DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES AIR FORCE
WASHINGTON DC

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MEMORANDUM FOR ALMAJCOM/CE/A7/MS/SG/JA/PA
HQ USAFA/CE/SG/JA/PA

FROM: HQ USAF/ILE/SGO

SUBJECT: Interim Policy and Guidance for the Prevention, Surveillance, and Remediation of Water Damage and Associated Mold Contamination in Air Force (AF) Facilities

The purpose of this memorandum is to provide AF-wide policy and guidance on water damage and moisture control in AF facilities that will minimize individual health concerns, structural damage, fungal contamination (i.e., mold) and other microbial contamination. AF policy requires all personnel to reduce the potential for mold by controlling moisture levels and eliminating water damage when found (Atch 1). Since mold-related federal status and regulations do not exist, this policy implements the best available technical guidance (Atchs 2-6).

This policy applies to all AF active, Air National Guard, and AF Reserve installations and facilities, regardless of location, and includes contractor operations. Demolition projects on vacant facilities are exempt from this policy's requirements, with the exception of worker personal protective equipment requirements.

If you, or members of your staff, have policy-related questions, please contact Lt Col Wade Weisman, USAF/SGOP, DSN 297-5438, wade.weisman@pentagon.af.mil, or Maj Andrew Lambert, HQ USAF/ILEHO, DSN 664-4061, Andrew.lambert@pentagon.af.mil.

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Attachments:
1. Background and Responsibilities
2. Mold Prevention Tips for Facility Managers
3. Response Activities for Wet Building Materials
4. Remediation of Mold-Contaminated Building Materials
5. Flow Chart to Help Installations Respond to Mold/Water Damage
6. References

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ATTACHMENT 1
Background and Responsibilities

I. BACKGROUND

1. Molds can be found almost everywhere. Mold grows rapidly (biomagnification) indoors when the spores come in contact with building materials that have sufficient moisture to support active fungal growth. The typical conditions leading to mold growth in buildings include inadequate moisture control, deficient ventilation systems, poor housekeeping, chronic water intrusion, and/or isolated floods, such as from a burst water pipe. Once growth begins, fungal spores and bacteria amplify quickly. The microorganisms produce new spores that are introduced into the airstream either because the mold grows on the wet building material or during other building material disturbances (e.g., renovations, repair work, etc.). Such growth also can lead to the release of volatile compounds and odors characteristic of fungal/microbial growth.

2. Preventing and remediating water damage is necessary to protect the health and well being of AF communities and our investment in AF infrastructure. ***In most cases, mold-related contamination is associated with water--the key to an effective mold program is controlling moisture in the facility. However, moisture control must be combined with adequate housekeeping and active participation of facility occupants in inspecting and responding promptly to initial signs of mold. By promoting timely facility moisture control, effective housekeeping, and active occupant participation, installations can successfully control mold growth and prevent potential subsequent medical concerns.***

II. RESPONSIBILITIES

1. This policy covers both facility (e.g., administrative, industrial, dormitories, child development centers, and family housing) and management issues related to water damage including: prevention, evaluation, control, and disposal of water damaged and mold-contaminated building materials. The organizations and personnel with primary responsibilities are discussed below. Risk communication should be considered a critical element in any water damage or mold remediation project.

2. Building Managers. Using the guidance in Attachment 2 (Mold Prevention Tips for Facility Managers), inspect and report moisture problems before mold and related microbial contamination becomes problematic. Since molds depend on the availability of nutrients (e.g. dirt, cellulose, and other substrates) as well as moisture, ensure a clean and dry environment is maintained within the facility. As part of routine building inspections required by AFPAM 32-1004 Volume 3, *Working in the Operations Flight Facility Maintenance* (1 September 1998), conduct periodic evaluations of the facility:

- Heating, Ventilation, and Air Conditioning (HVAC) system(s)
- Pipe chases
- Utility tunnels
- Building “envelope” (roof, walls, flooring, etc.)

(a) A facility that has a history of water damage or HVAC problems may initially be placed on a 30-day evaluation cycle and later, as maintenance requirements subside, the cycle

may extended. Building managers (with necessary HVAC support personnel) must perform the following actions during scheduled facility visits:

(1) Monitor the facility for signs of water damage (e.g., spotted ceiling tiles, water marks near windows/doors/damp floors, etc)
(2) Check for signs of condensation and/or suspected mold growth around diffusers or HVAC vents
(3) Verify HVAC condensate drain pans are functioning properly
(4) Confirm that HVAC is operating within design criteria
(5) Confirm that the building's thermostat is maintained at the installation's recommended temperature

