Chubb Construction Risk Engineering

Water Intrusion & Mold

CHUBB®

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Purpose

The purpose of the ACE Water Intrusion & Mold Resource Guide is to provide information regarding water intrusion and mold as it occurs in the construction industry. The goal is to raise awareness of the exposures, their potential causes and to provide recognized prevention and remediation techniques and methods so you, the client, may make informed decisions about managing your particular exposures and risk as they pertain to these issues.

While general guidelines are stated below on such matters as to whether vacating an area may be recommended and on how to cordon off an area, these are general guidelines only, and are not intended as a substitute for professional advice. You will need to consult a professional regarding your specific situation, since the facts will vary.

Water Intrusion

What is Water Intrusion?
Water intrusion is a condition where unwanted water or moisture enters a structure. If gone unnoticed or uncontrolled, it can lead to significant damage to building materials, the structure, carpeting, fixtures, electronic equipment, mold and other damage. These damages can lead to serious construction defect claims made by the building owners and/or tenants.

There are many reasons why water intrusion can occur such as:

- Faulty design of the building envelope allowing excessive moisture to enter.
- Poorly designed plumbing, mechanical, Heating, Ventilation, Air Conditioning (HVAC), drainage and roofing systems.
- Improper application of flashing, caulking, vapor barriers, water proofing, Exterior Insulation Finishing System (EIFS) /Stucco, or other building components.
- Leaking and sweating pipes, balconies, patios, windows, exterior siding, garages, and retaining walls, drain pans, or other areas where there are penetrations in the exterior of the structure.

Additionally, water intrusion may be more likely to occur in locations where the climate and geography lend itself to excessive moisture. The type of building materials used (wood frame versus masonry and steel) and the building materials used can also contribute to the likelihood of water intrusion. All of these items need to be considered when assessing the potential for water intrusion.

Indicators of Water Intrusion
Both during and after the construction process, it is important to know some key indicators that may lead to water intrusion problems. Knowing these may help to avoid prolonged exposure to excessive moisture, reducing the likelihood of damage to the building and property as well as the growth of mold.

Some indicators that a water intrusion problem may exist are:

- Visible formation of water or moisture on exposed surfaces (interior windows, desks, counters, carpets, etc.)
- Drippings from pipes, valves, equipment or other surfaces
- Discoloration or water lines on interior walls, ceiling tiles
- White lines and patches, chalky substance on basement/foundation walls
- Visible mold/fungus or mildew on interior surfaces
- Damp/musty orders
- Damp and humid environment even in conditioned spaces

What if Water Intrusion is found?
The presence of mold, water damage, or musty odors should be addressed immediately.

Regardless of the situation, the underlying cause of water accumulation must be rectified or property damage and fungal growth will recur. All sources of water intrusion must be eliminated, the extent of water damage determined and damaged materials should be dried and repaired.

Any initial water infiltration should be stopped and cleaned immediately. An immediate response (within 24 to 48 hours) and thorough clean up, drying, and/or removal of water damaged materials will prevent or limit property damage and mold growth.

Prevention
Below are some items that should be considered when preventing water intrusion. In addition, Appendix A, located at the end of the document, contains the **ACE Water Intrusion/Mold Prevention Checklist** that can be used to supplement your current prevention programs.

- Work off of approved, not conceptual, construction plans and designs
- Build in strict compliance with approved drawings and plans
- Conduct constructability reviews to identify and correct flaws in plans that can lead to water intrusion.
- Use licensed and reputable architects, designers and engineers to avoid improper design, detailing and construction.
- Implement a communication procedure for all site employees so prompt notification of any potential water intrusion problems can be investigated and addressed

- Evaluate the underlying water table and any seasonal fluctuations to determine whether any potential hydrostatic pressure concerns on building foundations and drainage design exist.
- Prevent condensation: Reduce the potential for condensation on cold surfaces (i.e., windows, piping, exterior walls, roof, or floors) by adding insulation.
- If the source of water is elevated humidity, relative humidity should be maintained at levels below 60 percent to inhibit mold growth. Emphasis should be on ensuring proper repairs of the building infrastructure, so that water damage and moisture buildup does not recur.
- In areas where there is a perpetual moisture problem, do not install carpeting (i.e., by drinking fountains, by sinks, or on concrete floors with leaks or frequent condensation).
- If the application of EIFS or other exterior finishing systems will occur, special attention should be paid to the following:

  - Subcontractors are certified by the manufacturer to install the specific product or system.
  - Manufacturer is consulted with before, during and after installation to ensure product or systems are properly designed, application is consistent with environment and geographical location and installed per specs.
  - Installation personnel are properly trained to install the specific product or system.

