

## SECTION 02 70 00 – WATER DAMAGE REMEDIATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This section provides standards for water damage including mitigation, remediation, and restoration for all campus property. This guide should be used for water damage by construction and for projects that are repairing existing water damage.
- B. All water mitigation, remediation, and restoration must be managed and coordinated with Environmental Health and Safety (EHS) through the University Project Manager.

#### 1.2 REFERENCES

- A. Occupational Safety and Health Administration (OSHA): A Brief Guide to Mold in the Work Place (<https://www.osha.gov/dts/shib/shib101003.html>)
- B. U.S. Environmental Protection Agency (EPA): Mold Remediation in Schools and Commercial Buildings (<https://www.epa.gov/mold>)
- C. Institute of Inspection Cleaning and Restoration Certification (IICRC) S500 Standard and Reference guide for Professional Water Damage Restoration
- D. Institute of Inspection Cleaning and Restoration Certification (IICRC) S520 Standard and Reference guide for Professional mold Remediation

#### 1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Performance Requirements – Are defined in Part 4 Illustrations

#### 1.4 SUBMITTALS

- A. Method of Procedure for clean up:
  - 1. Provide a written method of procedure after an event and confirm the guidelines in Part 4 Illustrations are being followed.
  - 2. Coordinate with the University EHS Department through the University Project Manager for additional requirements per project.

### PART 2 - PRODUCTS (Not Applicable)

### PART 3 - EXECUTION (Not Applicable)

### PART 4 - ILLUSTRATIONS

- A. University of Colorado Denver | Anschutz Medical Campus Water Damage: Mitigation, Remediation, and Restoration. Revised July 31, 2015
  - 1. Coordinate with the University Project Manager for attachments.



University of Colorado  
Denver | Anschutz Medical Campus

# **Water Damage: Mitigation, Remediation and Restoration Guidelines**

*Revised July 31, 2015*



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## I. Purpose

These guidelines were developed to ensure that all water incursions are handled in a professional manner which includes the latest information and procedures available. This document is revised from the University of Colorado Boulder Water Damage guidance document. The purpose of the document is to provide a consistent approach to outlining which buildings and materials have been impacted and what actions are necessary to bring the buildings back online as quickly and safely as possible. Every effort will be made to ensure the health and safety of all University of Colorado Denver | Anschutz Medical Campus faculty, students, staff and visitors to the campus in a timely fashion.

## II. Goal

Guidelines, procedures and standards have been established not only to ensure the safety of campus constituents but also to include every means available to promote the preservation, replacement and/or repair of University property. This document was developed based on current industry standards and recommendations contained in the Institute of Inspection Cleaning and Restoration Certification (IICRC) S500 Standard and Reference Guide for Professional Water Damage Restoration and IICRC S520 Standard for Professional Mold Remediation. Typically an outside contractor that is trained and familiar with IICRC remediation protocols is retained to perform water, mold and sewage restoration efforts due to the amount of training, vaccination, personal protective equipment (PPE), and other safety requirements associated with the work activities.

## III. Definitions

Certain terms and definitions associated with water damage restoration exist. The following are definitions of terms used (adopted in part from the IICRC S500):

### ***Category 1 Water***

Water originating from a source that does not pose substantial harm to humans. Category 1 water is also referred to as “clean water.” Examples of clean water sources may include, but are not necessarily limited to the following:

- Broken domestic water supply lines;
- Tub or sink overflows with no contaminants;
- Appliance malfunctions involving domestic water supply lines;
- Melting ice or snow;
- Falling rainwater; and
- Broken toilet tanks and toilet bowls that do not contain contaminants or additives.

Clean water that has contact with structural surfaces and content materials may deteriorate in cleanliness as it dissolves or mixes with soils and other contaminants, and as time elapses. Building materials impacted by clean water, if not dried within 24 to 48 hours can result in mold growth.



### *Category 2 Water*

Water containing a significant degree of chemical, biological and/or physical contamination and having the potential to cause discomfort or sickness if consumed by or exposed to humans.

Category 2 water is also referred to as “gray water.” Gray water carries microorganisms and nutrients for microorganisms. Examples of gray water sources may include, but are not necessarily limited to the following:

- Discharge from dishwashers or washing machines;
- Overflows from toilet bowls with some urine (no feces)
- Sump pump failures;
- Seepage due to hydrostatic pressure;
- Chilled and condensate water; and
- Fire Protection Sprinkler Water.

Gray water (Category 2) may contain chemicals, bio contaminants (fungal, bacterial, viral or algal) and other forms of contamination including physical hazards. Time and temperature aggravate Category 2 water contamination levels significantly. Gray water (Category 2) in flooded structures that remains untreated for longer than 48 hours may present an increased risk if consumed or exposed to humans. All building materials impacted by Category 2 water and not dried within 48 hours must be re-classified and treated as Category 3 water.

### *Category 3 Water*

Grossly unsanitary water containing pathogenic agents, arising from sewage or other contaminated water sources and having the likelihood of causing discomfort or sickness if consumed or exposed to humans. Category 3 water includes sewage and other contaminated water sources entering or affecting the indoor environment. Category 2 water that is not removed promptly (within 48 hours) from the structure may be reclassified as Category 3 water. Toilet back flows that originated beyond the toilet trap are considered Category 3 water contamination, regardless of visible content or color. Category 3 water includes, but is not necessarily **limited to all forms of flooding from:**

- Sewage/rainwater mixed
- Rising water from rivers or streams
- Category 2 water not dried within 48 hours

Any non-structural porous building materials impacted with Category 3 water must be removed and properly disposed of. Any structural building materials impacted by Category 3 water must be properly sanitized prior to restoration.