(b) Building managers must clean and correct any small mold problems or water damage within their capability (such as replacing ceiling tiles with minor water damage after ensuring Civil Engineering (CE) has fixed the roof leak and caulking foundation cracks) promptly (within 48 hours) following the guidelines in Attachment 3. If mold contamination or water damage exceeds the building manager's abilities, the manager will contact the CE Customer Service Center to request an AF Form 332 work order:

(1) The initial work order should be classified as an **emergency** work order for CE to respond to the facility to identify and mitigate the moisture problem and dry or remove water damaged building materials. This initial work order is an "emergency" because water can cause electrical shock and deteriorate building materials beyond normal "safe" conditions, potentially leading to dangerous structural failures (i.e., roof collapse, etc.). After the initial response, CE may downgrade the work order to "urgent" status.
(2) All follow-on actions must be completed as an **urgent** work order. CE will replace damaged building materials and remediate mold contamination from the affected area within five workdays after receipt of necessary building materials. When a water leak penetrates walls, ceilings, foundation cracks, etc., it **should not** be downgraded to a routine work order. The water problem must be corrected before mold is allowed to develop.

(c) Before accomplishing a mold or water damage remediation project, the building manager, in coordination with the Bioenvironmental Engineering (BE), and CE, shall notify the building occupants and the building's organizational commander in the affected area(s). While small-scale projects do not dictate "whole building" notifications, coordinate activities with the supervisors of the affected areas. Supervisors are then responsible for notifying affected personnel. Notification must include a description of the planned remedial measures and an estimated completion date. Notification should also include points of contact for any occupant health concerns.

(d) If a building manager receives occupant health complaints, he/she should refer the potentially affected personnel to their medical provider (section "4").

3. Civil Engineering (CE). The installation CE will evaluate mold contamination complaints and adequately resource all aspects of remediation activities to control and prevent infrastructure deterioration from mold.

(a) CE Operations (CEO): Conduct facility evaluations (upon building manager request) in dormitories, family housing, lodging, industrial, and administrative buildings following the facility inspection guidelines in AFIERA Technical Report, Guide for Indoor Air Quality Surveys, IERA-RS-BR-TR-2003-0001 or in subsequent technical report updates. Rely on visual inspection and, where appropriate, humidity sensors, to identify obvious growth or persistent water problems. In facilities where mold and/or moisture/excess humidity problems are present (reference Atch 2), CEO should determine the source. CE may request the BE assist with the facility evaluation as required (Atch 6, Reference "a" contains facility evaluation guidelines).

(1) Control sources of moisture through proper management, isolation and containment; once mold and microbial contamination is identified, remediate water damaged areas. The accumulation of dirt on ventilation system surfaces tends to dry slowly after condensation has occurred, produces an increased surface area for microbial growth, and provides nutrient material for the microorganisms. Any time visual inspection indicates mold growth on the thermal/acoustic lining in the duct or air handler, recommend the contaminated lining material be replaced. Cleaning of contaminated lining material is not recommended due to the difficulty of cleaning the porous material without causing damage. If mold growth is extensive through out the HVAC system, consider replacing all the lining in the contaminated system. If the duct is metal with the thermal/acoustic material on the exterior, then clean the duct interior using procedures for non-porous surfaces. Take care to avoid leakage of cleaning solutions and to ensure ducts are dried before returning to service.

(2) Mold-related or water damage service calls to CE should be addressed as discussed on page 2 of this attachment. CE will coordinate with the building manager and complete necessary facility alterations or repairs to remediate the mold problem or water damage. CEO will complete **emergency** work orders and **urgent** work orders in accordance with the timeframes listed in AFPAM 32-1004 Volume 3, *Working in the Operations Flight Facility Maintenance* (1 Sept 1998). CE craftsmen and contractors must use the guidance outlined in Attachments 3 and 4 to remove water damaged building materials and remediate facilities contaminated with mold.

(3) Water damaged building materials must be repaired/removed in accordance with Attachment 3 and Table 3.1. These guidelines are designed to help avoid the need for remediation of mold re-growth by taking quick action before growth starts. However, once mold becomes established in a facility, clean, repair, or remove mold contaminated building materials following guidelines described in Attachment 4 and Table 4.1.