Implement a written Quality Control and Assurance program that includes at a minimum:

- Roles and responsibilities for all employees
- Accountability program
- Conduct preconstruction, scheduled and post construction inspections for all aspects of the construction process
- Implement Contractor Prequalification procedures that include a review of their safety record, quality control procedures, Experience Modification Rate (EMR), construction defect claims history and experience and manufacturer's certifications
- Consult with manufacturers on installation and application of products and materials and install them according to specifications.
- Use third party consultants for design review and installation inspections
- Material storage and inspection procedures (protect materials before installation)
- Includes a water intrusion/mold prevention and remediation program
- An owner training/turnover program that educates owner/staff on mechanical systems and equipment operations and locations and provides warrantees, maintenance/repair and operating instructions
- Maintain documentation for building and operation inspections, approved change orders, approved design changes and other issues that pertain to building design and construction. This should include written inspection reports, videos and photographs (including any pre-existing conditions).

Microbial Contamination (Mold)

What is Mold?
Molds are microbial organisms that produce tiny spores in order to reproduce. The mold spores are released into the air and travel both indoors and outdoors. When mold spores come into contact with damp locations, they can begin to grow. Molds can be found almost anywhere.

They can grow on virtually any substance, providing moisture is present. For food they will digest whatever it is they are growing on. There are many types of molds which can grow on wood, paper, carpet, and foods. When excessive moisture or water accumulates indoors, there is the potential for mold growth to occur. This even more so if the water intrusion/moisture problem is not discovered or remediated in a timely manner. Since mold spores float through the air and found both in and out of doors, it is impractical to eliminate all molds and mold spores in the environment. The most effective way to prevent mold growth is to control water intrusion/moisture.

Health Effects
Some people are sensitive to molds. In some people, molds can cause symptoms such as nasal stuffiness, eye irritation, wheezing, or skin irritation. Severe reactions may occur among workers exposed to large amounts of molds in occupational settings or to those who have severe allergies to molds. Severe reactions may include fever, shortness of breath and asthma.

People with chronic lung illnesses, such as obstructive lung disease, may develop mold infections in their lungs.

Exposure to fungi associated with bird and bat droppings (e.g., Histoplasma capsulatum and Cryptococcus neoformans) can lead to health effects, usually transient flu-like illnesses, in healthy individuals. Severe health effects are primarily encountered in those who have compromised immune systems. The presence of suspected mold on building materials if identified by a visual assessment or by bulk/surface

sampling results, does not necessarily mean that people will be exposed or exhibit health effects.

Only a small group of fungi have been associated with infectious disease. Several species of Aspergillus are known to cause aspergillosis. The most common is Aspergillus fumigatus.

Exposure to this common mold, even to high concentrations, is unlikely to cause infection in a healthy person.

In order for humans to be exposed indoors, fungal spores, fragments, or metabolites must be released into the air and inhaled, physically contacted (dermal exposure), or ingested. Whether or not symptoms develop in people exposed to fungi depends on the nature of the fungal material (e.g., allergenic, toxic, or infectious), the amount of exposure, and the susceptibility of the exposed persons.

Susceptibility varies with the genetic predisposition (e.g., allergic reactions do not always occur in all individuals), age, state of health, and concurrent exposures. For these reasons, and because measurements of exposure are not standardized and biological markers of exposure to fungi are largely unknown, it is not possible to determine "safe" or "unsafe" levels of exposure for people in general.

Clinical tests that can determine the source, place, or time of exposure to fungi or their products are not currently available. Antibodies developed by exposed persons to fungal agents can only document that exposure has occurred. Since exposure to fungi routinely occurs in both outdoor and indoor environments, this information is of limited value.

People performing renovations/cleaning of widespread fungal contamination may be at risk for developing Organic Dust Toxic Syndrome (ODTS) or Hypersensitivity Pneumonitis (HP). ODTS may occur after a single heavy exposure to dust contaminated with fungi and produces flu-like symptoms. A variety of biological agents may cause ODTS including common species of fungi.

HP may occur after repeated exposures to an allergen and can result in permanent lung damage.