#### **IV. Flood Mitigation, Recovery and Restoration Process**

##### **A. Initial Flood Response**

A. 1. The source of flooding or leakage must be identified and repaired or eliminated where applicable. During or immediately following a water incursion, efforts must be made to protect people and property by collecting and extracting as much water and moisture as possible. Although collecting or extracting all water and moisture during a water incursion is not possible, limiting the amount of residual water coming in contact with porous building materials will minimize the extent of additional damage and potential for mold growth. Water/moisture removal procedures may include the following:

- i. Mopping
- ii. Diversion to drains
- iii. Dehumidification
- iv. Wet vacuuming
- v. Pumping
- vi. Temperature control

A.2. As soon as practical, after the identification of a water incursion, a claim should be filed with University Risk Management (URM) in order to determine insurance coverage. Determination of claim status should not delay initial or immediate response to mitigate water damage and to protect people or property.

##### **B. Inspection**

Following the removal of excess water, a detailed inspection must be conducted that considers the extent of water migration, the types and quantities of affected materials and the degree of apparent damage. The information obtained may be used to analyze the extent of damage and to determine the required mitigation. Moisture measurements and the principals of psychrometry may be used to formulate a plan to dry and restore, or replace both structural materials and contents. A comprehensive inspection may include, but is not limited to the following:

- i. Identifying and evaluating health and safety hazards
- ii. Determining the source and category of water
- iii. Determining the need to protect floor covering materials and contents
- iv. Determining the extent of moisture intrusion
- v. Evaluating building materials (flooring, walls, ceiling, etc.)
- vi. Evaluating impact to building/room contents
- vii. Evaluating the HVAC system (if applicable)
- viii. Documenting preexisting conditions not related to the current loss (wear, delamination, etc.)

For areas with extensive water damage, a determination must be made if occupants need to be moved away from the damaged areas until recovery and restoration activities are



completed. Factors used to make this determination may include, but are not limited to the following:

- i. Type of contamination (e.g., Category 1,2, or 3 water);
- ii. Obvious indications of high levels of microbiological or chemical contamination
- iii. Presence of occupants who are immune compromised or have mold allergies, asthma or other medical conditions.

### **C. Defining Water Impacted Building Materials**

Following a water incursion, university personnel or an Emergency Mitigation and Restoration Standing Order Contractor (SOC) must develop a moisture map to outline what building materials have been impacted. The moisture map is a visual tool used to delineate which materials require drying, removal and or remediation. Areas to be mapped are based on preliminary building assessments during the water incursion, work orders placed as a result of the water incursion or Building Proctor/occupant interviews. A final determination of what remediation actions are required will be made based on the category of water, usage of space and the university flood mitigation guidelines. The moisture mapping procedure is outlined below.

The following procedure was developed to document building materials impacted by water incursion.

#### Equipment/materials

- Penetrating Moisture meter
- Infrared (IR) Camera
- Current Building Floor Plans
- Building Specific Note page

#### Building Inspection

- 1) Estimate building background moisture equivalent by testing several materials with the moisture meter which are known to have not been impacted by the flood and considered "dry". Background should be 6-8% in most materials but can be as high as 10%.
- 2) Visually inspect room/area for signs of water incursion or water damage. For example, water staining, mold growth, bubbled paint, etc.
- 3) Perform preliminary scan of room/area with Infrared (IR) camera to outline areas with a heat signature consistent with water damaged porous building material.
- 4) Using a moisture meter, collect random samples from each accessible porous building material (i.e., drywall, carpet, ceiling tiles, etc.) to delineate current moisture content.

#### Documentation

- 1) Based on site inspection, record which surfaces have been impacted and require further assessment.

**Walls:** Each wall on the floor plan must be marked to indicate the height on the wall that requires further assessment and follow up based on visual inspection and current moisture content. Walls must be marked with a "1", "2", "4" or "8" indicating the number of feet of impacted material requiring further assessment. The number of feet noted must always be rounded up. For example, if a wall is stained or wet up to 14 inches from the ground the mark



on the map for that wall should be “2” indicating 2 feet of impacted material. A “0” should be noted to indicate that materials are currently dry and do not show any signs of damage or staining.

**Floors and Ceilings:** Each floor and ceiling must be marked on the floor plan with an “F” (Floor) or “C” (Ceiling) to indicate which surface was impacted and that the material requires further assessment. Notes must be made to indicate the type of damage, the location of the damage relative to the room, and the approximate square footage of the impacted area(s). For example, stained carpet/northwest corner of room/~16 sq. ft.; wet drywall on ceiling/6 ft. from west wall, 2 ft. from north wall/~2 square feet; etc.

- 2) Additional notes about the space must be documented on the building specific note page. For example odor, signs of how water entered space, etc. If rooms are locked make a note and coordinate with building proctor or Facilities Management Representative (FMR) to have the room assessed at a later date.

#### **D. Monitoring**

Continual monitoring must be conducted in the flood impacted areas starting with the initial flood response and continued throughout the restoration process. Continual monitoring will ensure the source of water has been fully rectified, document progress in drying and ensure no additional areas of water damage are discovered. When applicable, monitoring can include checking equipment operation, work progress and indoor environment quality. Monitoring procedures may include the following:

- i. Temperature and relative humidity measurements
- ii. Updating drying progress status
- iii. Checking the moisture content of structural wood and other materials with a moisture meter or infrared camera.

#### **E. Flood Mitigation (Scope Development)**

A scope of work based on the initial inspection, Building Proctor/occupant interviews, ongoing monitoring, work orders and the flood map must be developed to outline what mitigation actions are required. Mitigation requirements are based on extent of damage, category of water and usage of space. Mitigation procedures include the following:

- i. Dehumidification
- ii. Active drying of building materials
- iii. Flood cutting
- iv. Wholesale removal of flood impacted building materials

The Facilities Management Representative (FMR) is responsible for developing the scope of work based on the material specific restoration criteria below. These guidelines outline the majority of circumstances which will require flood mitigation based on material type, category of water, usage of space and potential for health and safety concerns. When necessary the Environmental Health and Safety (UC-EHS) department is available to provide assistance and recommendations for situations not addressed in these guidelines.





