

# **BSR/IICRC S500 Standard for Professional Water Damage Restoration**

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**BSR/IICRC S500 Draft Standard for Professional Water Damage Restoration  
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1

2

## 1 ***Important Definitions***

2  
3 Throughout this document the terms “shall,” “should,” and “recommend” are used to compare and  
4 contrast the different levels of importance attached to certain practices and procedures.

5  
6 **shall:** when the term *shall* is used in this document, it means that the practice or procedure is mandatory  
7 due to natural law or regulatory requirement, including occupational, public health and other relevant  
8 laws, rules or regulations, and is therefore a component of the accepted “standard of care” to be  
9 followed.

10  
11 **should:** when the term *should* is used in this document, it means that the practice or procedure is a  
12 component of the accepted “standard of care” to be followed, while not mandatory by regulatory  
13 requirements.

14  
15 **recommend(ed):** when the term *recommend(ed)* is used in this document, it means that the practice  
16 or procedure is advised or suggested but is not a component of the accepted “standard of care” to be  
17 followed.

18  
19 In addition, the terms “may” and “can” are also available to describe referenced practices or procedures,  
20 and are defined as follows:

21  
22 **may:** when the term *may* is used in this document, it signifies permission expressed by the document, and  
23 means that a referenced practice or procedure is permissible within the limits of this document, but is not a  
24 component of the accepted “standard of care” to be followed.

25  
26 **can:** when the term *can* is used in this document, it signifies an ability or possibility open to a user of the  
27 document, and it means that a referenced practice or procedure is possible or capable of application, but  
28 is not a component of the accepted “standard of care” to be followed.

29  
30 For the practical purposes of this document, it was deemed appropriate to highlight and distinguish the  
31 critical restoration methods and procedures from the less critical, by characterizing the former as the  
32 “standard of care.” The IICRC S500 consensus body standard committee interprets the “standard of care”  
33 to be: practices that are common to reasonably prudent members of the trade who are recognized in the  
34 industry as qualified and competent. Notwithstanding the foregoing, this Standard is not intended to be  
35 either exhaustive or inclusive of all pertinent requirements, methods or procedures that might be appropriate  
36 on a particular water damage restoration project.

## **A Scope, Purpose and Application**

### **A.1 Scope**

This Standard describes the procedures to be followed and the precautions to be taken when performing water damage restoration in residential, commercial and institutional buildings, and the systems and personal property contained within those structures.

This Standard assumes that the determination and correction of the underlying source or cause of the water intrusion leading to the water damage is the responsibility of the property owner and not the restorer, although the property owner may contract with the restorer or other specialized experts to perform these services.

Water damage restoration consists of the following components for which procedures are described in this Standard:

- Principles of Water Damage Restoration
- Microbiology of Water Damage
- Health Effects from Exposure to Microbial Contamination in Water-Damaged Buildings
- Building and Material Science
- Psychrometry and Drying Technology
- Equipment, Instruments, and Tools
- Antimicrobial (biocide) Technology
- Safety and Health
- Administrative Procedures, Project Documentation and Risk Management
- Inspections, Preliminary Determinations and Pre-Restoration Evaluations
- Limitations, Complications, Complexities and Conflicts
- Specialized Experts
- Structural Restoration
- Heating, Ventilating and Air Conditioning (HVAC) Restoration
- Contents Evaluation, Restoration and Remediation
- Large or Catastrophic Restoration Projects
- Materials and Assemblies

### **A.2 Purpose**

It is the purpose of this Standard to define criteria and methodology used by the restorer for inspecting and investigating water damage and associated contamination, and for establishing water damage restoration work plans and procedures.

This Standard is not intended to be either exhaustive or inclusive of all pertinent requirements, methods or procedures that might be appropriate on a particular water damage restoration project. Restorers should use professional judgment throughout each and every project. However, the use of professional judgment is not a license to not comply with this standard. A project might have unique circumstances that may infrequently allow for a deviation from the standard. Prior to deviation from the standard of care (i.e., “shall” or “should”) the restorer should document the circumstances that led to such a decision, notify the materially interested parties, and in the absence of a timely objection, document the communication before proceeding.

This Standard does not specifically address the protocols and procedures for restoration when potentially hazardous, regulated materials are present or likely to be present in water-damaged structures, systems and contents. Such potentially hazardous, regulated materials include, but are not limited to: asbestos, lead, arsenic, mercury, polychlorinated biphenyls (PCBs), pesticides, fuels, solvents, radiological residues, and other chemical and certain biological contaminants.

### A.3 Application

This Standard was written for use by those involved in the water damage restoration industry, primarily for restoration companies and workers, and secondarily, for others who investigate or assess abnormal water intrusion, prepare restoration specifications and procedures and protocols, and manage restoration projects, (e.g., indoor environmental professionals (IEPs), and other specialized experts) and finally, for other potential materially interested parties (e.g., consumers and occupants, property owners and managers, government and regulatory bodies, insurance company representatives, or third party administrators).

## B. Definitions

Certain terms and definitions associated with water damage restoration exist. The following are definitions of terms used in this standard:

**affected area:** an area of a structure that has been impacted by primary or secondary damage.

**air:** a simple mixture of gases (e.g., nitrogen, oxygen, water vapor, carbon dioxide) that surrounds the Earth; a space that is filled with air.

**airflow:** air movement, whether uncontrolled or controlled (managed). Two commonly used airflow measurements are volumetric flow (e.g., cubic feet per minute) and velocity (e.g., feet per minute).

**airmover:** an air moving device typically designed for or used in the professional water damage restoration industry.

**assessment:** a process performed by an indoor environmental professional (IEP) that includes the evaluation of data obtained from a building history and inspection to formulate an initial hypothesis about the origin, identity, location and extent of contamination. If necessary, a sampling plan is developed, and samples are collected and sent to a qualified laboratory for analysis. The subsequent data is interpreted by the IEP. Then, the IEP, or other qualified individual, may develop a remediation plan. See also *evaluation*.

**bound water:** moisture held within the cellular or crystalline structure of the material. This moisture may be sorbed into the cells or can become physically or chemically bound to the surfaces of cells. Some of this moisture is always present in the material and does not need to be removed. In fact, much of the bound water in concrete is a critical part of the hydration process and actually strengthens it. A certain amount of bound water in wood is also desirable, contributing to its dimensional stability and strength.

**boundary layer:** a thin layer of air at the surface of materials that due to surface friction does not move at the full speed of the surrounding airflow. The effect of this lack of airflow retards water evaporation at the surface and heat transfer to the materials. Directing sufficient and continuous air at material surfaces minimizes this boundary layer, removes evaporated water, and aids in transferring thermal energy to the surface of materials.

**Category of Water:** the categories of water, as defined by this document, refer to the range of contamination in water, considering both its originating source and quality after it contacts materials present on the job site. Time and temperature can affect or retard the amplification of contaminants, thereby affecting its category. Restorers should consider potential contamination, defined as the presence of undesired substances; the identity, location and quantity of which are not reflective of a normal indoor environment; and can produce adverse health effects, cause damage to structure and contents or adversely affect the operation or function of building systems.

1  
2 **Category 1:** Category 1 water originates from a sanitary water source and does not pose  
3 substantial risk from dermal, ingestion, or inhalation exposure. Examples of Category 1 water  
4 sources can include, but are not limited to: broken water supply lines; tub or sink overflows with no  
5 contaminants; appliance malfunctions involving water-supply lines; melting ice or snow; falling  
6 rainwater; broken toilet tanks, and toilet bowls that do not contain contaminants or additives.  
7

8 Category 1 water can deteriorate to Category 2 or 3. Category 1 water that flows into an  
9 uncontaminated building does not constitute an immediate change in the category. However,  
10 Category 1 water that flows into a contaminated building can constitute an immediate change in  
11 the category. Once microorganisms become wet from the water intrusion, depending upon the  
12 length of time that they remain wet and the temperature, they can begin to grow in numbers and  
13 can change the category of the water. Odors can indicate that Category 1 water has deteriorated.  
14

15 **Category 2:** Category 2 water contains significant contamination and has the potential to cause  
16 discomfort or sickness if contacted or consumed by humans. Category 2 water can contain  
17 potentially unsafe levels of microorganisms or nutrients for microorganisms, as well as other  
18 organic or inorganic matter (chemical or biological). Examples of category 2 water can include, but  
19 are not limited to: discharge from dishwashers or washing machines; overflows from washing  
20 machines; overflows from toilet bowls on the room side of the trap with some urine but no feces;  
21 seepage due to hydrostatic pressure; broken aquariums and punctured water beds.  
22

23 Category 2 water can deteriorate to Category 3. Once microorganisms become wet from the water  
24 intrusion, depending upon the length of time that they remain wet and the temperature, they can  
25 begin to grow in numbers and can change the category of the water.  
26

27 **Category 3:** Category 3 water is grossly contaminated and can contain pathogenic, toxigenic or  
28 other harmful agents and can cause significant adverse reactions to humans if contacted or  
29 consumed. Examples of Category 3 water can include, but are not limited to: sewage; wasteline  
30 backflows that originate from beyond any trap regardless of visible content or color; all forms of  
31 flooding from seawater; rising water from rivers or streams; and other contaminated water entering  
32 or affecting the indoor environment, such as wind-driven rain from hurricanes, tropical storms, or  
33 other weather-related events. Category 3 water can carry trace levels of regulated or hazardous  
34 materials (e.g., pesticides, or toxic organic substances).  
35

36 **Regulated, hazardous materials, and mold:** if a regulated or hazardous material is part of a  
37 water damage restoration project, then a specialized expert may be necessary to assist in damage  
38 assessment. Restorers shall comply with applicable federal, state, provincial and local laws and  
39 regulations. Regulated materials posing potential or recognized health risks can include, but are  
40 not limited to: arsenic, mercury, lead, asbestos, polychlorinated biphenyls (PCBs), ethylene glycol,  
41 pesticides, fuels, solvents, caustic chemicals and radiological residues. For situations involving  
42 visible or suspected mold, refer to the current version of ANSI/IICRC S520 *Standard for*  
43 *Professional Mold Remediation*. Qualified persons shall abate regulated materials, or should  
44 remediate mold prior to restorative drying.  
45

46 **Class of water intrusion:** a classification of the estimated evaporation load; is used when calculating the  
47 initial humidity control (e.g., dehumidification, ventilation). The classification is based on the approximate  
48 amount of wet surface area, and the permeance and porosity of affected materials remaining within the  
49 drying environment at the time drying is initiated. Information needed to determine Class should be gathered  
50 during the inspection process. The Classes are divided into four separate descriptions, Class 1, 2, 3, and  
51 4.  
52

53 **Class 1** — (least amount of water absorption and evaporation load): Water intrusion where wet,  
54 porous materials (e.g., carpet, gypsum board, fiber-fill insulation, concrete masonry unit (CMU),

1 textiles) represent less than ~5% of the combined floor, wall and ceiling surface area in the space;  
2 and where materials described as low evaporation materials (e.g., plaster, wood, concrete,  
3 masonry) or low evaporation assemblies (e.g., multilayer wallboard, multilayer subfloors, gym  
4 floors, or other complex, built-up assemblies) have absorbed minimal moisture.  
5

6 **Class 2** — (significant amount of water absorption and evaporation load): water intrusion where  
7 wet, porous materials (e.g., carpet, gypsum board, fiber-fill insulation, concrete masonry unit  
8 (CMU), textiles) represent ~5% to ~40% of the combined floor, wall and ceiling surface area in the  
9 space; and where materials described as low evaporation materials (e.g., plaster, wood, concrete,  
10 masonry) or low evaporation assemblies (e.g., multilayer wallboard, multilayer subfloors, gym  
11 floors, or other complex, built-up assemblies) have absorbed minimal moisture.  
12

13 **Class 3** — (greatest amount of water absorption and evaporation load): water intrusion where wet,  
14 porous materials (e.g., carpet, gypsum board, fiber-fill insulation, concrete masonry unit (CMU),  
15 textiles) represent more than ~40% of the combined floor, wall and ceiling surface area in the  
16 space; and where materials described as low evaporation materials (e.g., plaster, wood, concrete,  
17 masonry) or low evaporation assemblies (e.g., multilayer wallboard, multilayer subfloors, gym  
18 floors, or other complex, built-up assemblies) have absorbed minimal moisture.  
19

20 **Class 4** — (deeply held or bound water): water intrusion that involves a significant amount of water  
21 absorption into low evaporation materials (e.g., plaster, wood, concrete, masonry) or low  
22 evaporation assemblies (e.g., multilayer wallboard, multilayer subfloors, gym floors, or other  
23 complex, built-up assemblies). Drying may require special methods, longer drying times, or  
24 substantial water vapor pressure differentials.  
25

26 **cleaning:** the process of containing, removing and properly disposing of unwanted substances from an  
27 environment or material.  
28

29 **contamination, contaminated:** the presence of undesired substances; the identity, location and quantity  
30 of which are not reflective of a normal indoor environment, and can produce adverse health effects, cause  
31 damage to structure and contents or adversely affect the operation or function of building systems.  
32

33 **cross-contamination:** the spread of contaminants from a contaminated area to an uncontaminated area.  
34

35 **damage, primary:** the wetting or impairment of the appearance or function of a material from direct  
36 exposure to water or contamination carried by the water which is reversible or permanent. Primary damage  
37 does not include water damage as a result of tracking or that is otherwise spread.  
38

39 **damage, secondary:** the wetting or impairment of the appearance or function of a material from indirect  
40 exposure to water or contamination carried by the water which is reversible or permanent. Examples of  
41 secondary damage can include: absorbed moisture or humidity, microbial growth, and acid residue  
42 discoloration. See "primary damage"  
43

44 **damage, pre-existing:** the impairment of the appearance or function of a material from direct or indirect  
45 exposure to water or other conditions not related to the current water intrusion. Examples of pre-existing  
46 damage can include: dry rot, urine contamination, and mold growth.  
47

48 **dehumidification:** the process of removing moisture from air.  
49

50 **dew point temperature:** the temperature at which humidity in a parcel of air reaches the saturation point  
51 (100% RH), below which water vapor will condense from that air to form condensation on surfaces or  
52 particles.  
53

54 **disinfectant:** irreversibly inactivates pathogenic (e.g., infectious) microorganisms on inanimate objects, but  
55

1 not necessarily their spores. Effectively destroys 99.999% of target organisms.