There is no practical way to eliminate all molds and mold spores in the indoor environment. The way to control indoor mold growth is to control moisture.

If You Suspect Mold Is Present:

If you suspect mold is present, an environmental assessment should be conducted. If extensive contamination exists, particularly in heating, ventilating, air conditioning (HVAC) systems or large occupied spaces, the assessment should be conducted by experienced health and safety professionals and remediated by personnel with training and experience handling environmentally contaminated materials.

Lesser areas of contamination can usually be assessed and remediated by building maintenance personnel.

Specific methods of assessing and remediating fungal contamination should be based on the extent of visible contamination and underlying damage. The simplest and most expedient remediation that is reasonable, and properly and safely removes fungal contamination, should be used.

Environmental Assessments:

Visual Inspection

Visual inspection is the most important initial step in identifying a possible contamination problem. The extent of any water damage and mold growth should be visually assessed. This assessment is important in determining remedial strategies.

Ventilation systems should also be visually checked, particularly for damp filters but also for damp conditions elsewhere in the system and overall cleanliness. Ceiling tiles, gypsum wallboard (sheetrock), cardboard, paper, and other cellulosic surfaces should be given careful attention during a visual inspection.

The use of equipment such as a boroscope, to view spaces in ductwork or behind walls, or a moisture meter, to detect moisture in building materials, can be helpful in identifying hidden sources of fungal growth and the extent of water damage.

Bulk/Surface Sampling

Bulk or surface sampling may not always be required to undertake a remediation. Remediation of visually identified fungal contamination should proceed without further evaluation.

Bulk or surface samples may need to be collected to identify specific fungal contaminants as part of a medical evaluation if occupants are experiencing symptoms which may be related to fungal exposure or to identify the presence or absence of mold if a visual inspection is equivocal (e.g., discoloration, and staining).

An individual trained in appropriate sampling methodology should perform bulk or surface sampling. Bulk samples are usually collected from visibly moldy surfaces by scraping or cutting materials with a clean tool into a clean plastic bag. Surface samples are usually collected by wiping a measured area with a sterile swab or by stripping the suspect surface with clear tape.

Surface sampling is less destructive than bulk sampling. Other sampling methods may also be available. A laboratory specializing in mycology should be consulted for specific sampling and delivery instructions.

Air Monitoring
Air sampling for mold does not need to be part of a routine assessment. This is because decisions about appropriate remediation strategies can usually be made on the basis of a visual inspection. In addition, air-sampling methods for some fungi are prone to false negative results and therefore cannot be used to definitively rule out contamination.

Air monitoring may be necessary if an individual(s) has been diagnosed with a disease that is or may be associated with a fungal exposure (e.g., pulmonary hemorrhage/hemosiderosis, and aspergillosis).

Air monitoring may be necessary if there is evidence from a visual inspection or bulk sampling that a ventilation system may be contaminated. The purpose of such air monitoring is to assess the extent of contamination throughout a building. It is preferable to conduct sampling while ventilation systems are operating.

Air monitoring may be necessary if the presence of mold is suspected - such as musty odors – but cannot be identified by a visual inspection or bulk sampling, such as mold growth behind walls. The purpose of such air monitoring is to determine the location and/or extent of contamination.

If air monitoring is performed, for comparative purposes, outdoor air samples should be collected concurrently at an air intake. If possible, this should occur at a location representative of outdoor air.

Personnel conducting the sampling must be trained in proper air sampling methods for microbial contaminants. A laboratory specializing in mycology should be consulted for specific sampling and shipping instructions.

Laboratory Analysis of Samples
Microscopic identification of spores/colonies requires considerable expertise. These services are not routinely available from commercial laboratories. Documented quality control in the laboratories used for analysis of the bulk/surface and air samples is necessary.

The American Industrial Hygiene Association (AIHA) offers accreditation to microbial laboratories (Environmental Microbiology Laboratory Accreditation Program (EMLAP). Accredited laboratories must participate in quarterly proficiency testing (Environmental Microbiology Proficiency Analytical Testing Program (EMPAT).

Evaluation of bulk/surface and air sampling data should be performed by an experienced health professional. The presence of few or trace amounts of fungal spores in bulk/surface sampling should be considered background. Amounts greater than this or the presence of fungal fragments (including hyphae and conidiophores) may suggest fungal colonization, growth, and/or accumulation at or near the sampled location.