Following scope development, the FMR is responsible for requesting an Environmental Compliance Document (ECD) to determine whether the building materials requiring mitigation are asbestos containing. An industrial hygiene consultant, certified by the Colorado Department of Public Health and Environment (CDPHE) to perform asbestos surveys will outline the asbestos status for each building material requiring mitigation or impact. If a recent complete asbestos survey is available for the buildings impacted, the Facilities Management Representative (FMR) may delineate these in lieu of the IH. Asbestos status will be based on recent surveys, historic sample data, or may require additional flood specific sampling. Any contractor working on the flood mitigation project must sign and return the ECD to the FMR. The ECD is an auditable document required by the University of Colorado in order to process payment for any work performed by contractors on the University of Colorado Denver | Anschutz Medical Campuses. In the event that asbestos abatement is required for flood mitigation activities, FM will outline the type of project (1-7) and the necessary involvement from a General Abatement Contractors (GAC) and or Industrial Hygienist (IH). Depending on the scope of work, an IH firm may be required to provide a final inspection, clearance sampling and documentation certifying that remediation efforts have been completed and the remaining materials are dry and free of visible staining or mold growth.

Any contractor or consultant performing asbestos assessment or abatement work must hold all applicable certifications per CDPHE regulations.

### **V. Health and Safety**

Contractors assisting the University in flood mitigation and recovery are responsible for protecting employees and following all applicable local, state and federal guidelines. The appropriate training and proper use of worker PPE is required during all mitigation activities.

University Personnel assisting in flood mitigation and recovery must work with the Environmental Health and Safety department (EHS) to determine what PPE and methodology is required for the specific mitigation activity and category of water.

The Safety of the campus community including students, staff, faculty and visitors is paramount. Any conditions that present a risk of adverse health impact, injury, or where structural integrity of buildings or other constructed facilities or equipment is compromised, an assessment must be conducted prior to allowing personnel to enter.

### **VI. Communications**

All staff with duties associated with the response, identification, mitigation, or assessment of moisture events should be provided the information herein, general guidance on project-specific communication goals or the communication plan as appropriate.



### **A. Departmental Communications**

Upon discovery of the presence of mold or when water impacted materials are not dried completely within a 24-48 hour time period (depending on the nature of the materials impacted) EHS must be informed. EHS is available to assist Facilities Management with small scale moisture assessments. Large scale flooding and moisture intrusion events necessitate the use of an approved restoration firm.

For large scale events or when occupant health concerns are possible, a communication plan should be developed as part of a collaboration with representatives of Facilities Management, Environmental Health and Safety and Risk Management.

### **B. Occupant Communications**

For large scale events or when occupant health concerns are possible, a communication plan should be developed as part of a collaboration with representatives of Facilities Management, Environmental Health and Safety and Risk Management.

Small scale moisture events, Facilities Management personnel will:

- Communicate promptly the nature of the initial mitigation efforts that have occurred to occupants affected by the water event and what is planned for ongoing or future mitigation, if needed.
- Designate a point of contact for the project that will provide information to the affected occupants.
- Provide contact information for the FMR that will act as the point of contact.
- Provide timelines for mitigation and assessment efforts to affected occupants.
- Provide advance notice of any planned relocation of personnel or equipment.
- Provide updates throughout the project.
- Communicate promptly once mitigation efforts are complete.

For large scale events or when occupant health concerns are possible:

- Communicate promptly the nature of the initial mitigation efforts that have occurred to occupants affected by the water event and what is planned for ongoing or future mitigation, if needed.
- A representative or representatives for building occupants is appointed that will act as a liaison and will be a point of contact for building occupants. This person(s) may attend project planning meetings.
- Points of contact will be identified for Facilities Management, Environmental Health and Safety and Risk Management.
- Facilities Management, Environmental Health and Safety and Risk Management representatives (points of contact) will meet to gather pertinent data and information and establish a communication plan. These representatives may act as or appoint a risk communication team or sole representative (and alternate).



- The risk communication team will work to understand and address the concerns of building occupants and communicate clearly what has to be done as well as possible health concerns.
- Meet *at least once* with all affected occupants and allow sufficient time for questions and answers at the beginning of the project and thereafter as needed.
- Develop an email distribution list of all affected occupants and their management.
- Provide regular communications through the distribution list and/or a webpage or blog.
- Communications with occupants and stakeholders should include changes to project schedules, results of assessment activities, scope of work activities, extent of remediation efforts, relocation information as applicable, information about health concerns, and means of filing claims as applicable.
- Provide clear communications based on the approved communication plan. Messages to the occupants must be provided through pre-established points of contact. Every message should be vetted by the communication team (points of contact) before it is provided to any building occupant.
- Communications to external entities should be reviewed by the University Communications department.
- Prepare a written summary of the project.
- Provide written summary to appropriate involved departments for their records.
- Hold a final meeting at completion of project to provide an overview and results.

## VII. Training

Contractors performing flood mitigation on Campus must have the following training for the scenarios outlined below. Additionally, contractors are responsible for providing employees with adequate health and safety training.

### 1) Water Damage with No asbestos abatement (including projects that have visible mold growth and impact by sewage)

Contractors conducting flood mitigation on campus for buildings which were impacted by water containing sewage and/or have visible mold growth but there is no asbestos abatement required will have a Supervisor who has applicable IICRC training or an equivalent level of training. Comparable trainings must be current and verified by University of Colorado Denver | Anschutz Medical Campus FM or EHS prior to start of work. Contractors will supply proof of training (current certificates of training or similar documentation). The IICRC trained supervisor must be onsite at all times. Workers with applicable or comparable IICRC training and certification are preferred. However, if a contractor does not have IICRC trained workers, the company is responsible for providing site specific safety training for all employees responsible for flood mitigation work. The training must cover health and safety topics and appropriate personal protective equipment related to flood mitigation. Training certificates must be available upon request. The contractors must be on Facilities Management's Standing Order Contractor list and follow all applicable State and federal regulations. All work must be conducted in compliance with the EHS Water Damage Restoration Guidelines.