2  
3 **drying:** the process of removing moisture from materials.

4  
5 **drying plan:** A subsection of a work plan, the drying plan is a restorer developed and implemented plan  
6 that establishes target ranges, means and methods for controlling humidity, temperature, and airflow to  
7 achieve the drying goals, and in accordance with project LCCCs.

8  
9 **dry standard:** a reasonable approximation of the moisture content or level of a material prior to a water  
10 intrusion. An acceptable method is to determine the moisture content or levels of similar materials in  
11 unaffected areas or use historical data for the region.

12  
13 **drying environment:** a controlled environment in which evaporation from damp or wet materials is  
14 encouraged, leading to an accelerated reduction in their moisture level or moisture content.

15  
16 **drying goal:** the target moisture content or moisture level in a material to be achieved at the end of the  
17 drying process that is based on the dry standard and is established by the restorer.

18  
19 **engineering controls:** utilization of equipment or physical barriers to prevent or significantly minimize  
20 exposure of workers, occupants, and unaffected areas and contents to recognized hazards (e.g.,  
21 contaminants, electrical circuits, falling debris).

22  
23 **equilibrium moisture content (EMC):** the moisture content at which a material neither gains nor loses  
24 moisture when surrounded by air at a given relative humidity and temperature.

25  
26 **evaluation:** a process completed by the restorer or specialized expert to gather and consider information.  
27 See also *pre-restoration evaluation, pre-remediation evaluation, assessment*.

28  
29 **evaporation:** the process of changing a liquid to a vapor.

30  
31 **evaporation load:** the anticipated amount of water vapor added to a drying environment by means of  
32 evaporation from wet materials. Evaporation load is affected by several factors, including concentration of  
33 moisture in the air, water vapor pressures of wet materials, temperature of wet materials, air movement  
34 across wet surfaces and access to wet materials.

35  
36 **flood (flooded, flooding):** an overflowing of a large amount of water beyond its normal confines inundating  
37 an area that would normally be dry land.

38  
39 **free water:** liquid moisture on the surface and held in the pores of the material. All of this is excess moisture  
40 that has been drawn into the materials through capillary action. As free water remains, the cell material will  
41 absorb the moisture, thus becoming bound water until the point of fiber saturation. In most cellulose-based  
42 products, (e.g., wood, paper) this fiber saturation point is between 25-30% MC. All free water needs to be  
43 removed during the restorative drying process.

44  
45 **humidity:** an expression of water vapor in air. Two common measurements used in this document are  
46 humidity ratio and relative humidity. Note: In this document, when the term humidity is used without  
47 qualification, it will refer to the humidity ratio of the air, one of the absolute measures of the amount of  
48 moisture present.

49  
50 **humidity control** – removing water vapor from air at an equal or greater rate than evaporated from wet  
51 materials to minimize moisture migration, potential secondary damage, and microbial amplification.



1 **humidity ratio (HR)** (alternatively, vapor content or mixing ratio): the humidity ratio of a given moist air  
2 sample is defined as the ratio of the mass of water vapor to the mass of dry air in the sample. It is expressed  
3 in grains per pound (grams per kilogram) of dry air, sometimes shortened to gr/lb or gpp (g/kg).

$$4 \quad HR = \text{Weight}_{\text{water vapor}} / (\text{Weight}_{\text{moist air}} - \text{Weight}_{\text{water vapor}}) \text{ or } \text{Weight}_{\text{water vapor}} / \text{Weight}_{\text{dry air}}$$

5 Note: In this document, when the term humidity is used without qualification, it will refer to the humidity ratio  
6 of the air, one of the absolute measures of the amount of moisture present.

7  
8 **indoor environmental professional (IEP):** an individual with the education, training and experience to  
9 perform an assessment of the microbial ecology of structure, systems and contents at a job site, create a  
10 sampling strategy, sample the indoor environment and submit to an appropriate laboratory, interpret  
11 laboratory data and determine Category of water or Condition 1, 2, and 3 for the purpose of establishing a  
12 scope of work and verifying the return to a normal microbial ecology (e.g., Condition 1). The term IEP  
13 (other terms or titles...)

14  
15 **inspection:** the process of gathering information needed to determine the category, condition, class, or  
16 status of a water intrusion, building material, assembly or system.

17  
18 **Institute of Inspection, Cleaning and Restoration Certification (IICRC):** an international, non-profit,  
19 certification and standard setting organization providing certification through education for the professional  
20 inspection, cleaning, restoration and remediation service industries: web page - [www.iicrc.org](http://www.iicrc.org).

21  
22 **low evaporation assemblies:** assemblies that due to their construction exhibit similar qualities to low  
23 evaporation materials (absorbs or transmits water slowly). Low evaporation assemblies may include, but  
24 not be limited to multilayer wallboard, multilayer subfloors, gym floors, or other complex, built-up  
25 assemblies. See low evaporation materials.

26  
27 **low evaporation materials:** materials that due to their porosity, permeance or internal structure have a  
28 low sorptivity (absorbs or transmits water slowly). Low evaporation materials may include but not be limited  
29 to plaster, wood, concrete, and masonry.

30  
31 **materially interested parties:** an individual or entity substantially and directly affected by the water  
32 damage restoration project.

33  
34 **microorganism (microbe):** an extremely small organism that usually is visible only with the aid of a  
35 microscope (e.g., protozoa, algae, bacteria, fungi, virus).

36  
37 **mitigate, mitigation:** to reduce or minimize further damage to structure, contents and systems in the built  
38 environment by controlling the spread of contamination and moisture.

39  
40 **moisture content:** the measurement of the amount of moisture contained in a material, expressed as a  
41 percentage of the weight of the oven-dry material. In regards to measurements, it is only recommended  
42 that the term "moisture content" be used when such measurements are taken using instruments calibrated  
43 for the given material and material temperature.

44  
45 **moisture level:** the measurement of the amount of moisture contained in a material on a relative scale. If  
46 a restorer is measuring materials with an instrument that is not calibrated for that material, then it is  
47 recommended that the term moisture level be used.

48  
49 **moisture map:** documentation that visually indicates the extent of water migration in the structure by  
50 communicating the area(s) affected and immediately adjacent unaffected area(s).

51  
52 **moisture meter:** a device used to measure the moisture level or moisture content of a material.

53  
54 **moisture sensor:** a device that indicates bulk moisture potentially present in a material, but does not  
55 provide a numerical reading to indicate the amount of moisture present.

- 1  
2 **monitoring:** the process of observing and documenting the change in a project variable over time, such  
3 as a moisture level or psychrometric value (e.g., temperature, humidity).  
4
- 5 **post-remediation verification:** an inspection and assessment performed by an IEP after a remediation  
6 project, which can include visual inspection, odor detection, analytical testing or environmental sampling  
7 methodologies to verify that the structure, system or contents have been returned to a Category 1 or  
8 uncontaminated level.  
9
- 10 **post-remediation evaluation:** process performed by the restorer to determine that the structure, system  
11 or contents have been returned to a Category 1 or uncontaminated level.  
12
- 13 **pre-remediation assessment:** the determination by an IEP of category 1, 2 or 3 status for the purpose of  
14 establishing a scope of work.  
15
- 16 **pre-remediation evaluation:** process performed by the restorer to establish the category of water for the  
17 purpose of establishing a scope of work.  
18
- 19 **pre-restoration evaluation:** *process performed by the restorer to establish recommended corrective*  
20 *actions based on information and evidence collected during the inspection process and conclusions derived*  
21 *from the preliminary determination. The information gathered from the pre-restoration evaluation is then*  
22 *used to develop the work plan, drying plan, safety and health plan, and to identify the need for specialized*  
23 *experts that may be required to clean and dry the structure, building systems, and contents to an acceptable*  
24 *drying goal.*  
25
- 26 **project:** an organized undertaking designed to return structure, systems or contents to an acceptable  
27 state or condition that is comparable to that which existed prior to a water intrusion event.  
28
- 29 **psychrometry:** a sub-science of physics relating to the measurement or determination of the  
30 thermodynamic properties of air/water mixtures (e.g., humidity and temperature).  
31
- 32 **relative humidity (RH):** the amount of moisture contained in a sample of air as compared to the maximum  
33 amount the sample could contain at that temperature. This definition is accurate in concept; but strictly  
34 speaking, relative humidity is the ratio of the partial pressure of water vapor in a sample of air to the water  
35 vapor pressure at saturation of that air, at a given temperature and barometric pressure.  
36
- 37 **remediate/remediation:** to remove microbial contamination consistent with IICRC standards.  
38
- 39 **remediator:** the remediation firm or contractor, or authorized representative, who is responsible for the  
40 remediation of damaged structures, systems or contents.  
41
- 42 **restorative drying:** the controlled removal of excess moisture from an indoor environment and affected  
43 materials; thereby, bringing a structure and its components, systems and contents to a pre-determined  
44 drying goal. See “drying”  
45
- 46 **restore/restoration:** to return a damaged structure, system, or contents to a normal, former or pre-damage  
47 state.  
48
- 49 **restorer:** the restoration firm, contractor, or authorized representative who is responsible for the restoration  
50 of damaged structures, systems and/or contents.  
51
- 52 **sanitizer:** reduces the number of, but does not destroy all microorganisms on inanimate objects. Effectively  
53 destroys 99.9% of target organisms.  
54
- 55 **scope of work:** the itemization of services to be performed on a restoration project.

1  
2 **standard of care:** practices that are common to reasonably prudent members of the trade who are  
3 recognized in the industry as qualified and competent.  
4  
5 **sterilizer:** used to eliminate or destroy microorganisms and their spores. Effectively kills 99.9999% of target  
6 organisms.  
7  
8 **thermo-hygrometer:** a device that measures, at a minimum, temperature and relative humidity of the air.  
9 Some models also calculate other psychrometric properties such as humidity ratio, water vapor pressure,  
10 and dew point.  
11  
12 **vapor diffusion:** vapor diffusion is the movement of moisture in the vapor state through a material. Vapor  
13 diffusion is a function of the vapor permeability of a material and the driving force or water vapor pressure  
14 differential acting across the material.  
15  
16 **water activity ( $a_w$ ):** The amount of free water available for microorganism growth on a substrate, such as  
17 wallboard, carpet or ceiling tile, is described as water activity ( $a_w$ ). It can be compared to the equilibrium  
18 relative humidity (ERH) of a material. ERH refers to the relative humidity (RH) of the atmosphere in  
19 equilibrium with a material with a particular moisture content (ISIAQ, 1996). A measurement of 80% ERH  
20 at the surface of a material would equate to a water activity ( $a_w$ ) of 0.8.  
21  
22 **water vapor pressure (WVP):** water vapor pressure is the pressure exerted by the molecules of water  
23 vapor on surrounding surfaces, usually expressed in inches of mercury ("Hg) or millimeters of mercury.  
24 Atmospheric pressure is the total pressure exerted by all gas components in the air (e.g., nitrogen, oxygen,  
25 argon, carbon dioxide, water vapor). Water vapor pressure (WVP) is only one component of the total  
26 atmospheric pressure. Since water vapor is the primary vapor of interest in the restoration industry, the  
27 term water vapor pressure (WVP) is often shortened to vapor pressure (VP). Unless noted when "vapor  
28 pressure (VP)" is used without qualification, it refers to water vapor pressure.  
29  
30 **work plan:** the planning and management documentation that describes the implementation of a scope of  
31 work.  
32

# BSR/IICRC S500 Standard

## 1 Principles of Water Damage Restoration

### 1.1 Introduction

A “principle” is defined as: “A basic comprehension, or fundamental doctrine or assumption that is accepted as true and that can be used as a basis for reasoning, process, or conduct.” There are five general principles used in the restoration of water damaged structures and materials. Applying these principles may require a multi-disciplinary approach involving professionals from several fields of expertise. For any of these principles to be applied effectively, timely response to the water intrusion is a necessity.

### 1.2 Principles of Water Damage Restoration

#### 1.2.1 Provide for the Safety and Health of Workers and Occupants

Appropriate safety procedures and personal protective equipment (PPE) shall be used to protect restorers. Reasonable effort should be made to inform building occupants of, and protect them from the identified health and safety issues.

#### 1.2.2 Document and Inspect the Project

Throughout the project, the restorer should establish, implement, and consistently follow methods and procedures for documenting all relevant information.

Detailed inspections should be conducted to identify the Category of water, the Class of water or extent of wetting, the types and quantities of affected materials, and apparent and potential damage. The information obtained should then be used to develop a preliminary determination, pre-restoration evaluation, scope of work and procedures. Methods used in the inspection, the data acquired, and decisions reached as a result should be documented.

##### 1.2.2.1 Initial Inspection

Upon entering a building, professional moisture detection equipment should be used to evaluate and document the psychrometric conditions inside and outside the building and the moisture level or moisture content of materials in affected and unaffected areas.

Restorers should inspect and document the source and time of the water intrusion, visible material deterioration, pre-existing damage and visible microbial growth. Professional moisture detection equipment should be used to inspect and document the extent of water migration and moisture intrusion into building materials and contents.