Air samples should be evaluated by means of comparison -- indoors to outdoors -- and by fungal type, such as genera and species). In general, the levels and types of fungi found should be similar indoors (in non-problem buildings) as compared to the outdoor air. Differences in the levels or types of fungi found in air samples may indicate that moisture sources and resultant fungal growth may be problematic.

Fungal Contamination Remediation:

The size of the area impacted by fungal contamination primarily determines the type of remediation.

The goal of remediation is to remove or clean contaminated materials in a way that prevents the emission of fungi and dust contaminated with fungi from leaving a work area and entering an occupied or non-abatement area, while protecting the health of workers performing the abatement.

Cleaning and Reuse of Contaminated Materials
Non-porous (metals, glass and hard plastics) and semi-porous (wood and concrete) materials that are structurally sound and are visibly moldy can be cleaned and reused. Cleaning should be done using a detergent solution.

Porous materials such as ceiling tiles and insulation, and wallboards with more than a small area of contamination should be removed and discarded. Porous materials - such as wallboard and fabrics -- that can be cleaned, can be reused, but should be discarded if possible.

A professional restoration consultant should be contacted when restoring porous materials with more than a small area of fungal contamination. All materials

to be reused should be dry and visibly free from mold. Routine inspections should be conducted to confirm the effectiveness of remediation work.

Small Isolated Areas (10 sq. ft or less) – such as ceiling tiles, small areas on walls Remediation can be conducted by regular building maintenance staff.

- The work area should be unoccupied. Vacating people from spaces adjacent to the work area may not be necessary but is recommended in the presence of infants (less than 12 months old), persons recovering from recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (including asthma, hypersensitivity pneumonitis, and severe allergies).
- Containment of the work area is not necessary. Dust suppression methods, such as misting, but not soaking, surfaces prior to remediation, are recommended.
- Contaminated materials that cannot be cleaned should be removed from the building in a sealed plastic bag. It is recommended that you first check with your state and local Environmental/ Health Departments regarding special requirements for the disposal of moldy materials.
- The work area and areas used by remedial workers for egress should be cleaned with a damp cloth and/or mop and a detergent solution.
- All areas should be left dry and visibly free from contamination and debris.

Mid-Sized, Isolated Areas (10–30 sq. ft.) – such as individual wallboard panels

- Remediation can be conducted by regular building maintenance staff.
- The work area should be unoccupied. Vacating people from spaces adjacent to the work area may not be necessary but is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (including asthma, hypersensitivity pneumonitis, and severe allergies).
- The work area should be covered with a plastic sheet(s) and sealed with tape before remediation, to contain dust/debris. Dust suppression methods, such as misting, but not soaking, surfaces prior to remediation, are recommended.
- Contaminated materials that cannot be cleaned should be removed from the building in sealed plastic bags. It is recommended that you first check with your state and local Environmental/Health Departments regarding special requirements for the disposal of moldy materials.
- The work area and areas used by remedial workers for egress should be vacuum equipped with a High-Efficiency Particulate (HEPA) filter and cleaned with a damp cloth and/or mop and a detergent solution.
- All areas should be left dry and visibly free from contamination and debris.

Large Isolated Areas (30–100 square feet) – such as several wallboard panels

- The following procedures at a minimum are recommended:
- The work area and areas directly adjacent should be covered with a plastic sheet(s) and taped before remediation, to contain dust/debris. Seal ventilation ducts/grills in the work area and areas directly adjacent with plastic sheeting.

- The work area and areas directly adjacent should be unoccupied. Further vacating of people from spaces near the work area is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (including asthma, hypersensitivity pneumonitis and severe allergies).
- Dust suppression methods, such as misting, but not soaking, surfaces prior to remediation, are recommended.
- Contaminated materials that cannot be cleaned should be removed from the building in sealed plastic bags. It is recommended that you first check with your state and local Environmental/ Health Departments regarding special requirements for the disposal of moldy materials.
- The work area and surrounding areas should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.
- All areas should be left dry and visibly free from contamination and debris.

If abatement procedures are expected to generate a lot of dust – abrasive cleaning of contaminated surfaces, demolition of plaster walls – or the visible concentration of the fungi is heavy – blanket coverage as opposed to patchy – then it is recommended that the remediation procedures for "Extensive Contamination" are followed. It is important to consult a professional to specifically assess the site in question.