2) Water Damage with Asbestos Abatement (including projects that have visible mold growth and impact by sewage)

Contractors conducting flood mitigation on campus for buildings which require asbestos abatement regardless of mold growth or sewage being present can be conducted by GAC on the Facilities Management's Standing Order Contractor list. The GAC must have a Supervisor who has applicable or comparable IICRC training. The IICRC trained supervisor must be onsite at all times. Comparable trainings must be current and verified by FM or EHS prior to start of work. It is preferred that GAC workers have an applicable IICRC training and certification. However, if a GAC does not have IICRC workers, the company is responsible for providing site specific safety training for all employees responsible for flood mitigation work. The training must cover health and safety topics and appropriate personal protective equipment related to flood mitigation. Training certificates must be available upon request. All work must be conducted in compliance with the EHS Water Damage Restoration Guidelines.

Projects which are considered a "hybrid" and have both asbestos abatement and areas of non-abatement must be conducted using personnel following the training requirements above. The FMR is responsible for determining whether the project will be subdivided and contracted separately for the different types of work or if the more stringent training requirement will be followed for all of the work. Non-asbestos contract workers must stop work immediately if suspect asbestos containing materials (ACM) are encountered and/or impacted. All work at permit threshold levels for ACM disturbance/abatement must be performed by workers certified as specified in CDPHE air and solid waste regulations.

## **VIII. Building Material Remediation and Restoration Criteria**

The following procedures were developed to provide a consistent approach to determining flood mitigation activities (drying, removal, remediation, etc.). The purpose of these procedures is to determine when building materials are "dry" and ready for restoration or when building materials require further mitigation (removal, remediation, etc.) prior to restoration. The FMR is responsible for developing the scope of work based on the material specific restoration criteria outlined below. A final determination of what remediation actions are required will be made based on the category of water, extent of damage, usage of space and potential for adverse impacts to building occupant health and safety. EHS is available to provide assistance and recommendations for unusual situations or circumstances not addressed in these guidelines.

The underlying principles that guide the development of these guidelines are:

1. The ambient conditions must be stabilized and be able to be held at normal room conditions
2. The building materials must be returned to their equilibrium moisture content to prevent the active growth of fungal organisms; and
3. The building materials must be returned to their pre-loss moisture state.

When these three criteria are met, a building can be considered dry.



Drying services shall be considered sufficient when the following three conditions have been achieved:

1. The interior ambient conditions are at or better than normal room conditions ( $\leq 30\%$  RH @ 70° F)
2. The moisture in the building materials themselves will not support the active growth of mold and mildew; and
3. The building materials and contents will finish returning to equilibrium with normal room conditions by themselves without further damage to them.

The observational history of abnormal moisture observed in the building should be incorporated into the scope of the restoration. The source of information regarding the water incursion can be obtained through building occupant interviews, assessments made by University personnel or other parties who were in the building at the time of water incursion flooding or shortly thereafter. The FMR or designee should consult with building proctors to determine the scope of reported moisture and add this information to moisture maps. If the presence of abnormal moisture in an area is somewhat tentative, the FMR should request additional investigation of such areas to better determine if it was impacted.

Additional reports coming from work orders should also be investigated to determine the possibility of moisture incursion and, if necessary, investigation of affected areas such as wall cavities or ceiling plenums should be performed to better determine if an area was impacted.

Results of these observations and investigations should be combined with the flood map information to create an overall restoration scope. In other words, the overall scope would be the compilation of any of these sources, erring on the side of caution.

If necessary, exploration of boundary areas may be investigated by performing test cuts in locations adjacent to affected areas to verify that a reasonable extent of water infiltration has been determined. It should be understood that large scale water incursions may prevent moisture mapping and initial dry-outs from occurring within 48 hours, all locations which were affected cannot be perfectly determined, but these measures are intended to ensure a reasonable effort to ascertain the scope is made

Building materials impacted by Category 2 water and left untreated for longer than 72 hours must be reclassified and treated as Category 3 water. Any non-structural porous building materials impacted with Category 3 water must be removed and properly disposed of. Any structural building materials impacted by Category 3 water must be properly sanitized prior to restoration. Additional information on appropriate sanitization can be found in IICRC S500. Building materials impacted by Category 1 water, if not properly dried with 24-48 hours (depending on the building material type as specified below), may result in mold growth and should be assessed for this potential and reclassified as applicable.

Prior to any restoration work the source of moisture must be determined and rectified.



The following general work practices address a number of typical materials. Special cases shall be reviewed by the FMR who will consult with EHS. While not specifically reiterated here, all work shall also conform to IICRC S500 as well.

## A. Flooring

The ability to salvage the various types of floor systems will be determined on a case by case basis. If floor systems are determined to have been wet, a determination will be made if the flooring will be removed and replaced or cleaned and sanitized. For all Category 3 Water contamination, all flooring must be removed (exemptions to removal requirement for non-porous specialty flooring must be reviewed and approved by FM and EHS). For Category 1 and Category 2 Water, individual assessments will be made to determine if the flooring and/or flooring subsystems will be removed.

It is recommended that a determination be made as to whether floor covering materials (e.g. carpet, cushion, vinyl, wood, laminates, etc.) are salvageable if less than Category 3 water was present. Considerations are based on the following:

1. Construction integrity
2. Category of Water
3. Potential for future damage (i.e. dislodging of asbestos containing floor tile)
4. Inability to sanitize/disinfect
5. Porosity and potential health effects from contaminants.

- 1. Hardwood or Engineered Wood Floors** – Wood floors impacted with Category 1 or Category 2 water which are not damaged and can be salvaged should be cleaned and sanitized. Wood floors impacted by Category 3 water must be removed and the subfloor beneath should be sanitized prior to reinstalling the new floor system.

For the purposes of these Guidelines, wood floor can be considered “dry” when the moisture content of the wood is decreasing and less than 15%.

- 2. Carpeting** – Carpeted areas impacted with Category 1 or Category 2 water which can be salvaged should be steam cleaned and sanitized. Carpeted areas impacted by Category 3 water must be removed and the subfloor beneath should be sanitized prior to reinstalling the new floor system. Carpeting is often placed on top of floor tiles and or mastic which may contain asbestos. It is the FMR’s responsibility to work with IH to determine if asbestos is present in the tile and mastic prior to proceeding with removal.

