psi)
(4) 50-foot heavy duty water hose
2 1/2" gas-powered water pump
(2) sump pumps
3500-watt generator with extension cords and floodlights
Electric exhaust fan
16-inch chainsaw with spare bar and chain (chaps, helmet, ear and eye protection, gloves) Heavy
duty wet/dry shop vac with filters and bags
Five-gallon gas can
2 1/2-gallon gas cans
Tool box with basic tools
wrecking bars (crow and pry bars) of assorted lengths
Reciprocating saw with spare blades
Circular saw with spare blades
1/2-inch drill with assorted bits
Bolt cutters
Sledge hammer
Large scoop shovel
Square shovels
Hack saw with spare blades
wheelbarrows
Appliance hand truck
water coolers
Six-foot step ladder
(4) 18-inch traffic cones
Squeegees
Pitch fork
Brooms
Rubber gloves and boots
Rain gear (jacket and pants)
Hard hats
Head lamps/lights
Contractor size trash bags (55 gallon)
(2) garden sprayers
(6) five-gallon buckets
Mold remediation product– several gallons
Bleach (do not store in the trailer) – 1 or 2 gallons
empty one-gallon jugs for mixing sanitizing solution