Responding to Building Water Damage

When water damage occurs in a building an immediate response saves time and money, and protects health. Delays or incomplete responses increase both the scope and severity of the problem, and results in an increase in the time and expense till the final restoration.

Types of Water Damage

The Institute of Inspection Cleaning and Restoration categorizes the water causing damage in a building depending on its source, and level of chemical or biological contamination it contains.

Category 1

Clean water from a sink overflow, broken water or steam line, or rainwater infiltration is referred to as category 1. Water in this category represents the lowest health risk to building occupants and clean-up crews. Building materials and furnishings damaged by category 1 water have the best potential for being salvaged.

There is a 24 to 48 hour window of time for the response to damage from water in category 1. After this period of time, microbial growth begins to lower the water quality to that of category 2.

Category 2

Category 2 is water in the large range between absolutely clean and absolutely contaminated. This water has a significant degree of contamination due to its source, from microbial growth, or from contamination after the initial release. Sources of category 2 water damage may be storm drain backups, treated cooling water, some surface water, fire suppression systems, and discharges from equipment.

Water in category 2 presents a higher risk of disease, infection or injury to people who come into direct contact with the contaminated area. Because of the additional contaminant in the water, materials damaged by category 2 water are much more difficult to salvage.

Category 3

Water placed into category 3 is contaminated water from sewers, some rivers, seawater, and some surface water. This water will likely contain infectious viruses, bacteria, and parasites. It has the likelihood of causing disease or infection from direct or even indirect contact. This water may also contain toxic and allergenic materials.

<table>
<thead>
<tr>
<th>Potential microbial contaminants in Category 3 water</th>
<th>Viruses</th>
<th>Bacteria</th>
<th>Parasites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotavirus, Hepatitis A, and Norwalk</td>
<td>Salmonella, Campylobacter, and E. coli</td>
<td>Giardia, Cryptosporidium, Round worms and tapeworms</td>
<td></td>
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</tbody>
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Why is Water Damage Such a Concern?

Contact with water damages building furnishings and materials through staining, swelling, rusting, and loss of structural integrity. Category 2 and 3 water carries contaminants that must be addressed as part of the restoration effort.

For building occupants water damage results in the disruption of their normal work activities, and can cause the loss of irreplaceable data and materials. Even damage from water in category 1 can promote allergenic microbial growth, the generation of noxious odors, and infections when not addressed promptly and properly. Category 2 and 3 water damage can present potentially serious health risks.

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Responding to Water Damage

Any water damage response action consists of these steps:

1. Protect occupant and responder health
2. Prevent additional damage
3. Remove contamination
4. Salvage materials

Protecting Health

To protect health it is necessary to know the category of water involved. The source of the water, and appearance and odor will help in deciding into which category it belongs.

If the water is category 2 or 3, building occupants and crews must be instructed to avoid contact with contaminated materials, and wear appropriate personal protective equipment when direct contact is necessary. Appropriate equipment may include: P100 respirator, additional organic vapor or other cartridges may be warranted; protective clothing including boots and gloves; eye protection.

When in the vicinity of category 2 or 3 water pay special attention to cuts, abrasions, and other wounds that break the skin and expose an individual to the potentially infectious organisms.

It is important to advise building occupants of the risks, if any, and give them guidance on entering the area. Air handlers should be isolated or shut down if necessary, and the area sealed to prevent the spread of contamination.

In addition to the threats to health posed by waterborne contaminants and mold, there are other significant risks in a flooded building. Injuries due to slips and falls are more likely due to the wet, and possibly slick surfaces. Wet ceilings can collapse causing injury to anyone underneath them.

Electricity is a special concern in a flooded building. Water on the floors and in the walls increases the possibility of electrocution. Opening walls for drying and removing wet insulation can lead to unintended contact with electrical circuits. Existing circuits without ground fault circuit interrupters (GFCI) should be shut down. Electrical needs during the clean up should be supplied through circuits protected with GFCI devices. Extension cords used clean should be three wire type S, ST, or SO designed for hard or extra hard use. A person with adequate knowledge of electrical safety must be chosen to make decisions about electrical components, shut down unsafe electrical circuits, and oversee the installation of electrical power for the clean up work.

During demolition work additional precautions may be necessary for handling and disposal of materials containing asbestos or lead based paints.
Preventing Additional Damage

Once safety has been addressed, take steps to prevent additional damage. Preventing additional damage requires stopping the flow of water, protecting furnishings, and lowering relative humidity levels.

If the water flow cannot be stopped, it should be directed to drains, or out of the building if possible. It may be necessary to contain, or sewer dispose of category 2 or 3 water.