(4) During cleaning, repair and removal operations, workers will wear the appropriate BE-approved personal protective equipment (PPE). CEO will incorporate mold

awareness and preventative issues into the Building Managers Handbook and Facility Managers program.

b. Civil Engineering Housing (CEH): Housing managers will initially investigate occupant complaints to screen out complaints associated with invasive mold/water problems due to poor housekeeping. If mold-related contamination or water damage exceeds the housing manager's abilities, the manager will contact the CE Customer Service Center to request an AF Form 332 work order:

- The initial work order should be classified as an **emergency** work order for CE to respond to the facility to identify and eliminate the moisture problem and dry or remove water damaged building materials. This initial work order is an "emergency" because water can cause electrical shock and deteriorate building materials beyond normal "safe" conditions, potentially leading to dangerous structural failures (i.e., roof collapse, etc.). After the initial response, CE may downgrade the work order to "urgent" status.
- All follow-on actions must be completed as an **urgent** work order. CE will replace damaged building materials and remediate mold contamination from the affected area within five workdays after receipt of necessary building materials. When a water leak penetrates walls, ceilings, foundation cracks, etc., it **should not** be downgraded to a routine work order. The water problem must be corrected before mold is allowed to develop.

(1) If a housing manager receives occupant health complaints, he/she should refer the potentially affected personnel to their medical provider (section "4").

(2) Housing managers located in climates susceptible to mold are encouraged to make occupants aware of mold issues and common prevention measures (Atch 2). Housing managers will distribute copies of the EPA Mold Guide (Atch 6, reference "f") to all incoming military family housing occupants when required by the installation CE. The decision to distribute the guide should be based on the installation's location and climate (i.e., is the installation located in a "humid area"). Humid areas are defined by UFC 3-400-2, Design Engineering Weather Data, as:

- Areas having over 3000 hours of 67 degrees Fahrenheit or higher wet bulb temperature

OR

- Areas with over 1500 hours of 73 degrees Fahrenheit or higher wet bulb temperature.

(3) In all cases, <u>if</u> the mold guide is provided, installations must require the occupants to acknowledge receipt.

c. Civil Engineering Environmental (CEV): Environmental Flights will support CEO and CEH during water damage and mold related remediation projects. The CEV will coordinate remediation work with the responsible state or local agency and provide necessary regulatory or

public notification when required by state/local laws or regulations. Incorporate this policy into the "Commander's Guide to Installation Excellence."

d. Civil Engineering Construction (CEC): Mold prevention should start in facility design to reduce, to the greatest extent possible, the conditions that lead to mold growth and mold-related microbial contamination. CEC will design new construction and renovation projects in accordance with Engineering Technical Letter (ETL) 04-3: *Design Criteria for prevention of Mold In Air Force Facilities*.

4. Medical Treatment Facility Staff: Provide health risk assessments and appropriate care to personnel that work or reside in AF facilities.

(a) MTF Commander: The MTF commander will provide personnel and expertise to evaluate occupant building related health complaints (These complaints may or may not be due to the indoor environment within a building but because of health concerns require medical and occupational health personnel evaluation).

(b) Physicians: Will provide medical evaluation and appropriate care to personnel with health complaints that may be building (including mold) related. In addition physicians will work with other members of Team Aerospace when requested to evaluate facilities for potential building (including mold) related illnesses. Military members seeking initial medical care for suspected building related illnesses or nonspecific indoor-related symptom complaints will notify their supervisor and schedule an appointment with their primary care provider. If the medical provider believes the symptoms are related to the building, then they should send an AF Form 190, *OccupationalIillness/Injury Report*, or SF-513, *Medical Record - Consultation Sheet* through PH. Civilian members seeking initial medical care for suspected building related illnesses or nonspecific indoor-related symptom complaints will notify their supervisor and should then seek medical care from their primary care provider. If after consulting with their medical provider the provider believes the symptoms are related to the building, then they should contact civilian personnel for completion of a US Department of Labor CA-2 *Notice of Occupational Disease and Claim for Compensation*.

(c) Bioenvironmental Engineering (BE). BE will work with CE staff to apply Operational Risk Management (ORM) principles in conducting health risk assessments to investigate/identify potential causes of building-related illness. BE will work with other Team Aerospace members to determine the need for and in the completion of health risk assessments in response to physician identified illness that may be building related. When remediation of mold-damaged areas is required, BE will recommend appropriate PPE, review/validate the remediation plan, and coordinate with CE in accordance with Attachment 4. If remediation is conducted, BE will work with CE to evaluate and visually verify the facility is suitable for re-occupancy.

(1) Mold sampling should only be accomplished as the result of consultation with the physician/health care provider and an occupational medicine physician or allergist in order to provide information that supports a specific clinical diagnosis or aids in medical treatment.

(2) If sampling is required, BE will perform sampling in accordance with guidance found in AFIERA Technical Report, Guide for Indoor Air Quality Surveys, IERA-RS-BR-TR-2003-0001 (Feb 2003), or subsequent updates.

(3) Microbial sampling and analysis has significant limitations and may not be a predictor of indoor air related health problems. There are currently no industry or legal standards for acceptable microbial concentrations in buildings.

