Preventing Long-Term Damage from Water Infiltration/Flooding in School Buildings

A systematized approach for remediating water problems in buildings because of floods, roof leaks, potable water leaks, sewage and groundwater/surface infiltration.

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"Creating Solutions for Healthy Indoor Environments

FOREWORD

Due to the amount of porous materials used in the construction of schools (drywall, carpet, etc.), water damage that is not properly addressed has the potential to lead to microbial growth (mold & bacteria). This growth might present an exposure issue for school occupants, especially for those with allergies and asthma. For many years, IEA has responded to water damage in schools with an eye towards eliminating the potential for microbial growth to occur.

This document has been updated in response to the flooding that occurred in the summer of 2007 in southern Minnesota. With the serious flooding that has occurred in the Midwest in 2008, we are making these guidelines available to school districts that may have experienced water damage, particularly flooding as well as other sources of water infiltration.

In working with FEMA in 2007, we realized that if school administration moves quickly, long-term damage will be prevented, and the potential for mold and other indoor air quality problems will be eliminated.

We hope that this information is helpful. If you wish IEA to provide assistance in designing a response to water damage, please call 800-233-9513.

Techniques are available that can be quickly and usually inexpensively implemented to help prevent negative outcomes.

Water Damage Remediation Protocol

Introduction

In addressing water events, time is of the essence to eliminate or minimize the potential for microbial (mold & bacteria) growth. Ideally, wet materials should be thoroughly dried within 24 to 48 hours from when the water event occurred. The longer materials remain wet, the greater the potential for microbial growth to occur on impacted building materials, especially those with organic components, i.e. paper surface on gypsum drywall.

If possible, the first step is to stop or correct the problem causing the water intrusion. In addition, the classification of water impacting a building should also be determined. Remediation activities will differ if a water event is sewage contaminated versus clean water (plumbing) or unsanitary (rain). After this, proceed according to the following protocol to determine response actions for material affected by the water intrusion. This protocol is not meant to be a thorough scope for every possible type of moisture event and impacted building material, but is meant to be a guide. If large areas and many types of materials are impacted, utilizing an expert to help in identifying and addressing water damaged materials is recommended.

1.0 GENERAL

- Inventory all water-damaged areas, building materials and furnishings. Special attention should be given to identify carpet under cabinets, furnishings, etc. A moisture meter should be utilized to identify the extent of water damage to drywall. An infrared camera can also be useful in assessing moisture on drywall.

- Once the water-damaged inventory is completed, document the type of water damage, i.e. clean water (potable sources), steam, unsanitary water (rain, ground water), or waste water (sewage).

NOTE: If a steam leak is a cause of moisture damage, determine if any chemical treatments have been added to the steam (review product MSDS). Even though steam is relatively clean, steam treatment chemicals may remain in the materials affected by the steam leak after the moisture has dried.

2.0 CEILING TILE

- Remove and dispose of all wet ceiling tiles within 24 to 48 hours of water damage, unless the ceiling tile has become wet because of a small steam leak and the shape of the tile has not been altered. In this situation, the ceiling tile can be air dried and reused. In situations where the tile has been impacted by unsanitary water (>24 hours or previous water damage) or contaminated water, utilize controls for removal and disposal. Controls can range from personal protection to full abatement under negative air pressure dependent on the extent of the damage.

3.0 DRYWALL/LATHE PLASTER

- Drywall can be difficult to dry in a timely manner, especially if fiberglass insulation is present in the wall cavity and is also wet. Remove and replace all water-damaged drywall and insulation within 48 hours. Use a moisture meter to define the extent of wet areas and remove sheetrock a minimum of 12 inches past the moisture mark.

- If the drywall is not removed within 48 hours, if previous water damage has caused microbial growth, or if the sheetrock has been damaged by unsanitary or contaminated water, then extensive controls will be necessary for the removal process. Remaining wall substrates (studs, cavity base) should be thoroughly cleaned by HEPA vacuuming followed by sanitization.

- All hard surfaces such as block walls, etc. should be scrubbed with a mild detergent followed by a rinse using a solution of 1/4 cup bleach per gallon of water. Follow this with a clean water rinse. After work is completed, turn the heat UP (if possible) and utilize dehumidifiers to dry the area. CAUTION: The chlorine in bleach may corrode metal and should not be used on metal surfaces. Instead, use the aforementioned cleaning procedure with only a wash with mild detergent. Also, bleach may fade colors. Therefore, test the bleach solution in an inconspicuous location before proceeding. **USE BLEACH IN A WELL VENTILATED AREA. DO NOT MIX BLEACH WITH OTHER CLEANING CHEMICALS, ESPECIALLY THOSE CONTAINING AMMONIA. POISONOUS VAPORS WILL RESULT**.