Options to prevent or minimize damage to additional furnishing in and near the flood area may include:

- Remove and secure small furnishings, breakables, moisture sensitive, and high value items
- Place items onto tables or counters and cover them with plastic
- Protect chair and desk legs with a wrap of foil where they contact the floor, or place each leg in a plastic cup or bowl
- Pin or tie up drapes and furniture skirts
- Place uncontaminated clothing and other soft items into plastic bags

Once the flow of water is stopped and undamaged materials have been protected, remove the excess water and any contamination carried with the water. Pumping is the preferred method to remove large volumes of water. Where water depths prevent the use of pumps, wet vacuums are the next best choice. Mopping is a less effective method that is limited to relatively smooth, hard surfaces. With category 2 or 3 water it may be necessary to repeatedly flush the area with additional clean water to assist in the removal of contamination.

Humidity levels can rise quickly in an extensively flooded building, especially. Begin drying within 24 hours if possible to minimize additional water damage and microbial growth.

The process of drying is managed through air movement, humidity level, and temperature. Fans, blowers, and carpet dryers are used to create air movement that increases the rate of evaporation of water from wet materials. It will be necessary to move chair pads and furnishings to allow air movement to reach all areas. In some cases it may be necessary to open venting holes in walls and cabinets to facilitate air movement.

The relative humidity level is the primary factor in determining drying effectiveness. For small floods, the building’s ventilation system may have adequate capacity to maintain optimal relative humidity levels. For larger floods, it will be necessary to bring in industrial dehumidification or desiccation equipment to manage humidity levels in the building. Temperature will help indicate which type is appropriate. Below 68° F refrigerant dehumidifiers can ice up and desiccant dehumidifiers may be a better choice. Home dehumidifiers are not up to the task. For optimal drying the relative humidity should be maintained below 40%.

Temperature influences evaporation rate, relative humidity, microbial growth rates, and occupant comfort. Higher temperatures increase the amount of water the air can hold, and speeds up evaporation. Higher temperatures also speed up the growth rate of bacteria and molds, increasing concerns of adverse health effects and odors. Cooler temperatures reduce the microbial growth rate, but can also cause condensation of moisture in the air. With very low temperatures occupant comfort becomes a concern.

Opening windows is not a good way to speed drying. Mechanically ventilated buildings rely on building pressurization to regulate the flow of air through the building. Opening windows will change the balance of the building pressurization, and upset the airflow. In the warm months an open window can allow humid air into the building. In cold months, the open window can rapidly cool the building resulting in condensation of water onto building surfaces. Open windows also present security concerns.

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Removing Contamination

After the contamination and excess water is removed, a decision can be made regarding the use of biocides as part of the clean-up and restoration process. The use of biocides may or may not be warranted. Biocides can slow microbial growth and aid in sanitizing contaminated materials, but they can also cause eye and respiratory irritation, and odor complaints with building occupants. Determining the proper application rate can be difficult. Refer to the product label for instructions for use and personal protection.

| Properties of Classes of Environmental Disinfectants |
|----------------------|----------------------|----------------------|----------------------|
| Disinfectant/Class   | Action               | Advantages            | Disadvantages         |
| Alcohols             | Bactericide, Viricide, Fungicide | No staining, non-irritating | Inactivated by organic matter, highly flammable |
| Quaternary ammonium compounds | Bactericide*, Viricide*, Fungicide | Inexpensive | Inactivated by organic matter, limited efficacy |
| Phenolics            | Bactericide, Fungicide, Viricide | Inexpensive, residual | Toxic, irritant, corrosive |
| Idophors             | Bactericide, Viricide, Fungicide, Sporicidial** | Stable, residual action | Inactivated by organic matter, expensive |
| Glutareldehydes      | Bactericide, Viricide, Fungicide, Sporicidial** | Unaffected by organics, non-corrosive | Irritating vapors, expensive |
| Bleach               | Bactericide, Viricide, Fungicide, Sporicidial** | Inexpensive | Toxic, corrosive, inactivated by organic matter; removes color |
| Hydrogen Peroxide    | Bactericide, Viricide, Fungicide, Sporicidial** | Relatively stable | Corrosive, expensive, degrades in heat or ultraviolet light |


*=Limited effectiveness  **=Requires prolonged contact time
Replacement versus Salvage

The costs in expense and time to salvage water-damaged materials often outweigh the costs of replacing with new materials. In specific cases, materials with limited damage and high value may be salvaged cost effectively. The less absorbent the material, the cleaner the water, and the shorter the time until drying begins all increase the likelihood of a successful salvage. Materials damaged by category 2 or 3 water will require cleaning or sanitizing in addition to drying.