(d) Public Health (PH): PH will evaluate clusters of occupationally linked illnesses or clusters of potential mold-related illness in AF buildings as identified through the AF Form 190, SF 513, and CA-2.

5. Facility Occupants. It is impossible to get rid of all mold and mold spores indoors; some mold spores will be found floating through the air and in house dust. The mold spores will not grow if moisture is not present. Indoor mold growth can and should be prevented or controlled by controlling moisture indoors.

(a) Base Housing. Places that are often or always damp can be hard to maintain completely free of mold. If there's some mold in the shower or elsewhere in the bathroom that seems to reappear, increase the air circulation by leaving the shower door/curtain open along with the door to the bathroom. Also, clean more frequently and this will usually prevent mold from recurring, or at least keep the mold to a minimum. Practice sound housekeeping: vacuum floors, remove trash frequently, prevent excessive dust accumulation, and use typical household cleaning products to control mold and mildew. When water leaks or spills occur indoors - ACT QUICKLY. If wet or damp materials or areas are dried 24-48 hours after a leak or spill happens, in most cases mold will not grow. Report all plumbing/building leaks and moisture problems immediately to your housing manager. Occupants should:

- Clean and repair roof gutters regularly.
- Make sure the ground slopes away from the house foundation, so that water does not enter or collect around the foundation. Report any identified problems to housing for resolution.
- Keep air-conditioning drip pans clean and the drain lines unobstructed and flowing properly.
- To help reduce moisture buildup in the home, when cooking, always operate the stove exhaust hood or when bathing, use the bathroom exhaust fan. Make sure the laundry clothes dryer vent is connected properly and exhausting outdoors.
- If you see condensation or moisture collecting on windows, walls or pipes - ACT QUICKLY to dry the wet surface and reduce the moisture/water source. Condensation can be a sign of high humidity.

(b) All Other Installation Facilities. Report signs of condensation and wet spots on building materials to Facility Manager. Practice sound housekeeping practices in work areas to

include vacuum floors, remove trash frequently, and prevent excessive dust accumulation. When water leaks or spills occur indoors - ACT QUICKLY. If wet or damp materials or areas are dried 24-48 hours after a leak or spill happens, in most cases mold will not grow. Report all plumbing/building leaks and moisture problems immediately to your Facility Manager.

6. Flow Chart to Help Installations Respond to Mold/Water Damage. Installations are encouraged to use the attached flow chart to address water damage and mold contamination in their facilities. Consult Attachment 5 for basic mold program management guidelines.

III. FUNDING

1. Funding for mold remediation (including emergency actions and temporary relocation of facility occupants) shall be programmed through appropriations intended for the type of work being accomplished (e.g. Transportation Working Capital Funds, Military Construction, Operation & Maintenance, Military Family Housing, Defense Health Program (DHP), etc.) consistent with programming rules specified in AFIs applicable to facilities work. Typical mold abatement projects would, in most cases, be accomplished as part of a larger facility project.

2. Funding for mold sampling, analysis, and monitoring costs completed to support a medical assessment, as directed by the chief of flight/occupational medicine, shall be programmed through the DHP. Where appropriate, a Risk Assessment Code (RAC) will be entered into the installation Hazard Abatement Plan, in accordance with AFI 91-301, *Air Force Occupational and Environmental Safety, Fire Protection, and Health (AFOSH) Program.*

Attachment 2

Mold Prevention Tips for Facility Managers

[Adapted from EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001]

1. Report leaky plumbing and leaks in the building envelope in accordance with AFPAM 32-1004 Vol 3 or other applicable guidance. Leaks should be repaired within 24 hours after initial notification and wet or damp spots should be cleaned and dried within 48 hours.
2. Conduct building survey following rain events to document condensation and wet spots. Request a work order to repair moisture problems (See procedure described in Atch 1). Attachment 3 addresses response activities for wet building materials.
3. If condensation on windows and walls are a common occurrence, contact CE for preventative actions.
4. Keep heating, ventilation, and air conditioning (HVAC) drip pans clean, flowing properly, and unobstructed.
5. Perform regular building/HVAC inspections. Coordinate HVAC inspections with CE, as needed, to ensure maintenance is scheduled and performed.

Attachment 3

Response Activities for Wet Building Materials

[Adapted from EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001, to apply to All AF Facilities]

Prevention:

1. When water-damaged materials are identified in a building, coordinate with CE to repair/alleviate the water or humidity problem and remediate mold-contaminated materials (reference Atch 4). If more damage is discovered during remediation, revise remediation plan as necessary. CE must carry out and complete a repair plan, as appropriate. CE will revise, if necessary, and perform recurring maintenance. Facility Manager must revise housekeeping requirements, as required.