- Wet lathe and plaster will leach the minerals from the wall and form a chalky surface. The loose material on the surface will need to be removed under controlled conditions and the surface allowed to dry. The surface can then be painted with a stain-blocking paint. An antimicrobial paint may be used, but is not necessary if the conditions that led to the moisture intrusion have been corrected.

- If the plaster/lathe wall develops a strong odor, with or without visible mold growth, eliminate the source of the water and replace the water-damaged plaster. During replacement of the plaster/lathe, the following general procedures are recommended.

    - Controls to limit the spread of dust and contamination include: installing critical barriers, using HEPA filtered exhaust units to create a negative air differential. Workers performing the work should use appropriate respiratory protection, gloves and disposable coveralls. Remaining substrates (studs, concrete floor, etc.) should be thoroughly cleaned. Cleaning typically involves HEPA vacuuming followed by sanitizing with an appropriate agent, such as a dilute bleach solution.

4.0 ELECTRICAL

- Consider all wet wiring, light fixtures and electrical outlets to be shock hazards until they have been checked by a building inspector and/or electrician. Until then, turn the power off in the area of water damage. Replace all electrical circuit breakers, GFIs (Ground Fault Interrupters), and fuses that have become wet. Switches and outlets that are wet can be cleaned and reused, but when in doubt, replace them.

- All electrical motors, light fixtures, etc. that were wet need to be opened, cleaned, and air dried by a qualified person. Before being put back into service, inspect the motors, light fixtures, etc. to ensure there are no visible moisture/water droplets present.

5.0 FURNITURE

- Dispose of upholstered furniture that has become wet due to floods, roof leaks, sewage backup and groundwater infiltration. Upholstered furniture damaged by steam* leaks or direct contact with potable water should be dried within 24 hours and monitored for fungal growth and odors.

- Hardwood furniture or laminate furniture whose laminate is intact should be air dried and cleaned with a detergent solution and rinsed with clear water and dried. See caution statements in Section 3.0

- Laminate furniture experiencing delamination should be disposed of. Pressed wood under the laminate absorbs water readily and is hard to dry.

- Furniture made of particle board or pressed wafer board should be discarded, unless the furniture has become wet due to a steam leak or direct contact with potable water. In this situation, the furniture can be dried and monitored closely for fungal growth/odor. If fungal growth occurs or the furniture develops an odor, the particle board/pressed wood furniture should be discarded.

6.0 FILES/PAPERS

- Remove and dispose of nonessential wet files and paperwork, unless the moisture was because of steam* leaks; then these can be dried. Essential wet paperwork from water-damaged areas should be moved to a location where it can be dried, photocopied and then discarded. Professional conservators should be contacted for information on handling these types of wet products at the American Institute for Conservation of Historic and Artistic Works, 202-452-9545.

- Large amounts of essential files and paperwork that cannot be dried within 24 to 48 hours may be rinsed with clean water and temporarily frozen until proper drying can be completed. Discard any paper products that develop mold.

7.0 CARPET

- Any carpet that has been contaminated over a large area with sewage should be removed under controlled conditions (containment placed under negative air pressure) and the entire area disinfected with bleach and water (or hospital-grade detergent).

- Small areas (< four sq. ft.) of carpet contaminated with sewage may be cleaned using the procedure listed for other sources of water.

A determination should be made if a carpet pad is present and the subfloor composition. If the subfloor is semi-porous such as plywood or gypcrete, these materials can be impacted by water and would need to be addressed, as would wet carpet padding. The presence of these wet materials below may require the carpet to be removed so that these materials can be dried.

Carpet that has become wet from floods, roof leaks, steam leaks, potable water leaks, and groundwater can be treated as per the following:

- Remove all materials (e.g. furniture, file cabinets) from the carpet.

- Extract as much water as possible from the carpet using wet vacuums.

* See NOTE in Section 1.0

- The carpet should not be shampooed following extraction since this can prolong the drying time. The carpet (and other building materials) should be thoroughly dried before the carpet is shampooed or steam cleaned.