For the purposes of these guidelines, a carpet can be considered “dry” when the moisture content of the carpet is decreasing and less than 15%.

- 3. Floor Tile** – Floor tile is typically dried during the water incursion or soon after the event. If floor tile is adhered to a concrete subfloor there is less potential for microbial growth due to the lack of cellulose containing materials. In these situations, floor tile impacted with





Category 1 or Category 2 water can be cleaned and sanitized prior to waxing and stripping. Situations where floor tile is adhered to a cellulose containing porous materials (i.e. wood floors) additional effort will be required to determine if the subfloor is dry or can be dried. If the subfloor cannot be dried in a reasonable amount of time the tile will have to be removed in order to ensure the subfloor can be dried prior to restoration.

Floor tile impacted with Category 3 water must be removed in order to adequately sanitize the subfloor beneath. It is important to keep in mind that floor tiles that have been impacted by a flood have an increased potential to become dislodged due to degradation of the mastic. It is the FMR's responsibility to work with IH to determine if asbestos is present in the tile and mastic prior to proceeding with removal.

4. **Floor Coverings (Vinyl, linoleum etc.)** - Floor coverings are typically dried during the water incursion or soon after the event. However, residual moisture may be trapped below the impervious floor covering. It is the FMRs responsibility to determine if the subfloor is dry. In situations where floor coverings have been impacted with Category 1 or Category 2 water and the subfloor is determined to be dry the flooring can be cleaned and sanitized. Floor coverings impacted with Category 3 water must be removed in order to adequately sanitize the subfloor beneath. It is important to keep in mind that floor coverings often contain friable asbestos in the felt backing. It is the FMR's responsibility to work with IH to determine if asbestos is present prior to proceeding with removal.
5. **Concrete Slab** – Concrete continually absorbs and releases moisture over time and can resist microbial growth due to its lack of organic materials and alkalinity. Concrete slab floors impacted by any Category water (1-3) should be sanitized and allowed to dry prior to restoration.

For the purposes of these Guidelines, concrete can be considered “dry” when the moisture content of the slab is decreasing and less than 15%.

## B. Wall and Ceiling Systems

Throughout the restoration process, it is highly recommended that effort is directed toward anticipating secondary damage and attending to other structural components that may require drying, or removal and replacement. This is especially important if water remains in contact with building materials longer than 24 hours, such as standing water inside a wall cavity.

The ability to salvage the various types of wall and ceiling systems will be determined on a case by case basis. For all Category 3 Water contamination, all materials should be removed. For Category 1 and Category 2 Water, individual assessments will be made to determine if the materials will be removed or cleaned and sanitized in place. Asbestos may be present in many of the building materials. It is the FMR's responsibility to work with IH to determine if asbestos is present prior to proceeding with removal or disturbance.

If additional inspection is required to determine the scope of work or the extent of water damage and potential for mold growth, the project IH should conduct additional investigations of wall



cavities and other inaccessible areas. EHS is available for support in assessing the need for additional investigation until a project IH is contracted.

1. **Drywall** – If drying procedures were not initiated within 48 hours of the initial water loss or dried within 48 hours, all wet drywall should be replaced. If drywall was impacted by Category 1 or Category 2 water, drying was completed in 48 hours and the drywall system is salvable, the drywall can remain in place and be sanitized. If drywall was impacted by Category 3 water the impacted portions of the wall system must be removed and all structural building materials must be properly sanitized prior to restoration.

For the purposes of these Guidelines, drywall can be considered “dry” when the moisture content of the drywall is decreasing and less than 15%.

2. **Concrete Block (CMU)** – Concrete continually absorbs and releases moisture over time and can resist microbial growth due to its lack of organic materials and alkalinity. Concrete block walls impacted by any Category water (1-3) should be sanitized and allowed to dry prior to restoration.

For the purposes of these guidelines, CMU can be considered “dry” when the moisture content of the block is decreasing and less than 15%.

3. **Plaster, Stucco** – Plaster absorbs moisture at a slower rate than drywall, however once water has been absorbed it releases the moisture very slowly. Plaster itself is an inorganic material and resistant to moisture damage and microbial growth. However, if wood lath was used in the construction of the plaster wall system the potential for mold growth exists. It is the FMR’s responsibility to determine if a wood lath is present and impacted by flood water. If wood lath is present and impacted by Category 1 or Category 2 water and determined to be dry at the time of the inspection (flood mapping) the wall can remain in place. If plaster or stucco are impacted by Category 3 water or the wall has remained wet for greater than 48 hours, the plaster must be removed and all structural building materials must be properly sanitized prior to restoration.

For the purposes of these Guidelines, Plaster and stucco can be considered dry, when the moisture content of the plaster/stucco is decreasing and less than 15%.

4. **Wood Components (studs, baseboard, etc.)** – Wood components which have been impacted by Category 1 or Category 2 water can be sanitized in place after they have been dried. Wood components which have been impacted by Category 3 water must be cleaned, decontaminated and dried prior to restoration.
5. **Insulation** - Thermal insulation materials used in walls or ceilings cannot be adequately dried and reused. If insulation material is determined to be wet, it must be removed and all structural building materials must be properly sanitized prior to restoration.