2. Facility Managers should continue to communicate with building occupants, as appropriate depending on the situation. Be sure to address all concerns. Consider developing public awareness guidance for base distribution.

3. Facility managers should cleanup visible spills and contact CE to manage the cleanup of the remaining water damaged areas. Select appropriate cleaning and drying methods for water damaged materials (see Table 3.1). Carefully contain and remove wet building materials. Use only PPE approved by installation BE. Arrange for outside professional contract support, if necessary.

- When addressing mold problems, don't forget to address the source of the moisture problem, or the mold problem may simply reappear!

- Remember to check for high humidity and condensation problems as well as actual water leaks, maintenance issues, and HVAC system problems.

- Protect the health and safety of the building occupants and remediators. Consult an occupational health professional or BE, as needed. Use appropriate PPE and containment options when working with mold.

Table 3.1 presents strategies to respond to water damage within 24-48 hours. These guidelines are designed to help avoid the need for remediation of mold growth by taking quick action before growth starts. If mold growth is found on the materials listed in Table 3.1, refer to Table 4.1 for guidance on remediation. Depending on the size of the area involved and resources available, professional assistance may be needed to dry an area quickly and thoroughly.

Table 3.1. AF Cleanup and Mold Prevention Policy Following Water Damage

Water-Damaged Material	Required Actions
Books and papers	For non-valuable items, discard Books and papers
	Photocopy valuable/important items, discard originals.
	Freeze (in frost-free freezer or meat locker) or freeze dry
Carpet and backing - dry within 24 to 48 hours	Remove water with water extraction vacuum
	Reduce ambient humidity levels with dehumidifier
	Accelerate drying process with fans
Ceiling tiles	Discard and replace
Cellulose insulation	Discard and replace
Concrete or cinder block surfaces	Remove water with water extraction vacuum
	Accelerate drying process with dehumidifiers, fans, and/or heaters
Fiberglass insulation	Discard and replace (discard at least two feet around damaged materials)
Hard surface, porus floorings (Linoleum, ceramic tile, vinyl)	Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary
	Check to make sure under flooring is dry; dry under flooring if necessary
Non-porous, hard surfaces (plastics, metals)	Vacuum or damp wipe with water and mild detergent and allow to dry; scrub if necessary
Upholstered furniture	Remove water with water extraction vacuum
	Accelerate drying process with dehumidifiers, fans, and/or heaters
	May be difficult to completely dry within 48 hours. If piece is valuable, you may wish to consult with a restoration/water damage professional who specializes in furniture
Wallboard (drywall and gypsum board)	May be dried in place if there is no obvious swelling and the seams are intact. If not, remove, discard and replace (discard at least two feet around damaged materials).
	Ventilate the wall cavity, if possible
Window drapes	Follow laundering or cleaning instructions recommended by the manufacturer
Wood surfaces	Remove moisture immediately and use dehumidifiers, gentle heat, and fans for drying. (Use caution when applying heat to hardwood floors).
	Treated or finished wood surfaces may be cleaned with mild detergent and clean water and allowed to dry
	Wet paneling should be pried away from the wall for drying

Notes: If mold growth has occurred or materials have been wet for more than 48 hours, consult Table 4.1. Even if materials are dried within 48 hours, mold growth may have occurred.

Attachment 4

Remediation of Mold-Contaminated Building Materials

[Adapted from EPA 402-K-01-001: Mold Remediation in Schools and Commercial Buildings, March 2001 to apply to All AF Facilities]

Remediation:

Table 4.1 presents remediation guidelines for building materials that have or are likely to have mold growth. The guidelines in Table 4.1 are designed to protect the health of occupants and cleanup personnel during remediation. These guidelines are based on the area and type of material affected by water damage and/or mold growth. Please note that these are guidelines; some professionals may prefer other cleaning methods.

Remediation activities could be scheduled during off-hours when building occupants are less likely to be affected or remediation activities could be contained in a specific room or area and occupants moved accordingly. Although the level of personal protection suggested in these guidelines is based on the total surface area contaminated and the potential for remediator and/or occupant exposure, contact BE for information on personal protective equipment based on identified hazards and professional judgment. These remediation guidelines are based on the size of the affected area to make it easier for remediators to select appropriate techniques, not on the basis of health effects or research showing there is a specific method appropriate at a certain number of square feet. The guidelines have been designed to help construct a remediation plan. The remediation manager will then use professional judgment and experience to adapt the guidelines to particular situations. When in doubt, caution is advised. Consult an experienced mold remediator for more information.

If building occupants are reporting serious health concerns, they should contact the local MTF for medical care or guidance. Always make sure to protect remediators and building occupants from exposure to potentially hazardous building conditions and materials.