- If the use of a biocide is considered, consult a microbiologist or C.I.H. The use of a biocide to prevent microbial growth from occurring is discouraged since some people may have a reaction to biocides. Often, quaternary ammonium compounds will be used as a biocide/cleaning compound. The compound may reduce levels of bacteria, but are often ineffective in killing fungal spores or preventing fungal growth from occurring.

- If the carpet develops an odor or visible mold growth is apparent, the carpet should be removed under controlled conditions. If mold-sensitive persons react when entering a space with previously water-damaged carpet with no odor or visible mold growth, the carpet should be tested or discarded under controlled conditions.

- Once the carpet and other impacted materials are thoroughly dried, the carpet can then be cleaned in-house or by commercial steam cleaning (hot water extraction)..

- Following cleaning, dry the carpet within 12 to 24 hours of treatment. Use commercial dehumidifiers and floor fans/exhaust fans to facilitate drying the carpet.

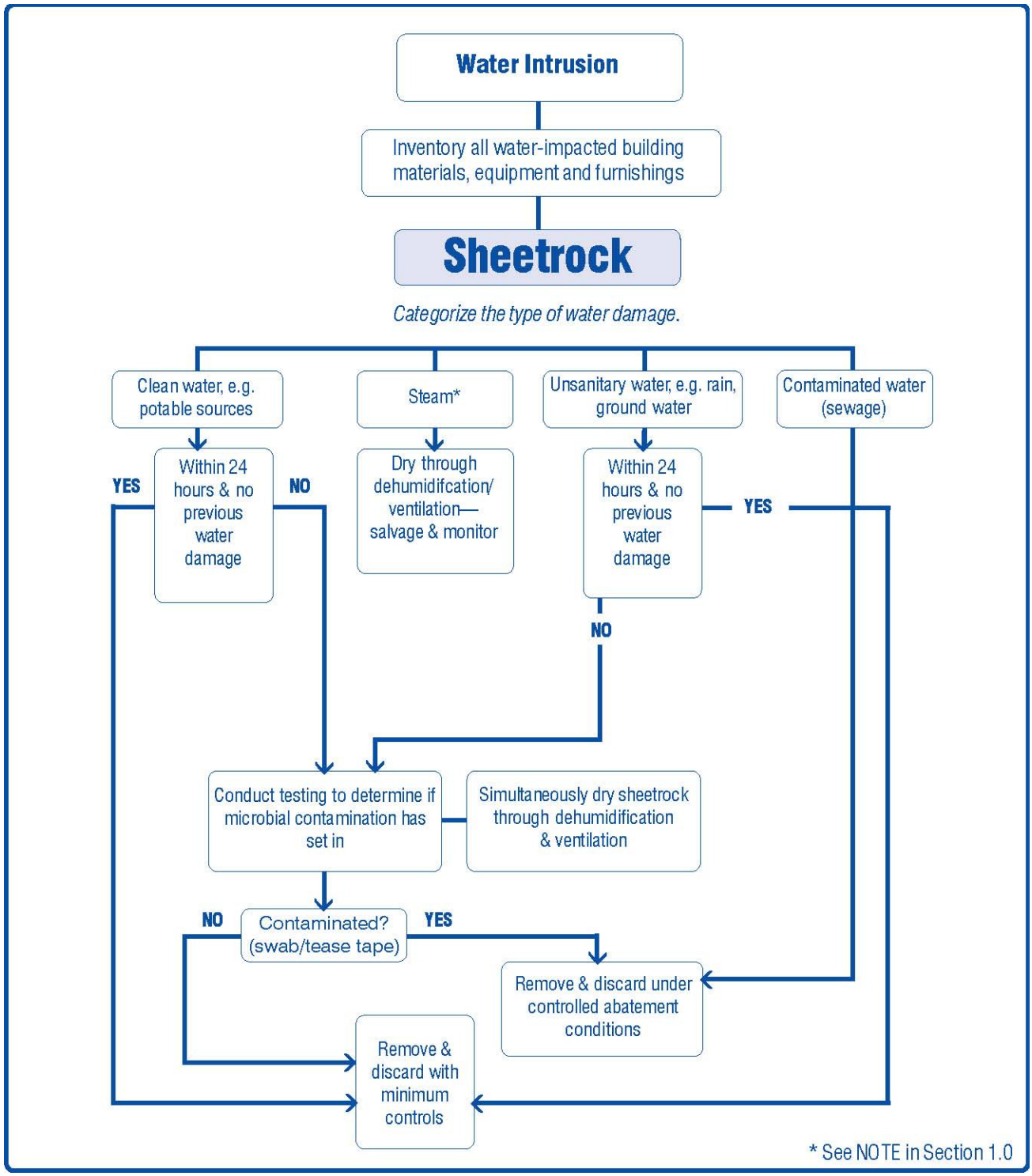
8.0 TESTING