Extensive Contamination (greater than 100 contiguous square feet in an area) The following procedures are recommended:

- Containment of the affected area: Complete isolation of work area from occupied spaces using plastic sheeting sealed with duct tape (including ventilation ducts/grills, fixtures, and any other openings). Use an exhaust fan

equipped with a HEPA filter to generate negative pressurization and airlocks to decontaminate the room.
- Vacating people from spaces adjacent to the work area may not be necessary but is recommended in the presence of infants (less than 12 months old), persons having undergone recent surgery, immune suppressed people, or people with chronic inflammatory lung diseases (including asthma, hypersensitivity pneumonitis and severe allergies).
- Contaminated materials that cannot be cleaned should be removed from the building in sealed plastic bags. The outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed in the decontamination chamber prior to their transport to uncontaminated areas of the building. It is recommended that you first check with your state and local Environmental/ Health Departments regarding special requirements for the disposal of moldy materials.
- The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop with a detergent solution and be visibly clean prior to the removal of isolation barriers.
- Air monitoring should be conducted prior to occupancy to determine if the area is fit to reoccupy.

Remediation of HVAC Systems:

Small Isolated Area of Contamination (<10 square feet) in the HVAC System

- Remediation can be conducted by regular building maintenance staff.
- The HVAC system should be shut down prior to any remedial activities.
- The work area should be covered with a plastic sheet(s) and sealed with tape before remediation to contain dust/ debris. Dust suppression methods, such as misting, but not soaking, surfaces prior to remediation, are recommended.
- Growth supporting materials that are contaminated, such as the paper on the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be removed and then sealed in plastic bags. It is recommended that you first check with your state and local environmental/health departments regarding special requirements for the disposal of moldy materials.
- The work area and areas immediately surrounding the work area should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution.
- All areas should be left dry and visibly free from contamination and debris.
- A variety of biocides are recommended by HVAC manufacturers for use with HVAC components, such as cooling coils and condensation pans. HVAC manufacturers should be consulted for the products they recommend for use with their systems.

HVAC - Areas of Contamination (>10 square feet) in an HVAC System

- The HVAC system should be shut down prior to any remedial activities.
- Containment of the affected area: Complete isolation of work area from the other areas of the HVAC system using plastic sheeting sealed with duct tape.
- Use an exhaust fan with a HEPA filter to generate negative pressurization.
- Airlocks and decontamination room should be used if contamination is greater than 30 square feet.
- Growth supporting materials that are contaminated, such as the paper on the insulation of interior lined ducts and filters, should be removed. Other contaminated materials that cannot be cleaned should be removed and then sealed in plastic bags. When a decontamination chamber is present, the outside of the bags should be cleaned with a damp cloth and a detergent solution or HEPA vacuumed prior to their transport to uncontaminated areas of the building. It is recommended that you first check with your state and local environmental/health departments regarding special requirements for the disposal of moldy materials.
- The contained area and decontamination room should be HEPA vacuumed and cleaned with a damp cloth and/or mop and a detergent solution prior to the removal of isolation barriers.
- All areas should be left dry and visibly free from contamination and debris.
- Air monitoring should be conducted prior to re-occupancy with the HVAC system in operation to determine if the area(s) served by the system are fit to reoccupy.
- A variety of biocides are recommended by HVAC manufacturers for use with HVAC components, such as cooling coils and condensation pans. HVAC manufacturers should be consulted for the products they recommend for use with their systems.

Training and Personal Protective Equipment (PPE):

Small Isolated Areas (10 sq. ft or less) - including ceiling tiles, small areas on walls Remediation can usually be conducted by regular building maintenance staff with proper training, but check for any applicable licensing or other legal requirements in your jurisdiction. Workers should receive training on proper clean up methods,

personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the Occupational Safety & Health Administration (OSHA) Hazard Communication Standard (29 CFR 1910.1200).

Respiratory protection (e.g., N95 disposable respirator), in accordance with the OSHA respiratory protection standard (29 CFR 1910.134) is recommended. Gloves and eye protection should be worn.

Mid-Sized, Isolated Areas (10 - 30 sq. ft.) – including individual wallboard panels Remediation can usually be conducted by regular building maintenance staff with proper training, but check for any applicable licensing or other legal requirements in your jurisdiction. [same comment as above.] Workers should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Respiratory protection (e.g., N95 disposable respirator), in accordance with the OSHA respiratory protection standard (29 CFR 1910.134) is recommended. Gloves and eye protection should be worn.