Note: Remove two feet of building materials on both sides of mold-contaminated porous building materials. Chemicals disinfectants should not be used to clean porous building materials in AF facilities; instead, replace porous building materials in accordance with Table 3.1.

Containment Options:

The purpose of containment during remediation activities is to limit release of mold into the air and surroundings, in order to minimize the exposure of remediators and building occupants to

Table 4.1. AF Policy for Remediating Building Materials with Mold Growth Caused by Clean Water*

Material or Furnishing Affected	Cleanup Methods**	Minimum Personal Protective Equipment***	Minimum Containment***
SMALL - Total Surface Area Affected Less Than 10 square feet (ft^2)			
Books and papers	3	N-95 half-face respirator, nitrile gloves, and unventilated goggles	None required
Carpet and backing	1, 3		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture and drapes	1, 3		
Wallboard (drywall and gypsum board)	3		
Wood surfaces	1, 2, 3		
MEDIUM - Total Surface Area Affected Between 10 ft^2 and 100 ft^2			
Books and papers	3	Limited or Full Consult installation BE due to the potential for remediator exposure and size of contaminated area	Limited Consult installation BE due to the potential for remediator exposure and size of contaminated area
Carpet and backing	1, 3, 4		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture and drapes	1, 3, 4		
Wallboard (drywall and gypsum board)	3, 4		
Wood surfaces	1, 2, 3		
LARGE - Total Surface Area Affected Greater Than 100 ft^2 or Potential for Increased Occupant or Remediator Exposure During Remediation Estimated to be Significant			
Books and papers	3	Full Consult installation BE due to the potential for remediator exposure and size of contaminated area	Full Consult installation BE due to the potential for remediator exposure and size of contaminated area
Carpet and backing	1, 3, 4		
Concrete or cinder block	1, 3		
Hard surface, porous flooring (linoleum, ceramic tile, vinyl)	1, 2, 3, 4		
Non-porous, hard surfaces (plastics, metals)	1, 2, 3		
Upholstered furniture and drapes	1, 3, 4		
Wallboard (drywall and gypsum board)	3, 4		
Wood surfaces	1, 2, 3, 4		

Notes: * These guidelines are for damage caused by clean water. If you know or suspect that the water source is contaminated with sewage, or chemical or biological pollutants, then the Occupational Safety and Health Administration (OSHA) requires PPE and containment. Installation BEs must oversee removals jobs requiring mold remediation caused by contaminated water.

** Select method most appropriate to situation. Since molds gradually destroy the things they grow on, if mold growth is not addressed promptly, some items may be damaged such that cleaning will not restore their original appearance. If mold growth is heavy and items are valuable or important, you may wish to consult a restoration/water damage/remediation expert. Please note that these are guidelines; other cleaning methods may be preferred by some professionals.

*** Consult with the installation BE to determine prudent levels of Personal Protective Equipment and containment for each situation, particularly as the remediation site size increases and the potential for exposure and health effects rises. The BE will assess the need for increased Personal Protective Equipment, if, during the remediation, more extensive contamination is encountered than was expected.

Cleanup Methods

•Method 1: Wet vacuum (in the case of porous materials, some mold spores/fragments will remain in the material but will not grow if the material is completely dried). Steam cleaning may be an alternative for carpets and some upholstered furniture.
•Method 2: Damp-wipe surfaces with plain water or with water and detergent solution (except wood —use wood floor cleaner); scrub as needed.
•Method 3: High-efficiency particulate air (HEPA) vacuum after the material has been thoroughly dried. Dispose of the contents of the HEPA vacuum in well-sealed plastic bags.
•Method 4: Discard - Remove water-damaged materials and seal in plastic bags while inside of containment, if present. Dispose of as normal waste. HEPA vacuum area after it is dried.
Personal Protective Equipment (PPE)

Personal Protective Equipment

•Minimum: Gloves, N-95 respirator, goggles/eye protection
•Limited: Gloves, N-95 respirator or half-face respirator with HEPA filter, disposable overalls, goggles/eye protection
•Full: Gloves, disposable full body clothing, head gear, foot coverings, full-face respirator with HEPA filter

Containment

•Limited: Use polyethylene-sheeting ceiling to floor around affected area with a slit entry and covering flap; maintain area under negative pressure with HEPA filtered fan unit. Block supply and return air vents within containment area.
•Full: Use two layers of fire-retardant polyethylene sheeting with one airlock chamber. Maintain area under negative pressure with HEPA filtered fan exhausted outside of building. Block supply and return air vents within containment area.