**Base molding**

Base molding on walls must be removed to inspect the base of the walls for water damage. For most molding it is cost effective to replace the molding with new. More expensive wood moldings can be carefully removed, cleaned as necessary, and then dried for re-use. If molding is to be reinstalled, mark it for location as it is removed.

**Carpet**

For most installations, replacement rather than salvage of the carpet will be cost effective. Always replace carpet if the flood is category 2 or 3 water, or it has been more than 48 hours since the flood occurred. Carpet applied over a wood floor must be removed to allow adequate drying of the wood floor.

To salvage carpet, it must be lifted so that air can be circulated over and under the carpet. Disengaging and lifting the wet carpet requires special care to prevent damage to the carpet, especially at seams and attachment points. If carpet is to be salvaged, the best procedure is to remove the carpet to a remote location where it can be dried, sanitized, and professionally cleaned. The cleaned carpet can then be brought back for re-installation when the area is fully dried.

**Carpet Padding**

Always replace padding if the if the water is category 2 or 3 water, or it has been more than 48 hours since the water damage occurred. Always replace padding made of natural fibers, foam rubber, or skinned pads. Carpet applied over a wood floor must be removed to allow adequate drying of the wood floor.

**Ceiling Tiles**

Replace sagging tiles, tiles damaged by category 2 or 3 water, or tiles wet for more than 24 hours.

**Drywall**

With prompt response, drywall in contact with category 1 water can be salvaged. Open areas behind base molding for inspection. An instrument for detecting moisture should be used to determine the condition of drywall near or in contact with water. If drywall is wet, but appears structurally sound, open weep holes to release any trapped water, and allow ventilation into the inner wall.

Drywall in contact with category 2 or 3 water should be removed. Use a moisture meter to determine the extent of water damage.

Check for insulation inside of the walls. If wet insulation is present it may be necessary to remove sections of the drywall to facilitate drying or replacement of the wet insulation. It may be cost effective to cut away wet drywall and insulation and replace the materials when the area has dried.

Replace sagging or delaminating sections of walls or ceilings. Open weep holes in ceilings where trapped water is suspected.

**Electrical Components**

Electric components that have become wet need replacing. Switches and outlets may be able to be cleaned, but when there is a question they should be replaced. Electrical motors, fixtures, thermostats, and appliances that were wet need to be cleaned and dried by an electrician, service technician, or other qualified person.
Hard Surfaces
Hard surfaces such as concrete block, linoleum, glass, and etc. can be cleaned with a detergent solution. In the case of category 2 or 3 water floods, this cleaning should be followed by sanitizing using a one of the disinfectants listed in the previous table. Be careful to follow the disinfectant manufacturers instructions for use and safety.

Particle Board
If the damage is from category 1 water and addressed promptly it may be possible to dry particleboard for salvage. If the water is category 2 or 3, or the particleboard has begun to swell and loose strength it should not be salvaged.

Plaster
Heavily painted plaster can be difficult to dry. Open holes as necessary to provide for inspection and ventilation.

Rugs
Depending on the size, value, and contamination in the water, rugs may be cost effectively cleaned, dried, and returned to the site.

Vinyl Flooring
Sheet and tile vinyl flooring that has been exposed to water for an extended period must be evaluated to determine if water is trapped under the flooring. If sheet vinyl has cuts, or is not well caulked at the edges water will soak into the backing material. If this has occurred the flooring cannot be adequately dried in place and must be removed. Vinyl tile without an adequate wax layer to seal the tiles will have the same problem. Vinyl installed over a wood floor will need to be removed to dry the wood.

Wall coverings
After removing base molding, vinyl wall coverings must be pulled back to dry a wet wall. With more permeable paper or cloth coverings it may be possible to adequately dry the wall with the coverings left in place. Staining may be a problem in trying to salvage wall coverings. If a section of existing wall covering is damaged satisfactory matching of the replacement wall covering with the existing covering is unlikely.

Summary
Effectively responding to water damage requires that a plan of action and the necessary resources be available for quick implementation. Every day of delay from the time of water release until the area is dried increases both the scope and severity of the problem, and the time and cost of the final restoration. The target time period to remove the water and begin drying is less than 48 hours, sooner when conditions are warm and humid.

Responding to extensive water flooding requires knowledge of the health risks presented in addition to experience in building demolition, construction, and restoration work. Specialized tools such as ground fault circuit interrupters, negative air machines, hepa-filtered vacuums are often required. Personal protective equipment including respirators requires specific training and written policies. Decisions will need to be made about salvage versus replacement of water-damaged materials. In general, only high value items will warrant saving for salvage.

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