- Air and building material/furniture testing for microorganisms may be performed immediately after the water problem and periodically thereafter by a trained environmental health professional to assure that there is no excessive human exposure to microbial growth. Post-cleanup clearance sampling and inspection are necessary to ensure that no excessive concentration of microbes will exist in the building.

- If materials have moisture infiltration for the first time and are being discarded, no testing is necessary. However, the decision on testing needs to be made on a case-by-case situation after all the variables have been considered.

Note on Personal Protective Equipment

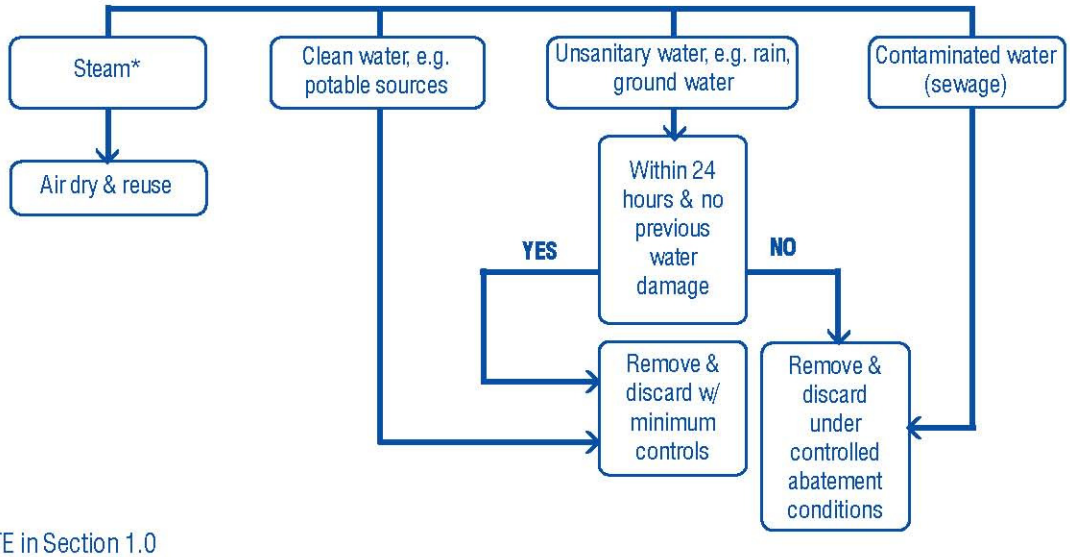
If testing for moisture infiltration has confirmed microbial growth on previously wet materials, then appropriately trained personnel with appropriate respiratory and personal protection should be used to remove materials. Negative air enclosures may also be set up for limiting cross-contamination from damaged areas to non-impacted areas and protect occupants in these areas.



The flowchart on this and the following pages provides a simplistic method for making appropriate decisions for handling water-damaged building materials. However, the entire document should be reviewed for detailed information and specific procedures.