Large Isolated Areas (30–100 square feet) – including several wallboard panels Properly trained and equipped mold remediation workers should conduct the remediation. A health and safety professional with experience performing microbial investigations should be consulted prior to remediation activities to provide oversight for the project.

The following procedures at a minimum are recommended:
Personnel trained in the handling of hazardous materials and equipped with respiratory protection, (e.g., N95 disposable respirator), in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended. Gloves and eye protection should be worn.

Extensive Contamination (greater than 100 contiguous square feet in an area) A health and safety professional with experience performing microbial investigations should be consulted prior to remediation activities to provide oversight for the project.

The following procedures are recommended:
Personnel trained in the handling of hazardous materials equipped with: Full-face respirators with high efficiency particulate air (HEPA) cartridges, disposable protective clothing covering both head and shoes, and gloves.

HVAC - Small Isolated Area of Contamination (<10 square feet) in the HVAC System Remediation can usually be conducted by properly trained building maintenance staff that is familiar with the design and function of the impacted HVAC system. However, obtaining professional assistance should always be considered in addressing even small amounts of mold growth or moisture problems within an HVAC system. Workers should receive training on proper clean up methods, personal protection, and potential health hazards. This training can be performed as part of a program to comply with the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Respiratory protection (e.g., N95 disposable respirator), in accordance with the OSHA respiratory protection standard (29 CFR 1910.134), is recommended. Gloves and eye protection should be worn.

HVAC - Areas of Contamination (>10 square feet) in the HVAC System Properly trained and equipped mold remediation workers with specific training and experience in HVAC systems, should conduct the remediation. A health and safety professional with experience performing microbial investigations should be consulted prior to remediation activities to provide oversight for remediation projects involving more than a small isolated area in an HVAC system. The following procedures are recommended:

Personnel trained in the handling of hazardous materials equipped with: Respiratory protection (e.g., N95 disposable respirator) in accordance with the OSHA respiratory protection standard (29 CFR 1910.134) is recommended.

Gloves and eye protection, full-face respirators with HEPA cartridges and disposable protective clothing covering both head and shoes should be worn if contamination is greater than 30 square feet.

Conclusion:

As this guide shows, there are numerous consequences associated with water intrusion and resulting mold growth. If uncontrolled, health hazards to the public and extensive damage to property may result. Varying state laws apply with respect to licensing of mold remediation personnel, and you should consult with a professional concerning local requirements.

There are many practices designed to help control water intrusion and identify a potential mold problem so it can be effectively remediated.

Prompt remediation of contaminated material and infrastructure repair is the primary response to fungal contamination in buildings. Emphasis should be placed on preventing contamination through proper building and HVAC system maintenance and prompt repair of water damage.

Always consult professional designers and engineers experienced in the field of building envelope design as well as other professionals used to install, maintain and inspect mechanical, plumbing and HVAC systems, roofs, and other aspects of the buildings construction that lend themselves to potential water intrusion.

If mold growth is identified, leave it to trained professionals and personnel experienced in mold remediation to evaluate, direct and perform remediation and clean up operations.

References/Acknowledgements:

US Environmental Protection Agency - Last updated on June 23, 2008. http://www.epa.gov/mold/moldresources.html

NYC Dept. of Health and Mental Hygiene, Guidelines on Assessment and Remediation of Fungi in Indoor Environments. http://www.nyc.gov/html/doh/html/epi/moldrpt1.shtml#exec

For additional information on air sampling, refer to the **American Conference of Governmental Industrial Hygienists'** document, **"Bioaerosols: Assessment and Control."**

The American Industrial Hygiene Association (AIHA)

Appendix A

Chubb Water Intrusion/Mold Prevention Checklist

Pre-Construction:

1. Project management team has received awareness training and education on Mold as well as training in the means and methods of preventing mold infestation on the project.