### C. Miscellaneous Materials

1. **HVAC Systems** - Internally lined duct work or exterior duct insulation may need mitigation if impacted by flood waters and not allowed to dry thoroughly. The FMR is responsible for assessing these situations on a case by case basis and coordinating with the HVAC control shop and EHS or project IH to determine the next course of action.
2. **Occupant Belongings – Personal property is not intended to be covered by the University insurance program.** Occupant belongings impacted by flood waters will be handled on a case by basis and may require involvement of University Risk Management for replacement. A final determination of what remediation actions are required will be made based on the category of water, extent of damage, if mold impacted, usage of space and potential for adverse impacts to building occupant health and safety. The FMR is responsible for working with the Building Proctor, room occupant and EHS or project IH to determine the required remediation actions.
3. **Ceiling Tiles** – Ceiling tiles are made out of various materials and can support microbial growth and are difficult to clean. To prevent mold growth and unsightly stains flood impacted ceiling tiles should be removed and replaced.
4. **Room Contents (University Property)** – University property is covered by the University insurance program. Property e.g. desk, bookcase, lab equipment, etc.) Impacted by flood waters will be handled on a case by basis to determine the need for sanitization or replacement. In general, porous materials (e.g. wood desks) impacted by Category 3 water should be disposed. A final determination of what remediation actions are required is based on the category of water, extent of damage, if mold impacted, usage of material and potential for adverse impacts to building occupant health and safety. If flood impacted property is to be cleaned and sanitized all contaminated and exterior surfaces must be wiped down with an appropriate biocide and/or dry methods (ozone, freeze dried, HEPA vacuumed, etc.) consistent with latest remediation standards and technology and/or as recommended by the project IH and/or abatement contractor. Final determinations are made by the University. The FMR is responsible for working with the room occupants, and the IH/GAC or EHS to determine the required remediation actions.

### IX. Removal of Flood Impacted Building Materials

The following guidelines have been developed by the University for restoration contractors and University Personnel to follow during flood mitigation efforts which will impact non-asbestos containing building materials. All contractors must use appropriate dust control methods to ensure building occupants are not impacted by excess dust during flood mitigation. All Contractors are responsible for protecting employees and following all applicable local, state and federal guidelines. The proper use of worker personal protective equipment (PPE) is required during all removal activities.



FM or contracted IH will provide an Environmental Compliance Document (ECD) for the building/area requiring flood mitigation. The Contractor shall review the document to verify no ACM is being disturbed. If any additional suspect materials are encountered, all work must stop and FMR, contracted IH, or UC EHS must be notified. A contracted IH will determine whether ACM is present and if any additional follow up procedures are needed when no current asbestos survey is available.

If no asbestos abatement is included in the scope of work, employees of the restoration contractor should all possess current and appropriate IICRC training for the work (worker/supervisor). If asbestos abatement is included, the IICRC training can be replaced with an appropriate training curriculum including appropriate hazard and PPE information. All federal and state training requirements apply to contractors of the University and appropriate certifications must be held as required by CDPHE for all workers involved in regulated activities (e.g., asbestos abatement).

If asbestos abatement is part of the project, these procedures should be dovetailed into abatement procedures. In other words, the containment requirements may change to comply with asbestos abatement requirements, but the drying and disinfection procedures would still remain in effect. Only the procedures that must be changed to comply with asbestos regulations would be modified.

#### **1. Building Materials impacted by Category 1 or 2 Water with no visible mold growth**

Response measure in this section do not address mold impacted materials. If mold is suspected or encountered, work must stop until an assessment of conditions by IH is performed. If mold is present, the work scope must be revised (refer to section 2, Building Materials impacted by Category 3 Water and/or with visible mold growth). At no time must blowers be used to dry materials with visible or suspect mold growth. Areas exposed to water, excessive moisture, or steam that are not dried out within 24 to 48 hours ([EPA](#))

##### **a. Preparation of Work Area/Containment**

- i. Install a dust barrier to control general (nuisance) dust. The area should be large enough to work in, but no larger than needed to limit the amount of post-demo cleaning.
- ii. Dust barrier should be made out of 6-mil poly sheeting. Tape should not leave adhesive residues or damage building surfaces. Contractor is responsible for any resulting repair.
- iii. Contractor must place a drop cloth under material being removed. The drop cloth must be large enough to extend beyond the work area and capable of catching all material and debris dislodged and released during the removal process.

##### **b. Removal of Materials**

- i. Remove all building materials that are outlined on the building specific moisture map.
- ii. Effort should be taken to remove materials in a manner which will generate the least amount of dust.



- iii. Flood cuts must be extended one foot above water damage, or the documented flood map elevations. When feasible, flood cuts should be made to facilitate efficient use of material and seam patching. In any regard, the cut should extend a minimum of one foot past the last sign of moisture.
- iv. All flood cuts on walls of normal dimensions (e.g. a typical room) should be to one level height unless directed to vary the height by the FMR. Longer walls (e.g. over 30 feet in length, may vary based on discussions with the FMR).
- v. Flood impacted building materials which have been removed must be immediately bagged for disposal.
- vi. If mold growth or material suspected of harboring mold is discovered, all work must stop, the Facilities Management Representative (FMR) must be notified and the materials must be removed following the mold remediation guidelines outlined below.

**c. Cleaning and Sanitization**

- i. The Contractor is responsible for sanitizing impacted materials which are to remain in place with an appropriate biocide to limit the potential for human exposure. The Contractor is responsible for following the cleaning procedures outlined in IICRC S500 and IICRC S520. The Contractor must ensure building occupants are not impacted during the sanitization process.

**d. Post Demo Cleaning and Inspection**

- i. Contractor is responsible for ensuring the work area is free of dust and debris.
- ii. All surfaces which were previously wet must be disinfected before removal of dust barriers.
- iii. Project Manager will coordinate with EHS or an IH Consultant to perform a visual inspection of work areas to ensure materials are adequately dry, free of visible staining, dust and debris.
- iv. Additional clearance sampling (e.g. bacterial, fungal, etc.) may be required and determined on a case by case basis
- v. Following the visual inspection and clearance from EHS or the IH Consultant, the Contractor can remove dust barriers.
- vi. The FMR, EHS or IH Consultant is responsible for verifying all building materials outlined in the scope of work have been dried to correct moisture content levels. Moisture levels must be determined using a moisture meter and adequately documented.
- vii. EHS or IH Consultant will provide close out documentation to the FMR indicating the project was completed per the scope of work.

**e. Waste Disposal and Handling**

- i. Contractors must dispose of all waste and debris in accordance to federal, state and local guidelines.