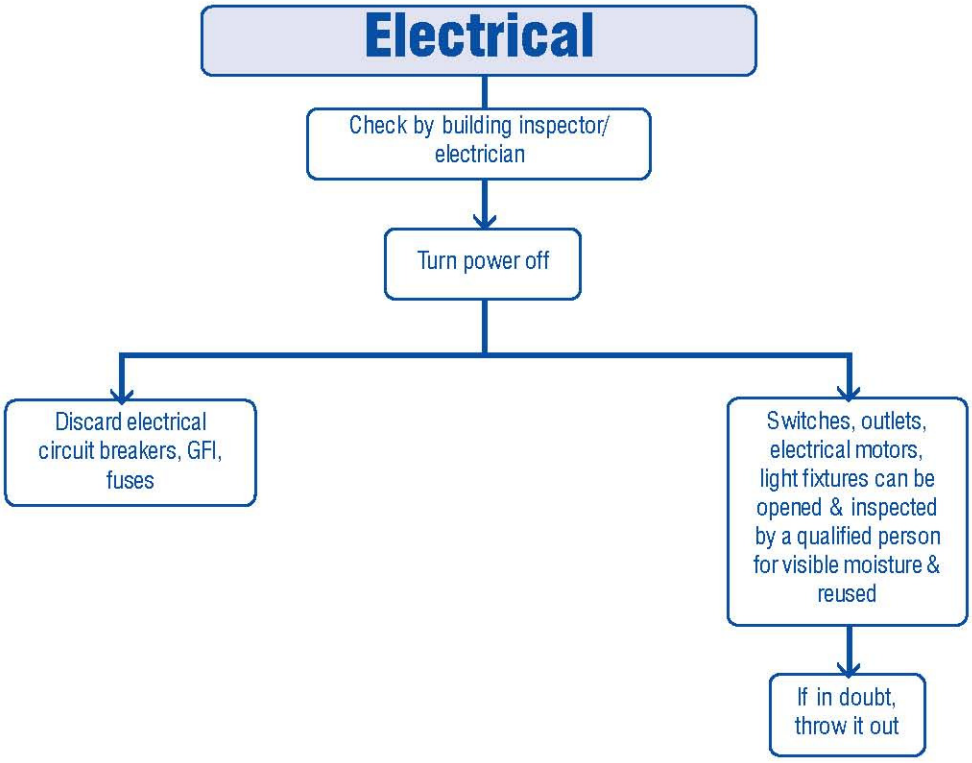
Ceiling Tile

Categorize the type of water damage.