   Training covered but not limited to the following:
   - Importance of keeping interior building material dry during storage.
     ☐ Yes ☐ No
   - Do not install building material that is wet.
     ☐ Yes ☐ No
   - Protect installed interior building material from water and moisture.
     ☐ Yes ☐ No
   - Conduct regular walk through of the project to identify water infiltration that can result in water damage and potential mold growth and if identified discuss with project manager.
     ☐ Yes ☐ No
   - Discuss with mechanical contractor responsible for duct installation that the duct work for the job sit will be transported in closed covered trucks.
     ☐ Yes ☐ No
   - Discuss with mechanical contractor that the open ends of the duct work need to be sealed at the end of the work day.
     ☐ Yes ☐ No
   - Thorough review of contract drawings and details to determine potential design flaws that have the potential to result in water infiltration and potential mold growth.
     ☐ Yes ☐ No
   - If design flaws or potential water infiltration exposures identified while reviewing contract drawings and details, they are brought to the attention of the design architect/engineer and RFI sent out.
     ☐ Yes ☐ No
   - Build in strict accordance to contract drawings and specifications. Do not take it upon yourself to make design changes without appropriate approval for design architect/engineer.
     ☐ Yes ☐ No
2. Project manager reviewed curtain wall or building façade drawings to understand and familiarize him/her with design and detail as well as means and methods of installation to ensure water tightness.
   ☐ Yes ☐ No
3. Discussion with owner to secure curtain wall or building façade independent consultant to review contract drawings and monitor installation process.
   ☐ Yes ☐ No
4. Curtain Wall or building façade mock up installed and tested under extreme weather conditions/elements to ensure water tightness and reaction to external forces and stresses.
   ☐ Yes ☐ No
5. Review of building material specified at the building core to ensure water/moisture exposure control material has been specified.
   ☐ Yes ☐ No
6. On high rise construction projects, discussion with building owner to buy temporary roofing and drainage as building rises to control, contain and divert water from migrating to lower floors that may have interior material installed.
   ☐ Yes ☐ No

7. Sub contractors are pre-qualified to determine their experience and track record on similar type projects. Determination made to verify prior construction defect claims resulting from subcontractors work on prior projects.
   ☐ Yes ☐ No
8. Provisions made in building schedule to ensure building water tightness prior to installation of interior finishes.
   ☐ Yes ☐ No
9. Manufacturers of moisture critical products have been consulted to verify the products application and standard details and recommendation of preferred and/or recommended installers.
   ☐ Yes ☐ No
10. Manufacturer warranties required of sub contractors supplying and installing mechanical equipment, roofing, windows, EIFS, curtain wall and pre-cast material.
    ☐ Yes ☐ No
11. Delivery and storage of interior building material planned in advance to ensure protection of material from elements, appropriate storage location and limited storage time.
    ☐ Yes ☐ No
12. Equipment purchased and on hand such as wet-dry vacuums, fans and dehumidifiers.
    ☐ Yes ☐ No
13. EIFS contractor listed as an approved applicator by manufacturer of the product.
    ☐ Yes ☐ No
14. Water table at the project site investigated to determine if hydro static pressure may result in water or moisture impregnating the slab, which could impact finish flooring.
    ☐ Yes ☐ No
15. Project prepared and equipped to efficiently remove and dry unwanted water buildup within 24 hours of discovery.
    ☐ Yes ☐ No
16. Procedures in place to document and photograph water intrusion/mold events and corrective actions taken to mitigate the conditions.
    ☐ Yes ☐ No

Construction Phase:

1. Provisions in place to inspect all interior building material delivered to the project to ensure no pre-existing mold contamination.
   ☐ Yes ☐ No
2. Interior building material stored in a dry area and off the ground.
   ☐ Yes ☐ No
3. Open ends of installed duct work sealed or capped at the end of the work day to prevent water or moisture entry
   ☐ Yes ☐ No
4. Core board installed on floors not fully water tight a sufficient distance up off the floor slab to ensure no contact with pooling water.
   ☐ Yes ☐ No
5. Interior sheetrock installed along the perimeter of the building done so only in areas that are water tight and not exposed to the elements.
   ☐ Yes ☐ No
6. Flooring products, such as carpet and wood flooring, stored in dry water and moisture free storage area.
   ☐ Yes ☐ No