## **2. Building Materials impacted by Category 3 Water and/or with visible mold growth**

Currently there are no regulations regarding airborne concentrations of mold. If mold or materials suspected of harboring microbial growth are encountered, the following steps should be taken. In addition, all applicable provisions of IICRC S520 shall be followed.

### **a. Preparation of Work Area/Containment**

- i. Contractor must install containment as outlined in IICRC S520. The containment must create a secondary enclosure sufficient to limit airflow from the work area to adjacent areas.
- ii. Install HEPA-filtered negative air machines sufficient to create negative pressure and negative air flow. Optimize machine locations to minimize stagnant areas within work area.
- iii. The containment should be large enough to work in, but no larger than needed to limit the amount of post-demo cleaning.
- iv. Containment barriers should be made out of 6-mil poly sheeting. Tape should not leave adhesive residues or damage building surfaces. Contractor is responsible for any resulting repair.
- v. Contractor must inspect the containment daily for damage/breach of containment and make immediate repairs.
- vi. Contractor must place signage on the containment area to restrict access. Unauthorized personnel must not be allowed to enter the containment.
- vii. Contractor must place a drop cloth under material being removed. The drop cloth must be large enough to extend beyond the work area and capable of catching all material and debris dislodged and released during the removal process.

### **b. Removal of Materials**

- i. Remove all building materials that are outlined on the building specific moisture map and scope of work.
- ii. Effort should be taken to remove materials in a manner which will generate the least amount of dust.
- iii. Flood cuts must be extended 1'0" above visible mold growth, water damage, or the documented flood map elevations. When feasible, flood cuts should be made to facilitate efficient use of material and seam patching. In any regard, the cut should extend a minimum of 1 foot past the last sign of moisture.
- iv. All flood cuts on walls of normal dimensions (e.g. a typical room) should be to one level height unless directed to vary the height by the FMR. Longer walls (e.g. over 30 feet in length, may vary based on discussions with the FMR.
- v. Flood impacted or mold covered building materials which have been removed must be immediately bagged for disposal.
- vi. HEPA vacuum visible mold growth on permanent building materials which are to remain in place.
- vii. After vacuuming, scrub substrates with abrasive cleaning techniques (e.g. wire brush, abrasive pad, etc.) to remove remaining surface growth.
- viii. Clean work area using a HEPA vacuum to ensure no dust and debris are present.
- ix. For documentation purposes, the FMR, EHS, or the IH consultant must be notified when mold or suspect mold is discovered.



**c. Cleaning and Sanitization**

- i. The Contractor is responsible for sanitizing impacted materials which are to remain in place with an appropriate biocide to limit the potential for human exposure. The Contractor is responsible for following the cleaning procedures outlined in IICRC S500 and IICRC S520. The Contractor must ensure building occupants are not impacted during the sanitization process.
- ii. Contractor must wipe down all surfaces which had mold growth with an anti-fungal agent.
- iii. Contractor is responsible for applying an opaque white anti-fungal encapsulate on all surfaces that had mold growth and could not be sanitized or removed unless directed not to do so by FMR.

**d. Post Demo Cleaning and Inspection**

- i. Contractor is responsible for ensuring the work area is free of dust and debris.
- ii. All surfaces which were previously wet must be disinfected before removal of dust barriers.
- iii. FMR will coordinate with EHS or an IH Consultant to perform a visual inspection of work areas to ensure materials are adequately dry, free of visible staining, dust and debris.
- iv. Clearance sampling (e.g. bacterial, fungal, asbestos, etc.) may be required and determined on a case by case basis and in accordance with regulations (e.g., for operations where ACM is impacted). Materials impacted by Category 3 water containing sewage must have fungal and bacterial clearance. Materials impacted by Category 3 water and showing signs of mold growth must have a fungal clearance.
- v. Following the visual inspection and clearance from EHS or the project IH Consultant, the contractor can remove dust barriers.
- vi. The FMR, EHS or IH Consultant is responsible for verifying all building materials outlined in the scope of work have been dried to correct moisture content levels. Moisture levels must be determined using a moisture meter and adequately documented.
- vii. IH Consultant will provide close out documentation to the FMR indicating the project was completed per the scope of work. Closeout documentation should include location of mold growth, photographs of locations after remediation is complete, drying records, and any other pertinent information.

**e. Waste Disposal and Handling**

- i. Contractors must handle, package, label, and dispose of all waste and debris in accordance to federal, state and local guidelines.



## References

IICRC: S500 Standard and Reference guide for Professional Water Damage Restoration

IICRC: S520 Standard and Reference guide for Professional mold Remediation

Occupational Safety and Health Administration (OSHA): A Brief Guide to Mold in the Work Place

<https://www.osha.gov/dts/shib/shib101003.html>

U.S. Environmental Protection Agency (EPA): Mold Remediation in Schools and Commercial Buildings [www.epa.gov/mold](http://www.epa.gov/mold)



## FACILITIES MANAGEMENT

### Flood Procedure (Interior)

NOTE: It is extremely important to address ANY water incursion with the utmost urgency.

#### Purpose:

These guidelines were developed to ensure that all water incursions are handled in a professional manner which includes the latest information and procedures available. The purpose of the document is to provide a consistent approach to outlining which buildings and materials have been impacted and what actions are necessary to bring the buildings back online as quickly and safely as possible

#### Definitions:

**Category 1 Water** - Same as definition on page 2 and added DI as clean water

**Category 2 Water** - Same as definition on page 3 with no additions

**Category 3 Water** - Same as definition on page 3 with no additions

**Minor Flood** - A small area that is easy to contain after isolation of the source and can be remediated quickly. There are no associated damages or operational impacts. Log the event in the daily log to include building, room and cause of flood.

**Major Flood** - A large area that cannot be easily contained after isolation of the source and will require additional help in order to remediate. If two shift people are on duty, one needs to investigate the source of the leak while the other contacts the SOM. Be prepared to give an accurate description to the SOM including building, floor, room, type of flood, and whether it is isolated or not. SOM will be contacted for all floods. Contact University of Colorado Denver | Anschutz Medical Campus Police Department to notify tenants of the emergency.