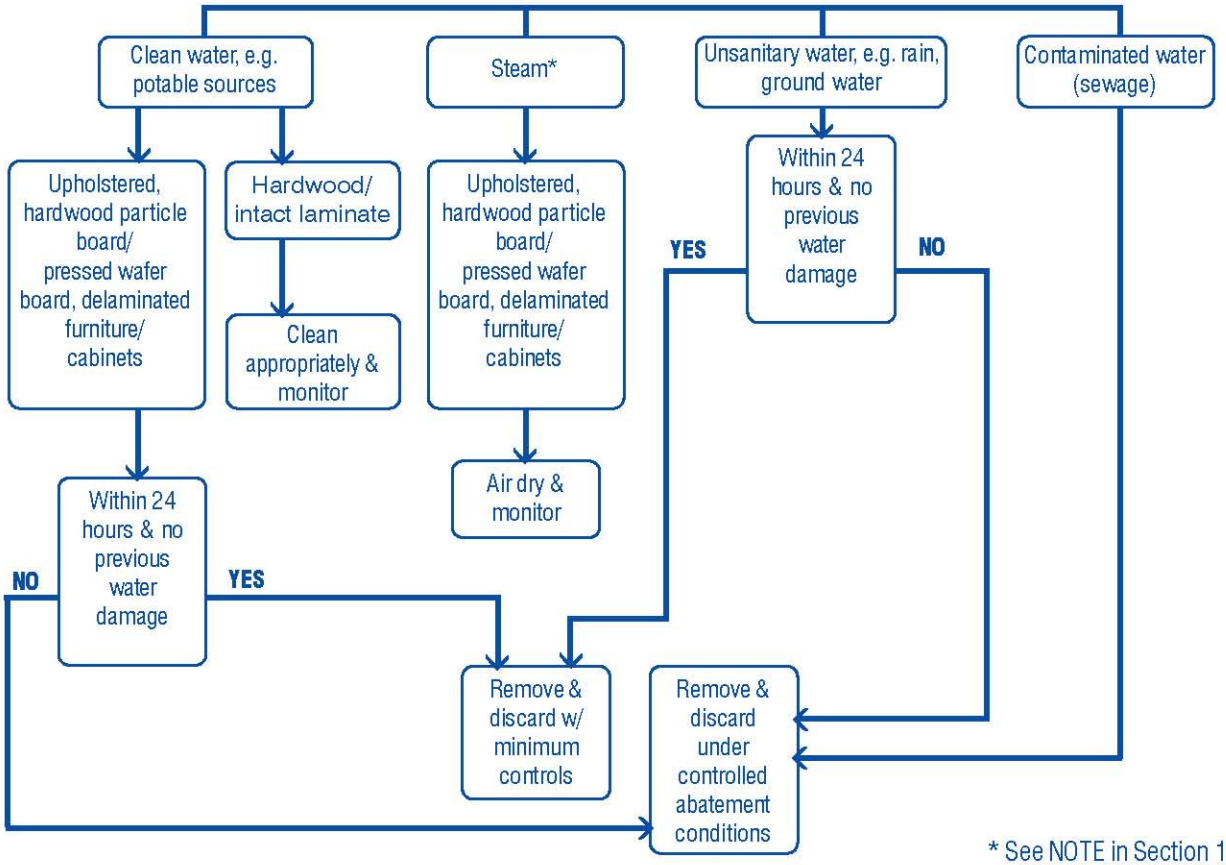
* See NOTE in Section 1.0

Electrical



Furniture/Casework

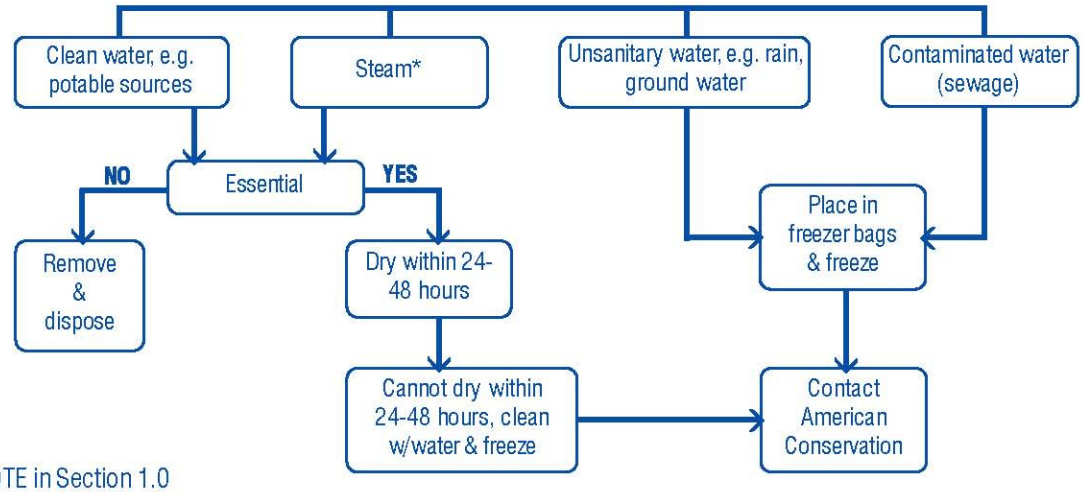
Categorize the type of water damage.