Restorers should establish drying goals for affected building materials and contents near the beginning of the restoration process, and it is recommended, if possible, that agreement with materially interested parties to the appropriateness of these goals be reached and documented. This may be achieved by determining a dry standard, which is a reasonable approximation of conditions prior to the moisture intrusion, or by comparing moisture level or moisture content in unaffected areas of the building.

When unaffected materials are not present, the restorer may use a reference from similar structures, experience from similar drying projects, and knowledge of the geographical area. The dry standards are then used by the restorer to establish drying goals.

##### 1.2.2.2 Ongoing Inspection(s)

1 Restorers should record, calculate and document moisture measurements required to adequately monitor  
2 the drying process. Restorers should record and monitor relevant moisture measurements daily, preferably  
3 at the same time of day, until drying goals are achieved. When benchmarks are not being met towards an  
4 acceptable drying goal, the restorer should further investigate to identify the cause and take corrective  
5 action.

### 6 7 **1.2.2.3 Final Inspection (Completion)**

8  
9 Drying equipment should remain in operation on site until it has been verified and documented that the  
10 drying goals have been achieved in the materials being dried. It is recommended that materially interested  
11 parties be provided access to documentation on the restoration process.

### 12 13 **1.2.3 Mitigate Further Damage**

14 Restorers should attempt to control the spread of contaminants and moisture to minimize further damage  
15 from occurring to the structure, systems, and contents. When contaminants are present restorers should  
16 remediate first, and then dry the structure, systems, and contents.

#### 17 18 **1.2.3.1 Control Moisture Intrusion**

19 Moisture problems should be identified, located, and corrected or controlled as soon as possible. Unless  
20 otherwise agreed by responsible parties, it is the responsibility of the property owner, not the restorer, to  
21 correct the source of the water intrusion, or to engage appropriate specialized experts to do so.

#### 22 23 **1.2.3.2 Control the Spread of Contaminants**

24 Contamination should be contained as close to its source as possible.

### 25 26 **1.2.4 Clean and Dry Affected Areas**

27 Restorers should clean and dry water-damaged buildings, systems and contents.

#### 28 29 **1.2.4.1 Cleaning**

30 Cleaning is the process of containing, removing and properly disposing of unwanted substances from an  
31 environment or material. Restorers should evaluate and clean materials within the work area as needed.

#### 32 33 **1.2.4.2 Drying**

34 Drying is the process of removing excess moisture from materials and involves the application of  
35 psychrometry and drying principles. Restorers should understand the science of drying and implement the  
36 principles of drying during a restoration project.

##### 37 38 **1.2.4.2.1 Enhancing Evaporation**

39 Evaporation is the process of changing a liquid to a vapor. Once bulk water has been removed, evaporating  
40 the remaining water in materials should be promoted.

##### 41 42 **1.2.4.2.2 Dehumidifying and Ventilating**

43 In order to avoid secondary damage and not retard the drying process, excess moisture evaporating into  
44 the air should be exchanged with less humid air or it should be removed from the air through  
45 dehumidification or ventilation.

##### 46 47 **1.2.4.2.3 Controlling Temperature**

48 Restorers should manage ambient and surface temperatures in the drying environment dependent upon  
49 the drying system employed.

## 1.2.5 Complete the Restoration and Repairs

After cleaning and drying has been accomplished, restorers should re-evaluate the scope of work to complete the restoration project. Qualified and properly licensed persons should perform authorized and necessary repairs.

## 2 Microbiology of Water Damage

### 2.1 Introduction

Indoor and outdoor environments naturally harbor a variety of microscopic life forms termed microorganisms or microbes. After a water intrusion event, the normal indoor ecology can quickly shift as microorganisms and microbes grow. Restorers should have a basic understanding of the normal and shifting ecologies of water damage events.

Mitigation following water damage events should begin as soon as safely possible, or microbial contaminants can grow and amplify, posing an allergic, toxic, or infectious disease health risk to both occupants and restoration personnel. An in-depth presentation of the health effects from indoor mold contamination is found in the current edition of ANSI/IICRC S520 Standard for Professional Mold Remediation.

### 2.2 Microbial Amplification

Bacteria and fungi of concern in indoor environments are those that utilize a variety of organic materials as nutrient substrates, to include a spectrum of building, finishing, and furnishing materials. Both bacteria and fungi, along with their various components and by-products, constitute a major portion of indoor dusts. In a dry environment subject to routine cleaning (e.g., dust removal), such reservoirs are normally non-problematic. However, as water intrudes, or moisture condenses onto surfaces and materials, the microbial ecology begins to change with potentially detrimental effects. This amplification affects the quality of the indoor air, can damage valuable materials, and can create health risks for those who live or work there (Andersson et al, 1997).

Most bacteria have a minimum water activity ( $a_w$ ) requirement for growth of  $>0.95$  (95% ERH). However, most molds that appear in the environment during the early stages of water damage require less moisture to grow. For these dry-tolerant (or xerophilic) molds,  $a_w$  of 0.66-0.70 (66%-70% ERH) is sufficient to promote growth. Xerophilic molds include species of *Penicillium* and *Aspergillus* that may produce potent allergens and toxic substances.

In addition to visible bacterial or fungal growth and detection of moisture in porous materials, a potential indicator of microbial growth and contamination is a “musty,” “moldy,” or “mildewy” odor. Bacteria and fungi produce a variety of microbial volatile organic compounds (MVOCs) during active growth on damp or wet building, finishing, and furnishing materials (Korpi et al, 1998). Detailed information on indoor environmental fungi can be found in the current edition of the ANSI/IICRC S520 *Standard for Professional Mold Remediation*.

### 2.3 Microbiology of Sewage

Bacterial pathogens in sewage can include virulent strains of gram-negative organisms such as *Salmonella*, *Shigella*, and *Escherichia coli* (Berry et al, 1994). Over 120 different viruses can be excreted in human feces and urine and can be found in municipal sewage (Straub et al, 1993), in addition to a wide variety of fungi and animal and human parasites. Sewage also constitutes a tremendous source of bacterial

1 endotoxins (cell wall components) that can induce a variety of adverse health effects. The potential adverse  
2 health consequences to occupants and restorers from sewage contamination and clean-up activities are  
3 discussed in Section 3, *Health Effects from Exposure to Microbial Contamination in Water-Damaged*  
4 *Buildings*.

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## 24 3 Health Effects from Exposure to Microbial Contamination in Water-Damaged 25 Buildings

### 27 3.1 Introduction

28  
29 Microbial contamination associated with water damage in indoor environments is a public health problem.  
30 It presents a health risk to both occupants and restoration workers, potentially resulting in a variety of  
31 illnesses of an inflammatory, allergic, infectious, and toxic nature. Floodwaters carry soil bacteria and fungi  
32 whose types, components, and by-products can induce respiratory inflammation and sensitivity, while  
33 sewage backflows additionally introduce a variety of infectious disease agents. Moisture accumulation  
34 (chronic leaks, condensation), leading to a state of unabated dampness, results in the growth and  
35 amplification of molds that can damage valuable materials and adversely affect human health.

### 37 3.2 Sewage and Health

38  
39 Unprotected workers who remediate sewage damage losses, as well as sewage treatment workers, and  
40 sewage sludge processors, are at risk for chronic respiratory disease, other systemic health effects, and a  
41 host of acute and chronic bacterial, fungal, viral, and parasitic diseases. Over 120 different viruses can be  
42 excreted in human feces and urine and find their way into sewage (Straub et al, 1993).

43  
44 Bacterial pathogens in sewage can include virulent strains of gram-negative organisms such as *Salmonella*,  
45 *Shigella*, and *Escherichia coli* (Berry et al, 1994). In addition to the infectious disease risk, gram-negative  
46 bacteria contain endotoxins that are released at the time of cell death and destruction. These cell fragments  
47 with endotoxins can be aerosolized during improper remediation activities, such as attempts to clean and  
48 dry sewage-saturated carpet in-place, as opposed to careful removal and disposal.

49  
50 Attempts at salvaging sewage-contaminated carpet and other porous materials can also liberate extensive  
51 amounts of allergens, as well as potentially infectious agents. This poses a risk for susceptible populations

1 such as the elderly, infants, convalescents, and those who are immunocompromised through disease or  
2 therapy.

### 3 4 **3.3 Secondary Fungal Contamination**

5  
6 If water damage events are not mitigated in a timely manner, fungal contaminants will grow and amplify,  
7 quickly posing an allergic, toxic, and infectious disease health risk to both occupants and restoration  
8 personnel. An in-depth presentation of the health effects from indoor mold contamination is found in the  
9 current edition of the ANSI/IICRC S520 *Standard Professional Mold Remediation*.

### 10 11 **3.4 Conclusion**

12  
13 In light of both the recognized and potential health effects associated with microbial contamination in water-  
14 damaged indoor environments, restoration professionals should take appropriate measures to protect  
15 building occupants, and maximally reduce exposure risks to their workers through training, immunization,  
16 and the use of administrative and engineering controls; personal protective equipment (PPE).

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## 26 27 28 29 **4 Building and Material Science**

30  
31 The success of a restorer's efforts is impacted by the principles of building science. Building envelopes are  
32 subject to the laws of thermodynamics, which imply that hot moves toward cold; wet moves toward dry;  
33 high pressure moves toward low pressure; and everything seeks equilibrium. These principles prevail and  
34 cause natural change in temperature, pressure, and moisture content, unless variables are present that  
35 enhance or hinder natural movement.

36  
37 Restorers are regularly called upon to provide service when buildings are affected by sudden and  
38 unexpected water intrusion. At other times, they may be called upon to identify and address the causes and  
39 damages resulting from chronic moisture problems in buildings. Often, a restorer finds that the effectiveness  
40 of measures taken to mitigate what is represented as a sudden and unexpected water intrusion are  
41 complicated or fail because of unrelated chronic conditions caused by patent or latent construction failure.  
42 An understanding of how moisture moves into, through, out of or accumulates in buildings is essential to  
43 successful water damage restoration.

44  
45 Building systems and assemblies are interrelated so that even a small change in one component can have  
46 a dramatic and potentially unexpected effect on the structure, systems, and contents. The impact of a water  
47 intrusion can affect the health and safety of occupants, and the functionality of a building. Restorers should  
48 understand building systems, assemblies, and related physical laws in order to restore a damaged building  
49 to its intended function and useful life.

50  
51 It is recommended that restorers understand the construction of wall and floor assemblies to facilitate  
52 educated decision making about drying and restoration. Knowledge of construction materials and their



1 applications for strength, sound transmission, and fire ratings all affect decisions as to how a building or  
2 structure can be properly dried and restored. Since all components of a building are interrelated, it is  
3 recommended that restorers attempt to discern the intent of the building's design or construction during a  
4 restoration project, and address those aspects individually and collectively.  
5  
6  
7

## 8 **5 Psychrometry and Drying Technology**

9  
10 In returning a building to an acceptable condition after a water intrusion, restorers should manage the  
11 environment within the building and the moisture in the structural materials and contents. To accomplish  
12 this, restorers should understand how to (1) manage the psychrometric properties of the environment, (2)  
13 effect moisture movement through different materials, and (3) promote surface evaporation from the  
14 materials.  
15  
16  
17

## 18 **6 Equipment, Instruments and Tools**

19  
20 Equipment, instruments, tools and their use shall conform to safety and inspection requirements of local,  
21 state, provincial or federal laws, and regulations. Restorers should follow the manufacturer's safety  
22 guidelines, operation instructions, and maintenance programs where applicable.  
23  
24  
25

## 26 **7 Antimicrobial (biocide) Technology**

### 27 **7.1 Antimicrobial (biocide) Use in Water Damage Projects**

28  
29 In addition to having general knowledge of potential microorganisms present in a water damage restoration  
30 project, restorers should have an understanding of the proper use of agents that can help control the growth  
31 of these microorganisms and reduce potential risks associated with some of their metabolic by-products  
32 (e.g., endotoxins, mycotoxins). Not all water intrusions warrant the use of antimicrobials (biocides). It is  
33 recommended restorers evaluate whether antimicrobial (biocide) application is appropriate. When there is  
34 a Category 1 water intrusion that has not changed in Category, the use of antimicrobials (biocides) is  
35 generally not warranted.  
36

37 There are several steps in the restoration process that restorers should perform or facilitate, which can  
38 return the structure to a sanitary condition without using antimicrobials (biocides). These steps should  
39 include: ensuring the water intrusion has been stopped, removing un-restorable contaminated materials,  
40 followed by remediation, drying, and final cleaning of affected materials, systems, and contents.  
41

42 Many antimicrobials (biocides) are deactivated by organic matter in water or on surfaces; therefore, pre-  
43 cleaning is an essential first step. In all cases, antimicrobials (biocides) shall be applied consistent with its  
44 label directions. In determining antimicrobial (biocide) use, restorers should weigh the benefits of using  
45 biocides against the risks associated with their use, and any client concerns or preferences. (Refer to  
46 Section 7 — *Antimicrobial (Biocide) Application*).  
47

### 48 **7.2 Risk Management**

49 In the United States, as part of a restoration company's risk management program, restorers who use  
50 antimicrobials (biocides) shall receive training in their safe and effective use. This may be the law in other  
51 countries. Restorers should determine the legal requirements for commercial use of such products in their

1 respective jurisdictions, and shall comply with applicable laws and regulations governing such products and  
2 their use.