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7. If scope of work includes installation of furniture equipment -- such as sofas, beds, chairs
   -- provisions have been made to ensure storage is in an environment free from exposure to water and moisture.
   ☐ Yes ☐ No
8. If wall fabric is installed, inspection and verification that wall receiving fabric is dry has been completed prior to installation.
   ☐ Yes ☐ No
9. Use of wall coverings with permeable paper backings that don't trap moisture in lieu of vinyl wall covering that can trap moisture laden air.
   ☐ Yes ☐ No
10. All flashing at sky lights, balconies, adjacent building walls, foundations and roofs inspected and sign off to ensure work performed in complete accordance to contract drawings, details and specification.
    ☐ Yes ☐ No
11. Roofing membrane and application inspected and signed off to ensure workmanship performed in accordance to contract drawings, detail and manufacture specifications
    ☐ Yes ☐ No
12. Flood testing of completed roofs to ensure 100% water tightness of the roof.
    ☐ Yes ☐ No
13. Manufacture warranty obtained on completed roof.
    ☐ Yes ☐ No
14. All moisture generated equipment vented outdoors.
    ☐ Yes ☐ No
15. Attics, crawl spaces and other enclosed spaces inspected to ensure proper ventilation.
    ☐ Yes ☐ No
16. EIFS installed and inspected according to manufacturer drawings, details and specifications.
    ☐ Yes ☐ No
17. Inspection of mesh, flashing and underlying insulation board performed to insure compliance with manufacturer drawings, details and specification.
    ☐ Yes ☐ No
18. EIFS wall penetrations including doors, windows, phone lines, A/C coolant lines, cable TV lines, hose bibs, etc., properly sealed as per manufacturer instructions.
    ☐ Yes ☐ No
19. HVAC equipment and systems properly installed according manufacturer's specification.
    ☐ Yes ☐ No
20. Drip pans for cooling coils properly installed and draining properly.
    ☐ Yes ☐ No
21. Interior supply ducts are bare galvanized sheet metal with no interior insulation.
    ☐ Yes ☐ No
22. All duct joints sealed.
    ☐ Yes ☐ No
23. Mechanical system design provides for adequate make-up or combustion air to eliminate the possibility of creating negative air pressure in the structure that could result in drawing in moisture through the floor slabs or wall.
    ☐ Yes ☐ No
24. Chilled water pipes properly insulated.
    ☐ Yes ☐ No
25. Completed HVAC system tested and signed off by independent third party and/ or manufacturer.
    ☐ Yes ☐ No
26. Curtain wall units installed according to contract drawings, details and specifications and inspected and sign off by independent third party curtain wall consultant firm.
    ☐ Yes ☐ No

27. Caulking and sealing of curtain wall units and windows as well as other areas receiving caulking and or sealants inspected and sign off.
    ☐ Yes ☐ No
28. Water proofing and vapor barriers installed as per contract drawings at required locations such as foundation walls, floor slabs, roofs and balconies.
    ☐ Yes ☐ No
29. All plumbing and drainage lines inspected, tested and signed off verifying they meet required building codes.
    ☐ Yes ☐ No

Project Turn Over:

1. Manufacturers inspect and test equipment/material to verify installation according to contract drawings, details and specification.
   ☐ Yes ☐ No
2. Manufacturer warrantee obtained equipment/material such as mechanical equipment, roofing, windows etc.
   ☐ Yes ☐ No
3. Meeting with building owner's engineer to review, run and inspect building components prior to building turn over.
   ☐ Yes ☐ No
4. Obtain inspection sign off by curtain wall consultant.
   ☐ Yes ☐ No
5. Obtain plumbing inspection sign off by third party consultant and/or building department.
   ☐ Yes ☐ No
6. Obtain sprinkler sign off by third party consultant and/or building department.
   ☐ Yes ☐ No
7. Inspect heating, ventilation and air conditioning drip pans to insure cleanliness, unobstructions and water flows properly.
   ☐ Yes ☐ No
8. Moisture generating equipment such as dryers properly vented to the outdoors.
   ☐ Yes ☐ No
9. Indoor humidity kept to below 60 percent relative humidity, preferably 30–50 percent RH.
   ☐ Yes ☐ No
10. Building owner instructed to perform regular building HVAC inspections and maintenance schedule.
    ☐ Yes ☐ No
11. Building owner instructed to maintain and replace proper air filters as necessary.
    ☐ Yes ☐ No
12. Site grading inspected to ensure grade and slope pitches water away building.
    ☐ Yes ☐ No

This sample checklist is being provided to you as a tool that you may wish to use in providing a safety and risk management program. You are responsible for providing safety and risk management services. We are providing this tool to you for our own underwriting purposes, and we hereby disclaim any obligation to oversee or monitor the adherence to required or otherwise reasonable safety and risk control practices. We further disclaim liability for claims or suits relating to the alleged or actual failure to conduct reasonable safety control practices.

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