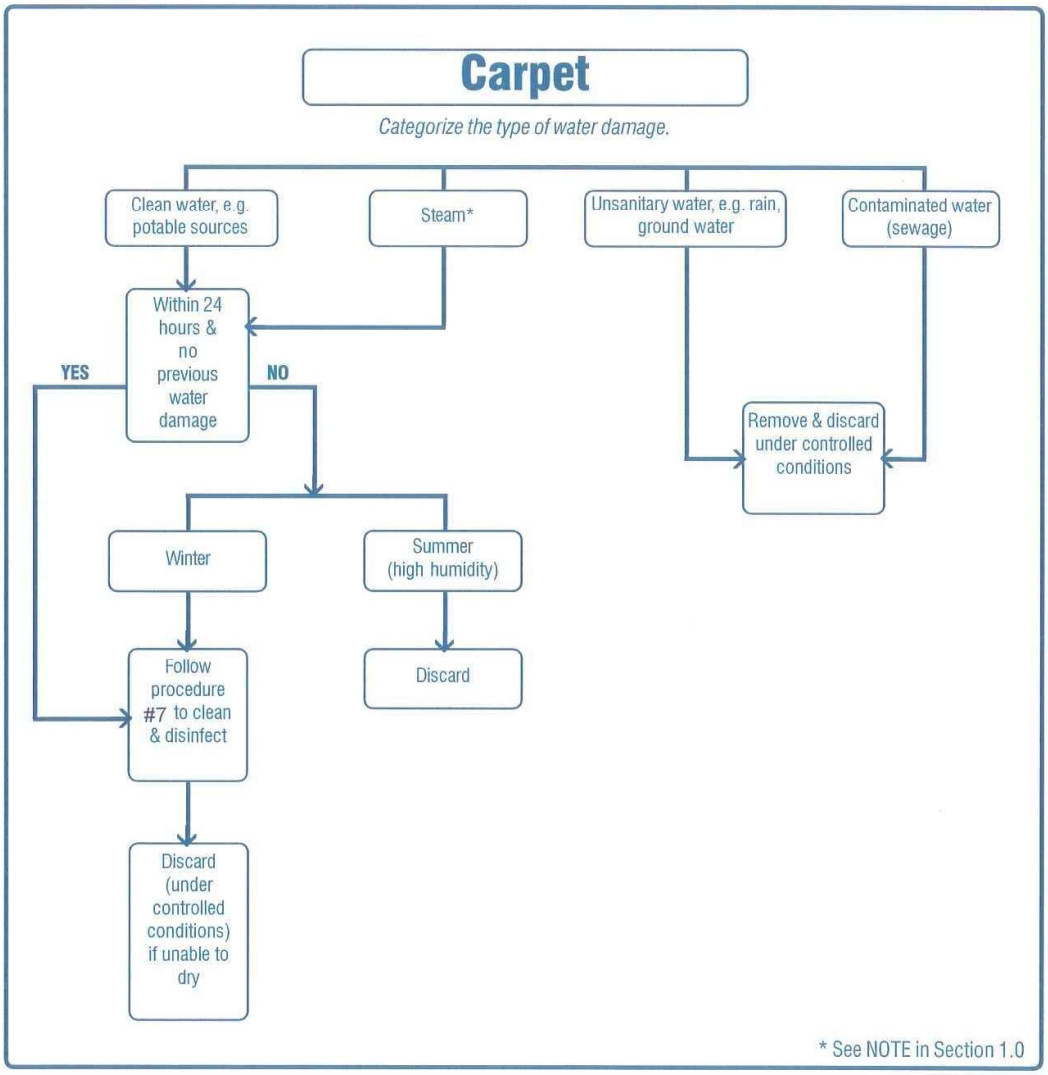
* See NOTE in Section 1.0

Paper/Files

Categorize the type of water damage.



* See NOTE in Section 1.0


Carpet
Categorize the type of water damage.
Clean water, e.g. potable sources
Steam*
Unsanitary water, e.g. rain, ground water
Contaminated water (sewage)
Within 24 hours & no previous water damage
YES
NO
Remove & discard under controlled conditions
Winter
Summer (high humidity)
Follow procedure #7 to clean & disinfect
Discard
Discard (under controlled conditions) if unable to dry
* See NOTE in Section 1.0

About IEA

IEA is committed to providing practical, cost-sensitive environmental, health and safety consultation for private and public organizations. Founded in 1984, it has provided environmental control services to hundreds of organizations throughout the United States.

- IEA employs a large, certified professional staff capable of addressing a wide range of indoor environmental needs nationwide.
- IEA draws upon the expertise of nationally recognized physicians, engineers, architects, toxicologists, attorneys, industrial hygienists, and epidemiologists.
- IEA has formally prepared policy and regulations for a number of public agencies in areas of environmental risk.
- IEA has served as a resource to the Environmental Protection Agency (EPA) on development of national guidelines for schools on indoor air quality issues.
- IEA has performed over 15,000 safety/environmental inspections of buildings on a nationwide basis.

SOURCES

1. *Federal Occupational Health Protocol for Controlling Microbial Growth After a Flood*
2. *Tips for the Care of Water-Damaged Family Heirlooms & Other Valuables*, Phoenix Business Group—Consumer Protection Services—& Cambridge Energy Management Department
3. *Dealing with Flood & Sewer Waters in Your Home*, Fort Wayne Sewer Task Force, Fort Wayne Planning Department, Fort Wayne Utilities, Indiana State Board of Health, & Area County Board of Health
4. *Health & Safety Universal Precautions for Post-Flood Buildings*, Mathew Klein, Indoor Air Quality Solutions & Mark Fleming, Blue Chip Builders, Inc.
5. *Making Choices About Cleaning Wet Carpet*, Iowa State University, Extension Textiles & Clothing

Other Services Provided by IEA

IEA provides comprehensive environmental compliance and management services to public, commercial and industrial clients nationwide.

- Asbestos abatement project design, monitoring and air sampling
- Health and safety assessments
- Indoor air quality investigative and remedial services
- Industrial hygiene services
- HVAC design/commissioning
- Lead inspections, abatement design, monitoring and sampling
- Mock OSHA audits and compliance programs
- Training services

. . . and many more.

Call 1-800-233-9513

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