**For any flood that contains oils, solvents, fuels or other unknown chemicals, do not attempt to remediate.** Try to isolate the source and contact the SOM right away. The SOM will then contact UCPD to contact the Environmental Health & Safety (EH&S) for support and direction on how best to deal with this type of flood.

#### NOTES:

a. Building materials impacted by clean water, if not dried within 24 to 48 hours can result in mold growth.

b. (Category 2) may contain chemicals, bio contaminants (fungal, bacterial, viral or algal) and other forms of contamination including physical hazards. Time and temperature aggravate Category 2 water contamination levels significantly. (Category 2) in flooded structures that remains untreated for longer than 48 hours may present an increased risk if consumed or exposed to humans. All building materials impacted by Category 2 water and not dried within 48 hours must be re-classified and treated as Category 3 water.

c. Any non-structural porous building materials impacted with Category 3 water must be removed and properly disposed of. Any structural building materials impacted by Category 3 water must be properly sanitized prior to restoration.





## First Responder Tasks

1. Report to location of occurrence
  - a. **For any flood that contains oils, solvents, fuels or other unknown chemicals, do not attempt to remediate.** Try to isolate the source and contact the SOM right away. The SOM will then contact UCPD to contact the Environmental Health & Safety (EH&S) for support and direction on how best to deal with this type of flood.
  - b. Has the source of the flood been isolated (valves shut off or redirected in some cases?)
  - c. Call SOM immediately after source has been identified and/or secured. If two personnel are responding to the flood, one should isolate the other should call SOM. After SOM has been contacted, remove water (unless it contains any items referenced in 1. a) using flood vacuum and wear PPE (rubber boots, gloves and safety glasses/splash goggles.)
  - d. Whenever possible, turn off the electrical power to the flooded rooms and disconnect the electrical power cords in contact with the floor (computers, centrifuges, etc.). Keep in mind that turning off the electrical power may affect experiments and other equipment in the surrounding areas. Inform the SOM of all equipment that is turned off or unplugged for safety.
  - e. During or immediately following a water incursion, efforts must be made to collect and extract as much water and moisture as possible. Water/moisture removal procedures may include the following:
    - i. Mopping
    - ii. Diversion to drains
    - iii. Dehumidification
    - iv. Wet vacuuming
    - v. Pumping
    - vi. Temperature control
  - f. Discard the water vacuumed up into the sanitary sewer. Do not discard collected water outside on ground or use storm sewer drains.

## SOM Checklist

1. SOM is notified of flood, and briefed on contents/make-up of flood (i.e., water category, etc.)
2. The SOM shall respond to site of floods that affect more than one room, affect more than one floor, involve any research building or have the potential for asbestos, any hazard such as lab space, radioactive material, biohazard, biosafety hoods, chemicals, etc.
3. When the SOM is contacted, the SOM shall assess the need for additional staff for cleanup
4. SOM should contact one of the designated remediation crews to mitigate mold and in the event the flooded area has potentially involved chemicals, radioactive materials, fuel, oil, or other biohazard EH&S will need to be contacted to arrange remediation or give info for appropriate contact for remediation.
5. SOM shall call UCPD to contact the EH&S pager for all flood.





6. If the flood area has damaged property, equipment, research, animal health, or created a safety issue, the SOM will report to the site and contact EH&S, UCPD and a third party remediation crew as needed.
7. When power is turn off, monitor freezers and sensitive equipment through the entire process. Once power is restore and the equipment are back on-line check to make sure the equipment are functioning properly.
8. Once the flood issue has been deemed under control the SOM will file a claim with University Risk Management. Once filed, the SOM will then contact the zone supervisor the next business day with all the details of the event and shift responsibility to the zone supervisor.
9. Zone supervisor along with EH&S will follow-up with the inspection of the flooded area: Following the removal of excess water, a detailed inspection must be conducted that considers the extent of water migration, the types and quantities of affected materials and the degree of apparent damage. The information obtained may be used to analyze the extent of damage and to determine the required mitigation. A comprehensive inspection may include, but is not limited to the following:
  - i. Identifying and evaluating health and safety hazards
  - ii. Determining the source and category of water
  - iii. Determining the need to protect floor covering materials and contents
  - iv. Determining the extent of moisture intrusion
  - v. Evaluating building materials (flooring, walls, ceiling, etc.)
  - vi. Evaluating impact to building/room contents
  - vii. Evaluating the HVAC system (if applicable)
10. Work with project manager and EH&S to develop flood mitigation scope of work based on the initial inspection. Refer to Water Damage: Mitigation, Remediation and Restoration Guidelines

## **Major Water Main or Sewer Line Break Emergency Procedure (Exterior)**

### **Definition**

Major water main or sewer line breaks are described as large pipe breaks exterior to the building. Both systems are located underground (min-4 feet). Water main break outside would require City of Aurora assistance to shut down main valve locate in the street. Sewer line breaks underground are not very noticeable and would require fluid group on site ASAP.

### **First Responder**

1. Identify source of break and call SOM
2. Need to identify if break is between meter and building or City of Aurora side
3. Brief the SOM on extent of damage including building, location in building, areas affected, and what type of support is necessary to secure break

### **SOM Checklist**

1. SOM should contact fluid group
2. If break is outside the meter SOM should contact City of Aurora (303-739-6741)

3. SOM should contact University Police to send out a Rave message to inform customers of the emergency
4. SOM should contact UCPD to contact EH&S to inform them of the emergency
5. SOM should contact the Facilities Management Grounds supervisor to inform them of the emergency
6. The SOM shall respond to all main line breaks to determine what needs to be done to bring the system back online
7. SOM shall assess if additional staff should be contacted for assistance in the cleanup and repair
8. Once the situation is stabilized, the SOM shall file a claim with University Risk Management and turn over the control of the repair to the fluid group supervisor
9. The following business day, the supervisor for the fluid group will take over the follow up process

**END OF SECTION 02 81 00**