Table developed from literature and remediation documents including Bioaerosols: Assessment and Control (American Conference of Governmental Industrial Hygienists, 1999) and IICRC S500, Standard and Reference Guide for Professional Water Damage Restoration, (Institute of Inspection, Cleaning and Restoration, 1999)

mold. Mold and moldy debris should not be allowed to spread to areas in the building beyond the contaminated site. The larger the area of moldy material, the greater the possibility of human exposure and the greater the need for containment. In general, the size of the area helps determine the level of containment. However, a heavy growth of mold in a relatively small area could release more spores than a lighter growth of mold in a relatively large area. The primary object of containment should be to minimize occupant and remediator exposure to mold.

A. Limited Containment

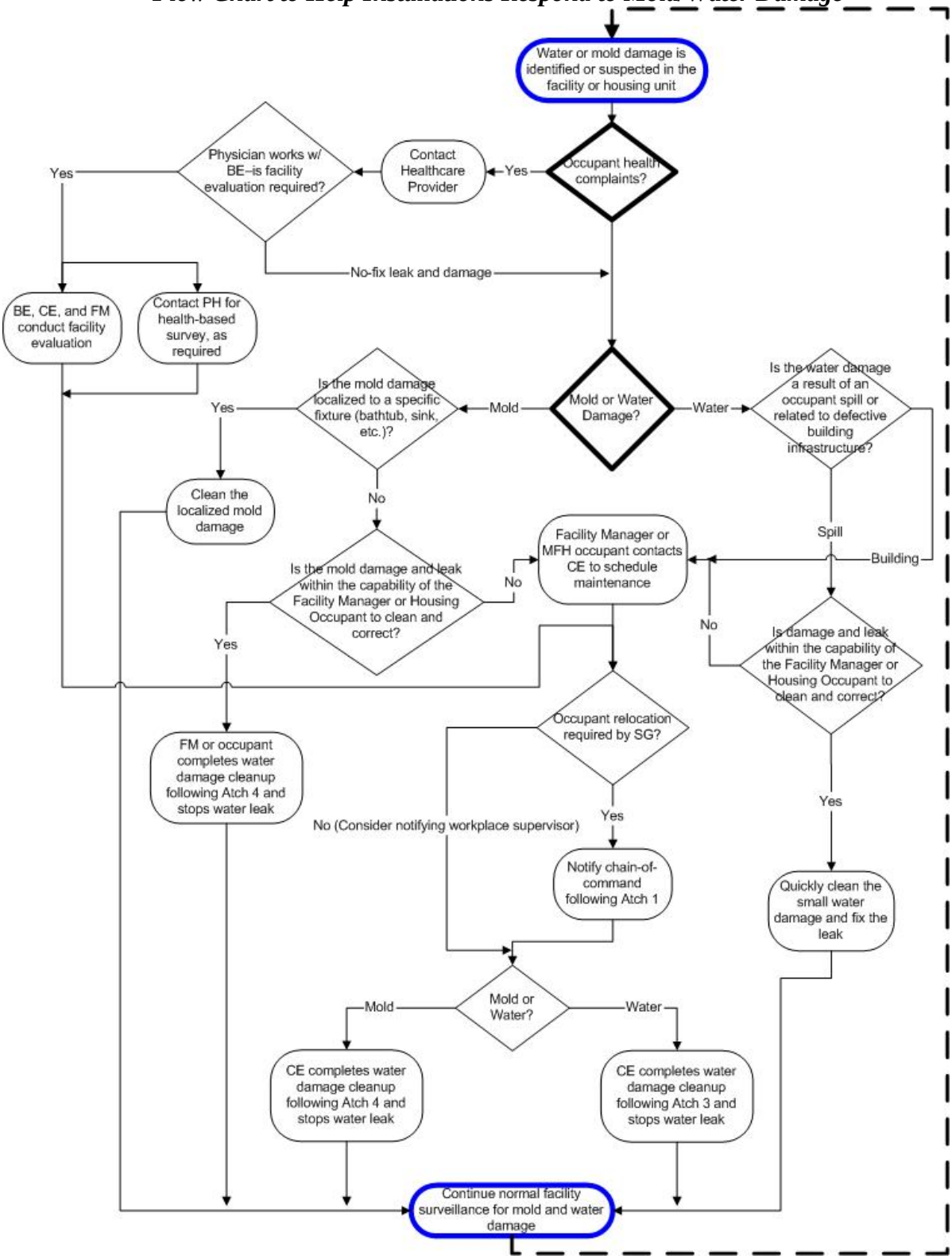
Limited containment is generally recommended for areas involving between 10 and 100 square feet (ft^2) of mold contamination. The enclosure around the moldy area should consist of a single layer of 6-mil, fire-retardant polyethylene sheeting. The containment should have a slit entry and covering flap on the outside of the containment area. For small areas, the polyethylene sheeting can be affixed to floors and ceilings with duct tape. For larger areas, a steel or wooden stud frame can be erected and polyethylene sheeting attached to it. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. Heavy mold growth on ceiling tiles may impact HVAC systems if the space above the ceiling is used as a return air plenum. In this case, containment should be installed from the floor to the ceiling deck, and the filters in the air-handling units serving the affected area must be replaced once remediation is finished. For small, easily contained areas, an exhaust fan ducted to the outdoors can also be used. The surfaces of all objects removed from the containment area should be "wet" cleaned prior to removal. Some remediation activities in limited containments may require the use of a negative air machine or air scrubber to prevent airborne contaminants from migrating throughout the duct system or to other areas of the facility.