### 3 4 **7.3 Application**

5  
6 Restorers shall apply only federal/state government-registered or authorized antimicrobials (biocides), and  
7 shall use them according to label directions. Any specified personal protective equipment shall be used.  
8  
9

## 10 11 **8 Safety and Health**

### 12 13 **8.1 Worker Safety and Health**

14  
15 The regulations referred to in this Standard are based on United States laws and regulations, but it is  
16 understood that other countries generally have comparable health and safety requirements. Restorers shall  
17 understand the laws and regulations related to health and safety for the particular country or locale in which  
18 they work. Although there are few specific federal, state, provincial and local laws and regulations directly  
19 related to water damage restoration and microbial remediation, there are safety and health regulations  
20 applicable to businesses that perform such work. Federal safety and health regulations in the United States  
21 that can impact the employees of a restoration business include, but are not limited to the following  
22 Occupational Safety and Health Act (OSHA) Standards found in Title 29 of the Code of Federal Regulations  
23 (CFR) parts 1910 and 1926:  
24

- 25     ▪ 29 CFR 1910 – General Industry Standards
- 26     ▪ 29 CFR 1926 – Construction Industry Standards

27  
28 Restoration firms shall comply with applicable sections of both the OSHA General Industry Standards and  
29 the Construction Industry Standards. Individual state and local governments can have additional safety  
30 and health requirements that are more restrictive than the Federal Occupational Safety and Health Act.  
31 Each state in the United States is required to use Federal OSHA as a minimum statutory requirement.  
32 Employers shall comply with these safety and health regulatory requirements. Specific items addressed  
33 by these regulations include, but are not limited to the following:  
34

- 35     ▪ site safety survey
- 36     ▪ hazard/risk assessment
- 37     ▪ emergency action and fire prevention plans;
- 38     ▪ personal protective equipment;
- 39     ▪ respiratory protection;
- 40     ▪ asbestos;
- 41     ▪ lead-based paint;
- 42     ▪ respirable silica dust
- 43     ▪ heat disorders and health effects;
- 44     ▪ bloodborne pathogens;
- 45     ▪ confined workspaces;
- 46     ▪ hazard communication;
- 47     ▪ lockout/tagout Procedures and Electrical Safety Orders;
- 48     ▪ fall protection;
- 49     ▪ noise exposure; and
- 50     ▪ scaffolds.

51  
52 Issues directly pertinent to the hazards of occupational exposure in buildings damaged by water are  
53 addressed more specifically in Section 3 *Health Effects from Exposure to Microbial Contamination in Water-*  
54 *Damaged Buildings.*

## 8.2 OSHA General Duty Clause

The OSHA “General Duty Clause” states that “Each employer:

- Shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees.
- Shall comply with occupational safety and health standards promulgated under this Act.” See 29 USC 654, §5.

Protection of the safety and health of restorers and building occupants is a primary concern on restoration and remediation projects. It is the responsibility of employers to ensure that employees entering and working in water-damaged or contaminated work areas, or in designated areas where contaminated contents are cleaned or handled, have received the appropriate training, instruction, and personal protective equipment. In the absence of a specific OSHA standard for water damage restoration, restorers shall recognize the general principles of exposure prevention as they are conveyed through the “General Duty Clause,” as well as to understand the current information available about potential hazards from occupational exposure in water-damaged structures, systems and contents. Restoration workers can also encounter lead, asbestos or other hazards as is discussed below. Industry standards have been adopted for recognized hazards by government agencies, such as OSHA and the EPA, as well as ACGIH and industry trade associations.

OSHA regulations are divided into sections that apply to various industries. When performing water damage restoration or remediation services, employees fall under the construction and general industry standards. These regulations address hazards such as scaffolding, electrical safety, confined spaces, falls, and hazardous material safety including asbestos, lead, and chemical exposures, as well as training and education for employees about these hazards. A complete list of federal OSHA regulations can be obtained from <http://www.osha.gov/law-regs.html>. The OSHA regulations for the General Industry (29 CFR 1910) and Construction Industry (29 CFR 1926) requires that no employee shall work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his or her safety or health. In other words, the employer shall provide a safe workplace, regardless of whether OSHA has considered a particular hazard.

## 8.3 Emergency Action and Fire Prevention Plans

Emergency action and fire prevention plans (OSHA 29 CFR 1926.35 and 1910.38) are required for all work places, including water damage restoration job sites. Requirements include, but are not limited to:

- communication and alarm systems;
- the location of the nearest hospital and fire station;
- emergency phone numbers (posted);
- shut down, evacuation and rescue procedures (posted);
- escape routes and signage (posted);
- use of less-flammable materials; and
- written program, if the employer has 10 or more employees.

## 8.4 Personal Protective Equipment (PPE)

OSHA 29 CFR 1910.132 requires that employers perform and document a hazard/risk assessment and provide their employees with the necessary PPE to reduce the risk of exposure to chemical, physical or biological hazards. Biological hazards that can be encountered when performing water damage restoration work include, but are not limited to, allergenic, toxigenic and/or pathogenic microorganisms. Various types of PPE are available to help prevent exposure.

1  
2 The following are potential routes of exposure:

- 3  
4     ▪ inhalation (respiratory);  
5     ▪ contact with mucous membranes (eyes, nose, mouth);  
6     ▪ ingestion; and  
7     ▪ dermal (contact with skin).  
8

9 Employers shall provide dermal and respiratory protection for employees entering a containment area  
10 where microbial contamination is present and remediation is being performed. Appropriate PPE is used to  
11 protect workers from possible inhalation or skin contact with microorganisms and their by-products, as well  
12 as chemicals or other substances that may be applied or handled in the course of restoration or remediation  
13 work. The selection of PPE depends on the anticipated exposure, types of microbial contamination,  
14 activities to be completed and potential hazards of chemicals that may be used in the restoration process.  
15 Restorers should consult an IEP or other specialized expert if there is a question regarding PPE selection.  
16 PPE can include, but is not limited to:

- 17  
18     ▪ respirator;  
19     ▪ eye protection;  
20     ▪ disposable coveralls including hood and booties;  
21     ▪ foot protection;  
22     ▪ hand protection;  
23     ▪ head protection; and  
24     ▪ hearing protection.  
25

#### 26 **8.4.1 Respirator Use and Written Respiratory Protection Plan**

27

28 Employees shall wear respirators whenever engineering and work practice controls are not adequate to  
29 prevent atmospheric contamination at the job site. If microbial remediation work is being performed, and if  
30 the restorer determines after the application of the “General Duty Clause” that a hazard exists, then a  
31 respirator is required for employees in the contaminated area. OSHA requires that a respiratory protection  
32 program be implemented for employees who wear a respirator. Visitors to the work site should be  
33 encouraged to wear respiratory protection and other appropriate PPE while in the contaminated work area.  
34

35 The respiratory protection regulations are found at 29 CFR 1910.134. The respiratory protection program  
36 outlines the written program requirements, and shall include but not be limited to:

- 37  
38     ▪ selection and use of NIOSH approved respirators;  
39     ▪ medical evaluation;  
40     ▪ respirator fit testing;  
41     ▪ user instruction and training in the use and limitations of the respirator, prior to wearing it;  
42     ▪ designated program administrator; and  
43     ▪ cleaning and maintenance program.  
44

#### 45 **8.4.2 Respirator Types**

46

47 The types of recommended respiratory protection range from NIOSH-approved N-95 filtering face pieces,  
48 to full-face air-purifying respirators (APR) or powered air-purifying respirators (PAPR) equipped with P-100  
49 (HEPA) filters and self-contained breathing apparatus (SCBA). P-100 filters should be used to protect  
50 against fungal spores and fragments, bacterial spores, dust and other particles. Organic vapor cartridges  
51 protect against Microbial Volatile Organic Compounds (MVOCs), some chemicals used when remediating  
52 sewage contamination, and other chemical compounds used in microbiological remediation projects.  
53

54 When using APRs, air is drawn into the respirator face piece by inhaling through filters or cartridges. When  
55 using PAPRs, air is mechanically delivered through the filters or cartridges into the face piece. Different

20

1 types of cartridges are available to remove chemical contaminants by a process of absorption or adsorption.  
2 Filters (e.g., P-100, R-100, N-100, N-95) are for removing particulates. APRs or PAPRs shall not be used  
3 in oxygen-deficient atmospheres or in other atmospheres that are immediately dangerous to life or health  
4 (IDLH).

## 6 **8.5 Warning Signs**

7  
8 The need for warning signs should be evaluated during the initial site safety survey as well as throughout  
9 the drying project, and as activities and conditions change. Signs shall be posted to identify egress means  
10 and exits (29 CFR 1910.37); biological hazards (29 CFR 1910.145(e)(4), (f)(8)); caution (29 CFR  
11 1910.145(c)(2), (d)(4)); and dangers (29 CFR 1910.145(c)(1), (d)(2), (f)(5)) that may exist on the job site.  
12 Warning signs that are posted to identify hazards that may exist on the job site should list the following  
13 emergency contact information: the company name, company address, 24-hour emergency contact  
14 number and name of project supervisor. When warning signs are posted on confined-space projects, they  
15 shall be printed with the date they were posted and the approximate date they are expected to be taken  
16 down or reassigned. Typical warning signs related to restoration work can include, but are not limited to:

- 17
- 18 ■ Do Not Enter – Sewage Damage Remediation in Progress;
- 19 ■ Caution: Slip, Trip and Fall Hazards;
- 20 ■ Caution: Hard Hat Area;
- 21 ■ Work Area Under Negative Air-Pressure; and
- 22 ■ No Unauthorized Entry.

## 24 **8.6 Mold**

25  
26 Buildings that have been wet for an extended period, or have been chronically wet can develop mold  
27 contamination. If restorers encounter mold growth during the course of the restoration project, water  
28 damage restoration activities that may disturb the mold should stop until such time that the area of existing  
29 or suspected mold contamination is contained. Further drying and mold remediation in the potentially  
30 contaminated area should be performed by trained remediators following the current edition of the  
31 ANSI/IICRC S520 *Standard for Professional Mold Remediation*. Restorers shall follow applicable federal,  
32 state, provincial and local laws and regulations.

## 34 **8.7 Asbestos**

35  
36 The asbestos safety regulations are found in OSHA Construction Standard 29 CFR 1926.1101 and General  
37 Industry Standard 1910.1001. These regulations shall be followed whenever a detectable amount of  
38 asbestos is encountered or is presumed to be present and might be disturbed. The restorer shall receive  
39 awareness training to ensure potential hazards are known and properly identified. Asbestos containing  
40 materials (ACM) can be found in buildings of any age including newly constructed buildings.

41  
42 Even if the building owner has a survey for asbestos, the restoration/remediation contractor is still  
43 responsible for identifying and controlling asbestos exposure during demolition and removal of materials.  
44 When restorers encounter materials containing asbestos or that are presumed to contain asbestos that  
45 have been or potentially will be disturbed during the course of work activities, they shall stop activities that  
46 can cause the friable material to become aerosolized. A licensed asbestos abatement contractor shall be  
47 engaged to perform the asbestos abatement. Federal, state, provincial and local laws and regulations  
48 might require that asbestos inspections be performed by licensed asbestos building inspectors prior to  
49 disturbing building materials which are presumed to contain asbestos.

## 51 **8.8 Lead**

52  
53 The lead regulations are found at OSHA Standards 29 CFR 1926.62 and 1910.1025. Lead construction  
54 work includes work that involves lead-based paint or other structural materials containing lead (e.g.,

1 emergency cleanup, demolition, repair or other work which could disturb lead).

2  
3 Even if the building owner has a survey for lead, the restorer is still responsible for identifying and controlling  
4 lead exposure during demolition and removal of materials in all pre-1978 buildings and some post-1978  
5 industrial applications. Restorers shall be in compliance with USEPA's Renovation, Repair and Painting  
6 (RRP) program for lead-based paint and surface coatings, as well as any other applicable federal, state,  
7 provincial and local laws and regulations.

## 8 9 **8.9 Heat Disorders**

10  
11 Work activities involving high air temperatures, radiant heat sources, high humidity, direct physical contact  
12 with hot objects, or strenuous physical activities have a high potential for inducing heat stress. Employees  
13 are at risk for heat-induced stress particularly when engaged in activities in areas such as attics and  
14 crawlspaces, or when wearing PPE.

15  
16 Outdoor operations conducted in hot weather, such as construction, asbestos removal, and remediation  
17 site activities, especially those that require workers to wear semi-permeable or impermeable protective  
18 clothing, also present the possibility of heat-related disorders to workers. Heat disorders range from heat  
19 rash and dehydration to heat exhaustion and heat stroke. Heat stroke, often characterized by hot, dry skin  
20 and sudden loss of consciousness, is a true medical emergency. Seek medical attention immediately. The  
21 respiratory protection and other PPE plans of the restoration or remediation contractor shall address  
22 prevention and on-site response to heat disorders. PAPRs can provide additional cooling for restorers in  
23 hot environments. For more information on heat-related disorders, see OSHA Technical Manual TED 1-  
24 0.15A, Section III, Chapter 4.

## 25 26 **8.10 Confined Space Entry**

27  
28 OSHA regulations addressing confined spaces are found in 29 CFR 1910.146 and 29 CFR 1926.21.  
29 Further guidance may be obtained from American National Standard ANSI Z117.1-1989, *Safety*  
30 *Requirements for Confined Spaces*. The OSHA and ANSI standards provide minimum safety requirements  
31 to be followed while entering, exiting, and working in confined spaces at normal atmospheric pressure. A  
32 "confined or enclosed space" means any space that:

- 33
- 34     ▪ is configured so that an employee can enter it;
- 35     ▪ has limited means of ingress or egress; and
- 36     ▪ is not designed for continuous occupancy.

37  
38 If it is determined that the workplace is a confined space, then the confined space entry program shall  
39 include:

- 40
- 41     ▪ determining if the space meets the definition of a Permit Required Space;
- 42     ▪ identifying the confined spaces and hazards in the workplace;
- 43     ▪ monitoring of atmospheric conditions in the space;
- 44     ▪ instructing workers on the proper use of the safety equipment;
- 45     ▪ defining the duties of the confined space entry team; and
- 46     ▪ developing training requirements for employees who enter the confined space.

47  
48 Permit-required confined space (permit space) means a confined space that has one or more of the  
49 following characteristics:

- 50
- 51     ▪ contains or has a potential to contain a hazardous atmosphere;
- 52     ▪ contains a material that has the potential for engulfing an entrant;
- 53     ▪ has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly  
54     converging walls or by a floor which slopes downward and tapers to a smaller cross-section; or

- 1       ▪ contains any other recognized serious safety or health hazard.

2  
3 If it is determined that the confined space is a Permit Required Confined Space, then the confined space  
4 shall have a posted permit.

### 6 **8.11 Hazard Communication**

7  
8 The OSHA Hazard Communication Standard (29 CFR 1910.1200) requires that information concerning  
9 chemical hazards (physical or health hazards) be provided to employers by chemical manufacturers and  
10 communicated to employees by employers. This is accomplished by means of hazard communication  
11 programs, which include a written program, container labeling and other forms of warning, safety data  
12 sheets (SDS), and employee training prior to working with hazardous chemicals. Examples of chemicals  
13 used during water damage restoration and remediation are the adhesive spray used to make enclosures,  
14 detergents and disinfectants (biocides) for cleaning, sealers, and encapsulants.

15  
16 Restorers working on multi-employer work sites shall:

- 17       ▪ inform other employers of hazardous substances;
- 18       ▪ inform other employers of means to protect their employees;
- 19       ▪ provide access to SDS; and
- 20       ▪ inform other employers of the labeling system used.

### 22 **8.12 Lockout/Tagout (Control of Hazardous Energy)**

23  
24 Restorers and occupants can be seriously or fatally injured if machinery, utilities, or appliances they service  
25 or maintain unexpectedly energizes, starts up, or releases stored energy. The OSHA Standard on the  
26 Control of Hazardous Energy (Lockout/Tagout), found in 29 CFR 1910.147, delineates steps restorers shall  
27 take to prevent accidents associated with hazardous energy. This standard addresses practices and  
28 procedures necessary to disable machinery or electrical services, and prevent the release of potentially  
29 hazardous energy while maintenance or servicing activities are performed. There are other OSHA  
30 standards that apply to energy control and energy release requirements of various types of machinery.  
31 Lockout/Tagout shall be performed by a qualified and authorized person.

### 34 **8.13 Safe Work Practices in Contaminated Environments**

35  
36 In addition to the specific safety or health concerns detailed in this Section, a number of basic work practices  
37 have been adopted for remediation projects by safety professionals. Restorers should incorporate the  
38 following items into restoration and remediation work procedures:

- 39       ▪ no eating, drinking, or smoking in any potentially contaminated or designated work area;
- 40       ▪ remove protective gear and wash hands before eating, drinking, smoking, or using the bathroom,  
41 rest periods and at the end of the workday;
- 42       ▪ shower at the end of the workday;
- 43       ▪ dispose of contaminated protective clothing with other refuse before exiting the containment;
- 44       ▪ do not move used protective clothing from one area to another unless properly contained;
- 45       ▪ wear appropriate gloves (e.g., latex, chemical-resistant, nitrile) while inside containment areas,  
46 designated work areas, or while handling bagged contaminated materials;
- 47       ▪ wear a second pair of gloves (rubber, textile or leather work gloves) over surgical gloves to protect  
48 against personal injury;
- 49       ▪ use the buddy system when working in high heat, remote or isolated workspaces;
- 50       ▪ address all cuts, abrasions, and first-aid issues promptly, especially when sewage-damaged  
51 materials are present;
- 52       ▪ discard gloves that are damaged, wash hands with soap and water, and inspect hands for injury;
- 53       and
- 54

- 1       ▪ dispose of all used disposable gloves as contaminated material along with contaminated debris.

2  
3 Restorers shall incorporate the following items into restoration and remediation work procedures:

- 4  
5       ▪ tail-gate meetings to discuss the daily work activities, including a review of safety issues;  
6       ▪ wear PPE appropriate to the hazards identified in the work area;  
7       ▪ use protective disposable coveralls with attached or separate shoe covers;  
8       ▪ don protective clothing prior to entering the containment or other designated work areas;  
9       ▪ inspect PPE prior to use;  
10       ▪ repair or replace damaged protective clothing;  
11       ▪ when an injury occurs, the injured worker and co-workers are to take the steps delineated in the  
12       company safety program;  
13       ▪ workers are to be instructed as to job specific emergency plans including emergency exits;  
14       ▪ workers are to be informed about the location of the emergency shower and eye wash stations;  
15       and  
16       ▪ report injuries to the supervisor as soon as possible.

#### 17 18 **8.14 Immunizations and Health Affects Awareness**

19  
20 Restorers and remediators should consider reducing the risk of infectious disease to workers by referring  
21 them to their primary health care physician (PHCP) for information on available immunizations (e.g.,  
22 tetanus/diphtheria boosters, Hepatitis A and B). Workers, who are at an increased risk for opportunistic  
23 infections, including but not limited to those who are immunocompromised due to HIV infection, neoplasms,  
24 chemotherapy, transplantation, steroid therapy, or underlying lung disease, should be advised of the  
25 increased risk of disease due to their condition. Such workers are usually precluded from participating in  
26 restoration or remediation activities in water-damaged buildings. Employees who have medical conditions  
27 that are of concern (e.g., AIDS, HIV seropositivity, pregnancy) should be evaluated by a qualified physician  
28 for a recommendation regarding whether performing assigned restoration or remediation activities presents  
29 an unacceptable health risk.

#### 30 31 **8.15 Vehicle Safety**

32  
33 Employers shall comply with applicable federal, state, provincial, and local laws and regulations regarding  
34 vehicle safety. Employers should provide instruction to their employees on driver safety. Employees shall  
35 comply with applicable federal, state, provincial, and local laws and regulations regarding vehicle operation.

#### 36 37 **8.16 Ergonomics**

38  
39 Employers shall provide their employees with ergonomically safe tools that will help minimize strain and  
40 repetitive motion injuries. Due to the nature of the restorer's work, they are susceptible to injuries affecting  
41 the shoulder, elbow, knees, and back. Employers should take into consideration the set up of the equipment  
42 on their trucks and make sure that the tools are placed in easily accessible places that prevent the employee  
43 from stretching or straining. In addition, providing ergonomically safe injury prevention tools, such as  
44 furniture sliders, reduce the strain on the back and help prevent injury.

#### 45 46 **8.17 Lifting**

47  
48 Lifting is an action that occurs on every project and one that restorers can take for granted. The movement  
49 of items can place a great deal of strain on the back and, when done improperly, can lead to serious injury  
50 and lost work time. Employers should train newly hired employees on the proper lifting techniques that will  
51 help prevent injury. As part of a back injury prevention program, employers should encourage employees  
52 to stretch before, during, and after their work shift. Stretching strengthens and warms the muscles used in  
53 the lifting process, reducing the chances of injury. Limiting the injury risk will keep employees on the job  
54 and productive.



## 8.18 Heat-Producing Equipment Cautions

There are potential hazards associated with the use of heat producing equipment (e.g., heaters, dehumidifiers). Restorers should consider the impact of high temperatures on building components and contents. Manufacturer's instructions and safety precautions shall be followed to reduce the potential for fire hazards and occupant safety issues.

Direct-fired heaters shall not be used unless adequate ventilation is available due to by-products of combustion (i.e., carbon monoxide). If indirect-fired heaters are placed within an occupied area, the combustion stream shall be ducted to the outside. When using equipment producing combustion by-products, restorers should monitor the air space for carbon monoxide.

## 9 Administrative Procedures, Project Documentation and Risk Management

### 9.1 Administrative Procedures

It is recommended that restorers establish, implement, and consistently follow methods and procedures for project administration, including but not limited to business systems and operational plans and protocols. Competent project administration promotes the delivery of high-quality water damage restoration services and increases the likelihood of having satisfied clients. Water damage restoration project administration typically includes, but is not necessarily limited to:

- use of written contracts;
- good communication with all involved parties;
- thorough project documentation, monitoring, and recordkeeping;
- appropriate methods to manage risk;
- ability to understand and coordinate multiple tasks, disciplines, and materially interested parties; and
- professional and ethical attitude and business orientation.

#### 9.1.1 Work Authorizations

Restorers should receive proper written work authorization before performing any services on a water damage project. A work authorization is a form that when properly executed, allows an individual or company to work on the premises or property of another, under the terms of the contract or owner's insurance policy. The work authorization may be included as a part of the contract and should be signed by the property owner or their authorized agent.

#### 9.1.2 Contracts

Restorers should enter into a written contract before starting a water damage restoration project. What constitutes an adequate written contract in any given situation or jurisdiction is beyond the scope of this Section. Restorers are advised to work with their legal counsel to develop contracts, and other forms, applicable to their restoration activities. Although projects vary in size and scope and can have unique issues and complications, it is recommended that contracts include, but are not limited to the following:

- the identity and contact information of the client and all materially interested parties;
- a description of the work to be performed, which can include reference to attached project specifications or other documents that specify the details of the work:
  - description of and responsibility for repair of collateral and/or consequential damage;

- 1       ○ any known limitations, complexities or potential complications of the project;
- 2       ○ any permits and licensing required for the project;
- 3       ○ the respective duties and responsibilities of the parties;
- 4       ○ the project start date and the time frame for completion of the work;
- 5       ○ the price or method for calculating the price or fees for the work;
- 6       ○ the price or fees for any changes or additions to the work;
- 7       ○ the party responsible for payment and the terms of payment;
- 8       ○ provisions dealing with contract default and termination;
- 9       ○ whether or not an insurance company is involved, and how the project will be handled;
- 10      ○ warranty and disclaimer provisions, if any;
- 11      ○ the completion criteria for the project (e.g., drying goals); and
- 12      ○ provisions relating to changes or additions to the work, including change orders.

13  
14 When a written contract is executed, it is recommended that each page of the contract be initialed by all  
15 parties to the contract. The contract should be dated and signed by the property owner(s) or their authorized  
16 agent, and each party should be given a copy of the contract as soon as reasonably practical. Restorers  
17 should seek legal counsel for the development of a contract, including appropriate terms and conditions, or  
18 when circumstances or situations dictate the need for contract modifications, addendums, or project-  
19 specific legal advice.

20  
21 By documenting the understanding of the parties at the beginning of a project, written contracts reduce the  
22 possibility of dispute, disagreement, or conflict during performance of the scope of work. It is recommended  
23 that contract documents be accurate and complete, free of ambiguity, and contain adequate disclaimers,  
24 reservations, or recommendations when project uncertainties, limitations, complexities or complications  
25 exist, or are indicated.

26  
27 Many contractual disputes develop when contract additions or modifications are made during performance  
28 of the work, but are not adequately documented. Verbal change orders may create future misunderstanding  
29 or disagreement resulting in legal disputes and litigation. Substantive or material deviations from the  
30 original, agreed-upon contract or scope of work should be documented in a written and detailed change  
31 order, which includes a description of the changes to the work, time for performance, price/fees, and method  
32 of payment. Further, it is recommended that the client or the client's designated agent, and the restorer's  
33 representative accept the change order in writing.

34  
35 Restorers should ascertain whether or not the moisture problem at issue has been identified, controlled, or  
36 repaired, and if not, to identify the process and party responsible for doing so. The resolution may be  
37 delegated to a specialized expert as dictated by the situation. Unless otherwise agreed by responsible  
38 parties, it is the responsibility of the property owner, not the restorer, to correct the source of the water  
39 intrusion.

### 40 41 **9.1.3 Communication**

42  
43 Communication between materially interested parties is important on any water damage restoration project.  
44 It is recommended that materially interested parties agree on the purpose and subjects of project  
45 communication, the frequency and mode of communication, and the contacts with whom communications  
46 will be distributed. It is recommended that significant items that could potentially affect the job be discussed  
47 verbally and then reduced to writing and distributed to appropriate materially interested parties.

48  
49 Communication often includes education, recommendations, and advisories. Clients and occupants with  
50 health concerns or medical questions should be instructed to seek advice from qualified medical  
51 professionals or public health authorities. Clients or occupants might ask the restorer whether the building  
52 can be occupied during restoration. Since the safety and health of occupants is a priority in a water damage  
53 restoration project, potential hazards may necessitate occupant evacuation. There are also times when  
54 project operations or containment make continued occupation of the structure problematic or impossible.  
55 In some instances, it may be appropriate for the restorer to provide clients or occupants with information

1 used in making a decision to evacuate. When providing such information, restorers should inform clients  
2 and occupants that any such information provided is not to be construed as medical or health diagnosis,  
3 directive, or advice. It is recommended that restorers not give advice, education, recommendations, or  
4 advisories on subjects outside their area of expertise.

## 6 **9.2 Project Documentation and Recordkeeping**

8 Thorough project documentation and recordkeeping are important while developing the scope of work and  
9 the execution and completion of the restoration work plan, especially if there is a need to review or  
10 reconstruct the restoration process or project at some time after completion. To properly develop and  
11 document the water damage restoration project, it is recommended that restorers attempt to obtain pertinent  
12 project information developed before, during, and after the involvement of the restorer in the project. It is  
13 also recommended that the restorer document important communications to reduce the possibility of  
14 miscommunication. The extent of project documentation and recordkeeping varies with each restoration  
15 project.

### 17 **9.2.1 Time Keeping Documentation**

19 Projects can be invoiced on a measured-estimate or bid basis, a time-and-material basis, or a cost-plus-  
20 overhead and profit basis. When applicable to the billing method, restorers should record the time worked  
21 by personnel involved in the project. Individual timesheets, either written or electronic, might be required  
22 for billing purposes. Individual time records can include, but are not be limited to:

- 24 ▪ worker name;
- 25 ▪ date of service;
- 26 ▪ job title or duties;
- 27 ▪ time in for a specific task;
- 28 ▪ time out for a specific task;
- 29 ▪ brief task description and/or a correlating accounting code for the task being performed;
- 30 ▪ total time worked;
- 31 ▪ validation of time by a supervisor, clerk, or record keeper; and
- 32 ▪ the signature of the worker.