B. Full Containment

Full containment is recommended for the cleanup of mold-contaminated surface areas greater than 100 ft^2 or in any situation in which it appears likely that the occupant space would be further contaminated without full containment. Double layers of polyethylene should be used to create a barrier between the moldy area and other parts of the building. A decontamination room or airlock should be constructed for entry into and exit from the remediation area. The entryways to the airlock from the outside and from the airlock to the main containment area should consist of a slit entry with covering flaps on the outside surface of each slit entry. The chamber should be large enough to hold a waste container and allow a person to put on and remove PPE. All supply and air vents, doors, chases, and risers within the containment area must be sealed with polyethylene sheeting to minimize the migration of contaminants to other parts of the building. The containment area must be maintained under negative pressure relative to surrounding areas. This will ensure that contaminated air does not flow into adjacent areas. This can be done with a HEPA-filtered fan unit exhausted outside of the building. All contaminated PPE, except respirators, should be placed in a sealed bag while in this chamber. Respirators should be worn until remediators are outside the decontamination chamber (e.g., airlock). PPE must be worn throughout the final stages of HEPA vacuuming and damp-wiping of the contained area. PPE must also be worn during HEPA vacuum filter changes or cleanup of the HEPA vacuum. The surfaces of all objects removed from the containment area and the containment area itself should be "wet" cleaned and HEPA vacuumed prior to reoccupancy.

Attachment 5

Flow Chart to Help Installations Respond to Mold/Water Damage



Attachment 6

References

(a) Macher, J. ed. Bioaerosols: Assessment and Control. Cincinnati, OH: ACGIH, 1999.

(b) United States Environmental Protection Agency. Mold Remediation in Schools and Commercial Buildings. http://www.epa.gov/iaq/molds/images/moldremediation.pdf. March 2001.

(c) Air Force Institute for Environment, Safety, and Occupational Health Risk Analysis (AFIOH). Guide for Indoor Air Quality Surveys. IERA-RS-BR-TR-2003-0001. https://kx.afms.mil/ctb/groups/public/documents/afms/ctb_009906.pdf

(d) Navy Occupational Safety & Health. OPNAVINST 5100.23F. July 2002.

(e) Working in the Operations Flight Facility Maintenance. Air Force Pamphlet 32-1004, Volume 3. September 1998.

(f) United States Environmental Protection Agency. A Brief Guide to Mold, Moisture, and Your Home. http://www.epa.gov/iaq/molds/moldguide.html EPA 402-K-02-003.

(g) US Army Center for Health Promotion and Preventive Medicine (USACHPPM) Technical Guide 277. Army Facilities Management Information Document on Mold Remediation Issues. http://chppm-www.apgea.army.mil/mold/TG277.pdf February 2002.

(h) US Army Center for Health Promotion and Preventive Medicine (USACHPPM) Technical Guide 278. Industrial Hygiene/Preventive Medicine Mold Assessment Guide. http://chppm-www.apgea.army.mil/mold/TG278.pdf February 2002.

(i) Cook, C. and McDaniel, D. IAQ Problem-Solving: An Overview of Successful Techniques for Improving Indoor Air Quality. Environmental Protection. May 2002.

(j) ASHRE Standard 62-1999, Ventilation for Acceptable Indoor Air Quality

(k) U.S. Environmental Protection Agency. Building Air Quality: A Guide for Building Owners and Facility Managers, http://www.epa.gov/iaq/largebldgs/baqtoc.html. EPA Doc Ref: #402F-91-102, December 1991

(l) FEMA/American Red Cross publication, "Repairing Your Flooded Home." Tiffany, Bader and Yang. http://www.fema.gov/hazards/floods/lib234.shtm

(m) Adverse Human Health Effects Associated with Molds in the Indoor Environment, ACOEM Evidence Based Statements, American College of Occupational and Environmental Medicine (ACOEM), http://www.acoem.org/guidelines