34 The specific method of tracking, recording, and reporting time records is beyond the scope of this document.  
35 It is recommended that water damage restoration contractors consult with qualified legal or accounting  
36 professionals on this issue.

### 38 **9.2.2 Equipment, Material and Supply Usage Documentation**

40 Projects invoices based on a time and material plus overhead and profit basis, or a cost-plus-overhead  
41 and profit basis, should include a list of equipment, materials and supplies used.

### 43 **9.2.3 Project Monitoring Logs**

45 Restorers should maintain organized logs to monitor progress and demonstrate effectiveness of the drying  
46 process. The specific method for creating and maintaining monitoring logs on a project is beyond the scope  
47 of this document. Specific items recorded on a project log can include, but are not limited to:

- 49 ▪ the name of the project;
- 50 ▪ the dates and times of service;
- 51 ▪ the person performing the service;
- 52 ▪ the instrumentation used;
- 53 ▪ the appropriate psychrometric readings (e.g., temperature, RH) in affected areas; unaffected areas  
54 and inlets/outlets of dehumidifiers or HVAC systems, if present;

- 1       ▪ moisture level or content measurements of representative materials in the affected and unaffected
- 2       areas;
- 3       ▪ drying goals and standards for the affected materials; and
- 4       ▪ location of the moisture level or content readings.

#### 6       **9.2.4 Required Documentation**

7  
8       The documents and records obtained and maintained by the restorer shall include documents required by  
9       applicable laws, rules and regulations promulgated by federal, state, provincial, and local governmental  
10      authorities. This includes appropriate safety and health documentation. In addition, documentation should  
11      consist of records and other information as required throughout this standard, which include but is not  
12      necessarily limited to:

- 14      ▪ the water damage restoration contract and/or the emergency mitigation authorization;
- 15      ▪ relevant details of the water intrusion (e.g., source, date of intrusion, date of discovery);
- 16      ▪ documents and records relevant to validating the drying process and verification of completion  
17      criteria (e.g. drying goals);
- 18      ▪ the scope of work and work plan;
- 19      ▪ detailed work or activity logs;
- 20      ▪ estimates, invoices, and bills;
- 21      ▪ documentation related to project limitations, complications, complexities or conflicts
- 22      ▪ documents and records that verify the use of equipment and materials on the project
- 23      ▪ certificate(s) of completion, or other documents communicating completion criteria has been met;  
24      and
- 25      ▪ to the extent the following documents or records are relevant, they should be obtained and  
26      maintained by the restorer:
  - 27          ○ notices, agreements, disclosures, releases, or waivers;
  - 28          ○ environmental reports;
  - 29          ○ written recommendations or technical specifications from specialized experts;
  - 30          ○ an inventory of contents/personal property that are being removed from the job site for  
31          storage, restoration or cleaning;
  - 32          ○ an inventory of unsalvageable or unsuccessfully restored contents/personal property that  
33          will be disposed;
  - 34          ○ permits and permit applications;
  - 35          ○ lien notices and releases;
  - 36          ○ change orders;
  - 37          ○ documentation reflecting client approval for the use of antimicrobial (biocides) including  
38          consumer “Right to Know” information; and
  - 39          ○ records of pressure readings in and out of containment erected for the purpose of  
40          remediation.

#### 42      **9.2.5 Recommended Documentation**

43  
44      While not an exhaustive list, it is recommended that documents and records obtained and maintained by  
45      the restorer include the following:

- 47      ▪ administrative file information that memorializes communication between all parties;
- 48      ▪ subcontract information, agreements, and change orders for any subcontractors engaged by the  
49      restorer on the project;
- 50      ▪ work specifications, submittals, and bid requests;
- 51      ▪ documentation relating to draw schedules, or responsible parties for payment of invoices;
- 52      ▪ building evaluations performed by the restorer or other specialized expert that details relevant  
53      information on the construction of the work areas;
- 54      Reports, maps, or logs that highlight inspection and monitoring observations or measurements;

- 1       ▪ other relevant project or client observations or perceptions (e.g., odors, condensation, and health
- 2       complaints); and,
- 3       ▪ an inventory and photographs of contents/personal property in the work area, either removed from
- 4       or remaining on the job site.

### 6       **9.2.6 Documentation of Limitations and Deviations**

7  
8       The client might request or decline water damage restoration services that prevent the restorer from  
9       complying with this Standard. When proceeding in such circumstances, there is a heightened risk of future  
10      conflict with the client and potential liability to the restorer. If the restorer decides to proceed with the project  
11      despite limitations on compliance with industry standards, the restorer should adequately document the  
12      situation and circumstances, which can include advising the client in writing of the potential consequences  
13      of such noncompliance and attempting to obtain a written waiver and release of liability from the client for  
14      those potential consequences. However, this might not prevent restorer liability, because of the fact that  
15      the job was accepted with knowledge that it could not be completed successfully, or that the results might  
16      be questionable. Prior to deviation from the standard of care (i.e., “shall” or “should”) the restorer should  
17      document the circumstances that led to such a decision, notify the materially interested parties, and in the  
18      absence of a timely objection, document the communication before proceeding. Refer to section 11,  
19      *Limitations, Complexities, Complications and Conflicts*.

### 21      **9.2.7 Recordkeeping and Record Retention**

22  
23      Restorers shall maintain restoration project documentation for the time period required by the record  
24      retention laws and regulations of applicable jurisdictions, if any. It is also recommended that restoration  
25      project documentation be maintained for the longest applicable statute of limitations in the relevant  
26      jurisdiction, at a minimum. Many jurisdictions follow the discovery rule, whereby the statute of limitations  
27      applicable to a restoration project only begins to run from the date of discovery of the problem, not the date  
28      the service was performed. Thus, in some circumstances, it may be appropriate to maintain restoration  
29      project documentation indefinitely. It is recommended that restorers obtain advice from qualified counsel  
30      regarding timeframes for documentation retention. The method of recordkeeping and record retention is  
31      beyond the scope of this document.

### 33      **9.2.8 Emergencies**

34  
35      In many circumstances, water damage restoration projects begin on an emergency basis. Emergency  
36      situations might impede communications about the project or limit the opportunity to document the project  
37      as described in this section. However, once an emergency situation is resolved, to the extent possible,  
38      restorers should complete the appropriate documentation and correct communication deficiencies caused  
39      by the emergency.

## 41      **9.3 Risk Management**

42  
43      It may be appropriate for restoration businesses to consider development of a formal risk management  
44      program, including a review of insurance coverage both required by law and appropriate to the risk (e.g.,  
45      general liability, contractor's pollution liability). Restorers shall determine and comply with any governmental  
46      insurance requirements related to their business operations. The conduct of business as a restoration firm  
47      requires consideration of several other types of insurance coverage, including:

- 48      ▪ workers' compensation: restoration firms shall meet legal requirements to provide workers'
- 49      compensation coverage for businesses having employees.
- 50      ▪ automobile: it is recommended, and in many jurisdictions required by law, that restoration firms
- 51      using vehicles in business obtain commercial automobile liability insurance.

1 Restorers shall determine and comply with any governmental insurance requirements related to their  
 2 business operations. It is recommended that restorers stay abreast of insurance industry developments  
 3 impacting their business. It is recommended that restorers develop and maintain a relationship with a  
 4 qualified insurance professional to assist in this regard.  
 5  
 6  
 7  
 8  
 9

## 10 **10 Inspections, Preliminary Determination, and Pre-Restoration Evaluations**

### 11 **10.1 Introduction**

12 Restorers should conduct the following activities at the beginning of the project:

- 13  information gathering;
- 14  initial response;
- 15  safety and health issue resolution;
- 16  pre-restoration inspection;
- 17  arriving at the preliminary determination;
- 18  pre-restoration evaluations; and
- 19  work planning

20  
 21  
 22  
 23 The ANSI/IICRC S500 *Standard for Professional Water Damage Restoration* has been written to provide  
 24 methods and procedures for restorers to safely restore property damaged from water intrusion. The  
 25 processes in a project do not always follow a linear progression and may occur in varying orders; even  
 26 simultaneously. The order of the processes presented in this section is by no means a mandatory order,  
 27 although there are steps that should occur early in the initial response. Each project can present a unique  
 28 set of circumstances that should be considered when establishing the order of the procedures discussed  
 29 in this section.  
 30

### 31 **10.2 Qualifications**

32  
 33 Restorers are expected to be qualified by education, training, and experience to appropriately execute the  
 34 skills and expertise required to safely perform restoration of structure and contents. Restorers shall only  
 35 perform services they are licensed, certified, or registered to provide when required by local, state,  
 36 provincial, or federal laws and regulations. If situations arise where there is a need to perform services  
 37 beyond their expertise, restorers should hire specialized experts or other support services, or recommend  
 38 to their customer that the appropriate specialized expert be retained in a timely manner. Restorers should  
 39 also address occupant questions when the subject is within the scope of their authority and ability.  
 40

### 41 **10.3 Documentation**

42  
 43 Throughout the project, the restorer should establish, implement, and consistently follow methods and  
 44 procedures for documenting all relevant information. This information can affect and provide support for  
 45 project administration, planning, execution, and cost. In addition, pre-existing damage (e.g., evidence of  
 46 wear, use, physical damage, previous water intrusions, staining, odors) should be documented and  
 47 communicated to materially interested parties. Refer to Section 9, *Administrative Procedures, Project*  
 48 *Documentation and Risk Management*.  
 49

### 50 **10.4 Definitions**

51  
 52 Before beginning the inspection, restorers should have an understanding of the category of water, class of  
 53 water, and other factors that influence the appropriate response.  
 54

#### 10.4.1 Category of Water

The categories of water, as defined by this document, refer to the range of contamination in water, considering both its originating source and its quality after it contacts materials present on the job site. Time and temperature can affect or retard the amplification of contaminants, thereby affecting its category. Restorers should consider potential contamination, defined as the presence of undesired substances; the identity, location, and quantity of which are not reflective of a normal indoor environment; and can produce adverse health effects, cause damage to structure and contents, or adversely affect the operation or function of building systems.

**Category 1:** Category 1 water originates from a sanitary water source and does not pose substantial risk from dermal, ingestion, or inhalation exposure. Examples of Category 1 water sources can include, but are not limited to: broken water supply lines; tub or sink overflows with no contaminants; appliance malfunctions involving water-supply lines; melting ice or snow; falling rainwater; broken toilet tanks; or toilet bowls that do not contain contaminants or additives.

Category 1 water can deteriorate to Category 2 or 3. Category 1 water that flows into an uncontaminated building does not constitute an immediate change in the category. However, Category 1 water that flows into a contaminated building can constitute an immediate change in the category. Once microorganisms become wet from the water intrusion, depending upon the length of time that they remain wet and the temperature, they can begin to grow in numbers and can change the category of the water. Odors can indicate that Category 1 water has deteriorated.

**Category 2:** Category 2 water contains significant contamination and has the potential to cause discomfort or sickness if contacted or consumed by humans. Category 2 water can contain potentially unsafe levels of microorganisms or nutrients for microorganisms, as well as other organic or inorganic matter (chemical or biological). Examples of Category 2 water can include, but are not limited to: discharge from dishwashers or washing machines; overflows from washing machines; overflows from toilet bowls on the room side of the trap with some urine but no feces; seepage due to hydrostatic pressure; broken aquariums; and punctured water beds.

Category 2 water can deteriorate to Category 3. Once microorganisms become wet from the water intrusion, depending upon the length of time that they remain wet and the temperature, they can begin to grow in numbers and can change the category of the water.

**Category 3:** Category 3 water is grossly contaminated and can contain pathogenic, toxigenic or other harmful agents and can cause significant adverse reactions to humans if contacted or consumed. Examples of Category 3 water can include, but are not limited to: sewage; wasteline backflows that originate from beyond any trap regardless of visible content or color; all forms of flooding from seawater; rising water from rivers or streams; and other contaminated water entering or affecting the indoor environment, such as wind-driven rain from hurricanes, tropical storms, or other weather-related events. Category 3 water can carry trace levels of regulated or hazardous materials (e.g., pesticides, or toxic organic substances).

#### 10.4.2 Regulated, Hazardous Materials and Mold

If a regulated or hazardous material is part of a water damage restoration project, then a specialized expert may be necessary to assist in damage assessment. Restorers shall comply with applicable federal, state, provincial, and local laws and regulations. Regulated materials posing potential or recognized health risks can include, but are not limited to: arsenic, mercury, lead, asbestos, polychlorinated biphenyls (PCBs), pesticides, fuels, solvents, caustic chemicals and radiological residues. For situations involving visible or suspected mold, refer to the current version of ANSI/IICRC S520 *Standard for Professional Mold Remediation*. The presence of any of these substances does not constitute a change in category; but qualified persons shall abate regulated materials, or should remediate mold prior to drying.

#### 10.4.3 Class of Water Intrusion

1  
2 Restorers should estimate the amount of humidity control needed to begin the drying process. A component  
3 of the humidity control requirement is the Class of water.  
4

5 The term “Class of water intrusion” is a classification of the estimated evaporation load and is used when  
6 calculating the initial humidity control (e.g., dehumidification, ventilation). The classification is based on the  
7 approximate amount of wet surface area, and the permeance and porosity of affected materials remaining  
8 within the drying environment at the time drying is initiated. Information needed to determine Class should  
9 be gathered during the inspection process. The Classes are divided into four separate descriptions, Class  
10 1, 2, 3, and 4.  
11

12 **Class 1** — (least amount of water absorption and evaporation load): Water intrusion where wet, porous  
13 materials (e.g., carpet, gypsum board, fiber-fill insulation, concrete masonry unit (CMU), textiles) represent  
14 less than ~5% of the combined floor, wall and ceiling surface area in the space; and where materials  
15 described as low evaporation materials (e.g., plaster, wood, concrete, masonry) or low evaporation  
16 assemblies (e.g., multilayer wallboard, multilayer subfloors, gym floors, or other complex, built-up  
17 assemblies) have absorbed minimal moisture.  
18

19 **Class 2** — (significant amount of water absorption and evaporation load): Water intrusion where wet,  
20 porous materials (e.g., carpet, gypsum board, fiber-fill insulation, concrete masonry unit (CMU), textiles)  
21 represent ~5% to ~40% of the combined floor, wall, and ceiling surface area in the space; and where  
22 materials described as low evaporation materials (e.g., plaster, wood, concrete, masonry) or low  
23 evaporation assemblies (e.g., multilayer wallboard, multilayer subfloors, gym floors, or other complex, built-  
24 up assemblies) have absorbed minimal moisture.  
25

26 **Class 3** — (greatest amount of water absorption and evaporation load): Water intrusion where wet, porous  
27 materials (e.g., carpet, gypsum board, fiber-fill insulation, concrete masonry unit (CMU), textiles) represent  
28 more than ~40% of the combined floor, wall, and ceiling surface area in the space; and where materials  
29 described as low evaporation materials (e.g., plaster, wood, concrete, masonry) or low evaporation  
30 assemblies (e.g., multilayer wallboard, multilayer subfloors, gym floors, or other complex, built-up  
31 assemblies) have absorbed minimal moisture.  
32

33 **Class 4** — (deeply held or bound water): Water intrusion that involves a significant amount of water  
34 absorption into low evaporation materials (e.g., plaster, wood, concrete, masonry) or low evaporation  
35 assemblies (e.g., multilayer wallboard, multilayer subfloors, gym floors, or other complex, built-up  
36 assemblies). Drying may require special methods, longer drying times, or substantial water vapor pressure  
37 differentials.  
38

#### 39 **10.4.4 Other Factors Necessary to Estimate Drying Capacity**

40 Other factors can impact the drying environment. Restorers should understand and consider these factors  
41 when estimating the drying capacity needed to prevent additional damages and begin the drying process.  
42 These factors include:  
43

- 44     ▪ influence of heating, ventilating, and air conditioning (HVAC) systems;
- 45     ▪ build-out density of the affected area;
- 46     ▪ building construction complexity; and
- 47     ▪ influence of outdoor weather.  
48

### 49 **10.5 Initial Contact and Information Gathering**

50  
51 The information gathering process begins with the initial contact between the restorer and the property  
52 owner or authorized agent. In addition to administrative information found in Section 9 *Administrative*  
53 *Procedures, Project Documentation, and Risk Management*, the restorer should gather information to allow



1 for an effective mobilization and response. Inaccurate or incomplete information can impact the ability of  
2 the restorer to take appropriate measures during the initial response. This information can include, but is  
3 not limited to:

- 4
- 5     ▪ structure type and use;
- 6     ▪ source, date, and time of water intrusion;
- 7     ▪ status of water source control;
- 8     ▪ general size of affected areas (e.g., number of rooms, floors);
- 9     ▪ suspect or known contaminants;
- 10    ▪ history of building usage;
- 11    ▪ history of previous water damage;
- 12    ▪ types of materials affected (e.g., flooring, walls, framing);
- 13    ▪ age of structure;
- 14    ▪ changes in structure design; and
- 15    ▪ number of occupants.

16  
17 The restorer can make assumptions using the information above to mobilize a proper response. Once the  
18 restorer arrives at the worksite and performs an initial inspection, these assumptions can change. The  
19 information gathered helps to establish a moisture inspection strategy and evaluate the existence of  
20 moisture problems that have caused or can lead to structural, system, or content damage or contamination.  
21 Contaminants (e.g., fungal or bacterial) can be visible or hidden. Where mold growth is discovered or is  
22 suspected refer to the current version of ANSI/IICRC S520 *Standard for Professional Mold Remediation*.

## 23 24 **10.6 Initial Response, Inspection and Preliminary Determination**

25  
26 During the initial response, the information gathering process should continue with a site walkthrough and  
27 customer and occupant interviews. At a minimum, the restorer should conduct the following activities during  
28 the initial response:

- 29
- 30     ▪ conduct a site specific safety survey;
- 31     ▪ identify customer priorities and concerns;
- 32     ▪ verify the source of water intrusion;
- 33     ▪ identify the extent of the water migration;
- 34     ▪ arrive at a preliminary determination;
- 35     ▪ identify pre-existing damage;
- 36     ▪ identify immediate secondary damage concerns; and
- 37     ▪ establish dry standards and drying goals.

### 38 39 **10.6.1 Safety and Health Hazards**

40  
41 Safety and health hazards shall be documented. As hazards are identified, appropriate actions shall be  
42 implemented to resolve the hazard, or minimize the potential for injury or other safety risks. Actions may  
43 include the involvement of a specialized expert. Refer to Section 8, *Safety and Health*.

### 44 45 **10.6.2 Identify Priorities and Concerns**

46  
47 During the initial inspection, restorers should consider the priorities and concerns of the materially interested  
48 parties. The type of structure, contents affected, building use, occupancy, and the impact associated with  
49 the loss-of-use can significantly influence priorities and concerns. Refer to Section 11, *Limitations,*  
50 *Complexities, Complications and Conflicts*.

### 51 52 **10.6.3 Extent of Water Migration**

1 Restorers should evaluate and document the extent of water migration in structure, systems, and contents,  
2 using the appropriate moisture detection equipment which can include, but is not limited to:

- 3
- 4     ▪ moisture sensors;
- 5     ▪ thermo-hygrometers;
- 6     ▪ invasive and non-invasive (i.e., non-penetrating, non-destructive) moisture meters;
- 7     ▪ infrared thermometer; and
- 8     ▪ thermal imaging cameras.
- 9

10 Since water can flow under walls, and come from above, restorers should inspect adjoining rooms even  
11 when no water is visible on the surface of floor coverings. The amount of surface area to inspect within a  
12 building can make it inefficient to detect moisture using moisture meters alone. Thermal imaging cameras  
13 can be used to show possible water flow patterns in a building in hard to reach places, increasing the  
14 efficiency of documenting affected areas and water migration. Thermal imaging cameras can be useful as  
15 they show apparent surface temperature variations commonly associated with moisture, but should always  
16 be verified by a moisture meter.

#### 17 **10.6.4 Pre-existing Damage**

18 Throughout the inspection process, restorers should inspect for pre-existing damage issues. Pre-existing  
19 damage is the wetting or impairment of the appearance or function of the material from direct or indirect  
20 exposure to water or other conditions not related to the current water intrusion. Examples of pre-existing  
21 damage can include, but are not limited to: dry rot, chronic water leaks, urine contamination, and visible  
22 mold growth. Indications of pre-existing damage can include, but are not limited to:

- 23
- 24
- 25
- 26     ▪ malodors;
- 27     ▪ visible evidence of staining and deterioration; and
- 28     ▪ evidence of damage unrelated to water (e.g., wear, use, lack of maintenance).
- 29

#### 30 **10.6.5 Secondary Damage**

31 Throughout the drying process, restorers should inspect for water-related secondary damage issues.  
32 Secondary damage is defined as the wetting or impairment of the appearance or function of a material from  
33 prolonged indirect exposure to water or indirect exposure to contamination carried by or resulting from the  
34 current water intrusion, which is reversible or permanent. Restorers should inspect for excessive humidity  
35 and elevated moisture level or moisture content in areas adjacent to the affected area.

#### 36 **10.6.6 Dry Standards and Drying Goals**

37 Dry standards are a reasonable approximation of the moisture level or moisture content of materials prior  
38 to a water intrusion. An acceptable method to establish a dry standard is to evaluate the moisture level or  
39 moisture content of similar materials in unaffected areas. When unaffected materials are not present, the  
40 restorer may use a reference from similar structures, experience from similar drying projects, and  
41 knowledge of the geographical area. The dry standards are then used by the restorer to establish  
42 acceptable drying goals.

43 Drying goals are a target moisture level or moisture content of materials established by the restorer that  
44 are based on the dry standards. Individuals establishing drying goals should have a working knowledge of  
45 the instrumentation used and local influences on normal moisture level or moisture content in building  
46 materials.

47 Drying goals may be at, or above the dry standard and should be documented as they relate to specific  
48 materials. The restorer should establish drying goals that would be expected to:

- 49
- 50
- 51
- 52
- 53
- 54
- 55     ▪ inhibit microbial growth; and

- 1           ▪ return materials to an acceptable moisture level or moisture content.  
2

3 It is recommended the drying goal be within 10% of the dry standard. To illustrate this, if the measured dry  
4 standard is a moisture level or moisture content of 10, then the drying goal would be a maximum of 11.  
5

### 6 **10.6.7 Preliminary Determination** 7

8 The “preliminary determination” is the determination of the Category of water. If the preliminary  
9 determination is that the water is Category 1, then the restorer can proceed without contamination controls  
10 (e.g., erecting containment barriers, establishing pressure differentials). With regard to Category 2 or 3  
11 water intrusions, remediation should occur prior to restorative drying and restorers shall use contamination  
12 controls and appropriate worker protection. Where necessary, an indoor environmental professional (IEP)  
13 should be used to assess the levels of contamination. For humidity control in Category 2 or 3 contaminated  
14 structures, refer to Section 12.3.5.  
15

16 In many cases an assessment by an IEP on a water damage restoration project is not necessary. However,  
17 if the inspection shows that one or more of the following elevated risk situations are present, then an IEP  
18 should be retained by one of the materially interested parties. Considerations can include, but are not  
19 limited to:  
20

- 21           ▪ occupants are high risk individuals; (refer to Section 3, *Health Effects from Exposure to Microbial*  
22           *Contamination in Water-Damaged Buildings*);
- 23           ▪ a public health issue exists (e.g., elderly care or childcare facility, public buildings, hospitals);
- 24           ▪ a likelihood of adverse health effects on workers or occupants;
- 25           ▪ occupants express a need to identify a suspected contaminant;
- 26           ▪ contaminants are believed to have been aerosolized; or
- 27           ▪ there is a need to determine that the water actually contains contamination.  
28

29 The preliminary determination prepares the restorer to perform a pre-restoration evaluation.  
30

### 31 **10.6.8 Performing the Initial Moisture Inspection** 32

33 An initial moisture inspection should be conducted to identify the full extent of water intrusion, including the  
34 identification of affected assemblies, building materials, and the edge of water migration. Normally, this  
35 process begins at the source of water intrusion. Water migration can then be traced across and beneath  
36 carpeted surfaces with a moisture sensor. Hard surfaces such as wood flooring, gypsum wallboard,  
37 resilient flooring and plaster should be inspected. This can initially be accomplished using a non-invasive  
38 (i.e., non-penetrating, non-destructive) moisture meter. Thermal imaging cameras can be used to help  
39 identify areas of potential migration followed by appropriate moisture detection instruments, especially on  
40 projects with complex or multiple areas of water intrusion.  
41

42 The initial inspection should continue in all directions from the source of water intrusion until the restorer  
43 identifies and documents the extent of migration. As affected assemblies are discovered, the restorer  
44 should identify and document the building materials that comprise the assembly and the impact of the water  
45 on each material. In some cases, limitations and complexities (refer to Section 11 *Limitations,*  
46 *Complications, Complexities and Conflicts*) can hinder the identification of materials and assemblies.  
47 Identification of building materials within an assembly can be accomplished through several methods (e.g.,  
48 building drawings, existing access openings, inspection holes, partial disassembly, invasive moisture  
49 meters). The extent of moisture migration should be documented using one or more appropriate methods  
50 including at a minimum a moisture map (i.e., a diagram of the structure indicating the areas affected by  
51 migrating water).  
52

53 The initial inspection process should include establishing a dry standard for affected materials. An  
54 acceptable method to establish a dry standard is to evaluate the moisture level or moisture content of similar  
55 materials in unaffected areas. The dry standard should be documented and used to establish a drying goal  
35

1 for salvageable affected materials. Results of the initial moisture inspection should be used to establish a  
2 monitoring method (i.e., the same meter and setting) to be followed for subsequent follow up visits to the  
3 project (i.e., daily). The results of the inspection should be documented (e.g., meter, setting, types of  
4 material).

5  
6 Infrared thermometers measure the average temperature on a spot at the surface of the material. The size  
7 of the sample area is determined by the distance-to-spot ratio. An infrared thermometer can be used to  
8 determine temperature differentials. The surface temperature difference can indicate evaporative cooling  
9 of wet materials. Cooler surfaces do not always indicate evaporative cooling.

10  
11 Restorers should use the appropriate meter or instrument during inspections and follow the manufacturer  
12 instructions. An understanding of meter operation and limitations is critical to accurate measurements.  
13 Restorers should be trained in the proper use and application of the meter in accordance with manufacturer  
14 literature and have an understanding of the intended use, limitations and proper operation of the device.  
15 Restorers using thermal imaging cameras in surveying buildings for moisture damage should be competent  
16 in its use. Areas identified with the camera as suspect for being wet should be verified by further testing  
17 with a moisture meter.

## 18 **10.7 Pre-Restoration Evaluation**

19  
20  
21 Following the preliminary determination, the restorer should conduct a pre-restoration evaluation. Pre-  
22 restoration evaluations establish recommended corrective actions based on information and evidence  
23 collected during the inspection process and conclusions derived from the preliminary determination. The  
24 information gathered from the pre-restoration evaluation is then used to develop the work plan, drying plan,  
25 safety and health plan, and to identify the need for specialized experts that may be required to clean and  
26 dry the structure, building systems, and contents to an acceptable drying goal. Information gathered shall  
27 include safety and health hazards and the approximate age of the building. Factors considered in the pre-  
28 restoration evaluation process can include but are not limited to:

- 29
- 30     ▪ emergency response actions;
- 31     ▪ building materials and assemblies;
- 32     ▪ contents and fixtures;
- 33     ▪ HVAC, plumbing and electrical systems; and
- 34     ▪ below-grade, substructure and unfinished spaces.
- 35

### 36 **10.7.1 Evaluating Emergency Response Actions**

37  
38 Restorers shall identify and manage potential safety and health hazards. During the inspection process,  
39 restorers shall make a reasonable effort to identify potentially hazardous materials that could impact  
40 building occupants or might be disturbed. Whenever occupants or other workers are present during the  
41 initial inspection, restorers should communicate known potential hazards (refer to Section 8, *Safety and*  
42 *Health*). Restorers shall comply with federal, state, provincial, and local laws and regulations regarding the  
43 inspection or handling of hazardous or regulated materials, such as asbestos or lead-based paints.  
44

### 45 **10.7.2 Evaluating Building Materials and Assemblies**

46  
47 Determining the composition of affected materials and assemblies helps establish and implement an  
48 appropriate restoration strategy. The construction, permeability, placement of vapor retarders, number of  
49 layers, degree of saturation, presence of contamination, degree of physical damage, and the presence of  
50 interstitial spaces should be considered when evaluating materials and assemblies.

51  
52 If materials are restorable, the restorer should use appropriate measuring devices to obtain and document  
53 moisture readings, and compare them to the drying goals. All building materials that are likely to be affected,  
54 including multiple layers in a single assembly, should be considered. It is recommended there be an

1 understanding in regards to the responsibility for the services rendered if the attempt to restore a material  
2 or assembly is not successful.

### 3 4 **10.7.3 Evaluating Contents**

5  
6 Determining the material composition of affected contents helps establish a moisture inspection strategy  
7 and implement an appropriate restoration strategy. The construction, permeability, degree of saturation and  
8 the presence of contamination should be considered when evaluating contents. Affected contents should  
9 be evaluated. Refer to Section 14, *Contents Evaluation and Restoration*.

10  
11 If contents are generally unrestorable and a restorer, based upon an agreement with the materially  
12 interested parties, attempts to dry those items, there should be an agreement between the parties about  
13 the responsibility for the services rendered in the event that the attempt is not successful.

### 14 15 **10.7.4 Evaluating HVAC Systems**

16  
17 Determining the material composition of affected HVAC systems helps establish a moisture inspection  
18 strategy and implement an appropriate restoration strategy. The construction, presence of moisture and  
19 contamination should be considered when evaluating HVAC systems. Affected HVAC systems should be  
20 evaluated by a qualified individual. Refer to Section 13, *Heating, Ventilating and Air Conditioning (HVAC)*  
21 *Restoration*.

### 22 23 **10.7.5 Evaluating Below-Grade, Substructure and Unfinished Spaces**

24  
25 Depending on the type of construction, water can collect in below-grade, substructure or unfinished spaces  
26 (e.g., basements, crawlspaces, mechanical chases, and attics). These areas should be evaluated. Below-  
27 grade, substructure and unfinished spaces can present unique challenges and may involve special  
28 evaluation procedures. The inspection and evaluation process shall be conducted according to federal,  
29 state, local, or provincial laws and regulations. Restorers should consult with a specialized expert when  
30 appropriate.

31  
32 Below-grade, substructure and unfinished spaces can contain safety and health hazards. Safety issues for  
33 entrants to consider include, but are not limited to: electrical shock hazards, puncture wounds and bites  
34 from rodents, insects or small animals, oxygen deprived atmospheres, and airborne contaminants. If a  
35 hazardous condition is known or suspected, it should be contained or removed by a qualified individual as  
36 necessary. Entrants should wear appropriate personal protective equipment. Refer to Section 8, *Safety and*  
37 *Health*.

38  
39 A water intrusion can be a single, short duration event; however, the amount of flow into the space can be  
40 significant. The restorer should evaluate the Category of Water, Class of Water Intrusion specific to the  
41 space, size of the affected area, and the composition and moisture content or level of structural materials  
42 (e.g., joists, subflooring).

43  
44 Many below-grade, substructure and unfinished spaces are considered a confined space. Before entering,  
45 accessibility issues for a confined space shall be addressed. Some confined spaces are classified as  
46 “permit-required” spaces. Refer to Section 8, *Safety and Health*.

47  
48 Once safety and health issues have been addressed, the below-grade, substructure and unfinished space  
49 inspection can begin and evaluations can be made. Items that can be useful when inspecting these areas  
50 include a flashlight, safety harness and rope, drop lights with GFCI cords, GFCI extension cords, a  
51 mechanics creeper, thermo-hygrometers, moisture meters, plastic sheeting and drop cloths.

## 52 53 **10.8 Project Work Plans**

1 The information gathered from the pre-restoration evaluation is used to develop work plans. A work plan is  
2 the and management documentation that describes the implementation of a scope of work. Refer to  
3 Section 9, *Administrative Procedures, Project Documentation and Risk Management*. The structural  
4 restoration procedures that follow the development of work plans are discussed in Section 12, *Structural*  
5 *Restoration*, and in Section 14, *Contents Evaluation and Restoration*.

## 6 7 **10.9 Ongoing Inspections and Monitoring**

8  
9 Once the project has been controlled and the correction of the damage has begun, the restorer should  
10 continue gathering information through ongoing inspections and monitoring. The monitoring process can  
11 include, but is not limited to: recording temperature and relative humidity readings and other calculated  
12 psychrometric values, checking the moisture levels or moisture content of materials, and updating progress  
13 reports.

14  
15 Because differences in calibration occur from one instrument meter to another, restorers should use the  
16 same meters throughout a project or establish an in-house method to verify that the meters used are within  
17 a reasonable tolerance of each other (e.g. using a dedicated calibration device, periodic verification of same  
18 make/model meters on a given material or given atmospheric condition). A dedicated calibration device is  
19 a manufacturer approved benchmark meter or calibration block. Restorers should be trained in the proper  
20 use and application of the meter in accordance with manufacturer literature and have an understanding of  
21 the intended use, limitations and proper operation of the device.

22  
23 Restorers should record and monitor relevant moisture measurements daily, preferably at the same time of  
24 day, until drying goals have been achieved and documented. The first of these inspections to monitor and  
25 make adjustments should be performed no later than the day following the initiation of restorative drying.  
26 The frequency of subsequent monitoring should be daily until drying goals have been met, but may be  
27 adjusted by the agreed scope of work, potential for secondary damage, job site accessibility, or by  
28 agreement between the materially interested parties. Such adjustments should be documented.

29  
30 The information gathered during ongoing inspections and monitoring can lead the restorer to adjust the  
31 placement of drying equipment and modify drying capacity. Where progress is not acceptable, the restorers  
32 should take corrective action. The ongoing inspection process can lead to the discovery of a complication.  
33 As complications arise, restorers should document the nature of the complication, the impact on the  
34 restoration process and scope, and communicate with materially interested parties. Refer to Section 11,  
35 *Limitations, Complexities, Complexities and Conflicts*. Restorers should continue the drying process until  
36 drying goals have been achieved and documented. Refer to Section 12, *Structural Restoration*.

## 37 38 39 40 **11 Limitations, Complexities, Complications and Conflicts**

### 41 42 **11.1 Introduction**

43  
44 Restorers can be faced with project conditions that present challenges. These challenges can produce  
45 limitations, complexities, complications or conflicts. Restorers should have an understanding of these  
46 issues and communicate them to appropriate parties. The following is a definition of each of these  
47 challenges.

48  
49 Before beginning non-emergency work, known or anticipated limitations and complexities, and their  
50 consequences, should be understood, discussed, and approved in writing by the restorer and the owner or  
51 owner's agent. The following is a discussion of each of these challenges.

### 52 53 **11.2 Limitations**

1 Limitations are restrictions placed upon the restorer by another party that results in a limit on the scope of  
2 work, the work plan or the outcomes that are expected, and can include but are not limited to one or more  
3 of the following:

- 4
- 5     ▪ the source of the water intrusion has not been corrected;
- 6     ▪ funds are limited;
- 7     ▪ the appropriate use of containment is not allowed on contaminated water losses;
- 8     ▪ the restorer is told to extract Category 3 water but not remove and discard contaminated porous  
9       material (e.g., carpet, gypsum board, fiber-fill insulation, CMU, textiles); and
- 10    ▪ the restorer is told to return contaminated contents without returning them to a sanitary condition.

11

12 Only the owner or owner’s agent, not the restorer or others, can impose limitations on the performance of  
13 a project. If an attempt to impose a limitation is initiated by any other materially interested party, the owner  
14 or owner’s agent should be advised and provide approval before the limitation takes effect. Limitations that  
15 allow for services to be rendered in compliance with this standard should be clearly defined in writing.  
16 Limitations placed on any project that are inconsistent with this standard can result in a conflict.

### 17

### 18 **11.3 Complexities**

19

20 Complexities are conditions causing a project to become more difficult or detailed, but do not prevent work  
21 from being performed adequately, and can include but are not limited to one or more of the following:

- 22
- 23     ▪ inconvenient or limited space or path for entry and exit serving the work area or building;
- 24     ▪ the restoration occurs after business hours or within a specified time period;
- 25     ▪ work needs to proceed during adverse weather;
- 26     ▪ the restoration includes a permit required confined space;
- 27     ▪ the business will be in operation or the space requiring work will be occupied during restoration;
- 28     ▪ access to the restoration area is desired by occupants;
- 29     ▪ a lack of available storage space for equipment, supplies, and debris;
- 30     ▪ a project site location is complicated due to building-specific uses (e.g., a clean room, intensive  
31       care unit or immunocompromised patient ward in a hospital); and
- 32     ▪ an imposed timeline for completion.

### 33

### 34 **11.4 Complications**

35

36 Complications are conditions that arise after the start of work causing or necessitating a change in the  
37 scope of work or work plan, and can include but are not limited to one or more of the following:

- 38
- 39     ▪ mold is found requiring an expanded scope of work (refer to current edition of ANSI/IICRC S520  
40       *Standard for Professional Mold Remediation*);
- 41     ▪ unexpected changes occur in weather conditions;
- 42     ▪ there are unanticipated delays;
- 43     ▪ the client needs the restoration work completed sooner than originally planned;
- 44     ▪ additional water loss, burglary, fire or other disaster occurs while the restorer has possession of  
45       the building or area to be restored; and
- 46     ▪ hazardous or regulated materials are discovered after work has begun.

47

48 The owner or owner’s agent should be notified in writing as soon as practical regarding any  
49 complications that develop. The presence of project complications can necessitate a written change order.

### 50

### 51 **11.5 Conflicts**

52

53 Limitations, complexities or complications that result in a disagreement between the parties involved about  
54 how the restoration project is to be performed are called conflicts. When limitations, complexities or

1 complications develop or are placed on the project by the owner or owner's agent, which prevent  
2 compliance with this standard, restorers can choose to negotiate an acceptable agreement, decline the  
3 project, stop work, or accept the project with appropriate releases and disclaimers. Conflict resolution  
4 should be documented. For further information refer to *Section 9: Administrative Procedures, Project*  
5 *Documentation and Risk Management*.

## 6 7 **11.6 Related Issues**

8  
9 The presence of limitations, complexities, complications, and conflicts on a water damage restoration  
10 project can create additional consequences and ramifications. These related issues include the potential  
11 for work stoppages, insurance coverage questions, and the need for change orders.

### 12 13 **11.6.1 Hazardous or Regulated Materials**

14  
15 The presence of a hazardous or regulated material on a project site can present a limitation, complexity or  
16 complication. The presence or potential presence of a hazardous or regulated material on a project site  
17 shall be carefully evaluated to determine if the restorer and its employees are qualified to work in that  
18 environment. Some hazardous or regulated materials require hazmat training; others require more specific  
19 training and licensing or may necessitate engaging a qualified specialized expert.

### 20 21 **11.6.2 Insurance**

22  
23 Restorers should be aware that the terms and conditions of their insurance coverage can create project  
24 limitations and complications. The extent of applicable insurance coverage, as further prescribed by the  
25 insurance exclusions in the policy, can exclude certain work activities from the insurance coverage (e.g.,  
26 regulated, hazardous materials, mold). If the applicable insurance does not cover the work anticipated at  
27 commencement of the project, a limitation can result. If a complication develops or is discovered after  
28 commencement of the work plan, it is possible that resultant changes in the scope of work might not be  
29 covered by the insurance policy of the restorer. Providing restoration services without insurance, or  
30 providing such services that exceed the scope of existing insurance coverage, can potentially expose the  
31 restorer or other materially interested parties to risk. In some jurisdictions, restorers are required to maintain  
32 insurance coverage as a condition of performing restoration services. Restorers shall determine whether  
33 or not insurance coverage is required for their operations.

### 34 35 **11.6.3 Change Orders**

36  
37 Contractual disputes can develop if contract additions or modifications are made during performance of the  
38 work, and not adequately documented. In order to protect all parties to a restoration contract, substantive  
39 changes in the scope of work, time frame, price or method of payment, or other material provision of a  
40 contract should be documented in a written change order that details the changes. The change order  
41 should be dated and signed by all parties to the contract, and each party should be given a copy of the  
42 change order as soon as reasonably practical.

### 43 44 **11.6.4 Work Stoppage**

45  
46 In some situations, limitations, complexities, complications or conflicts can necessitate work stoppage. In  
47 the event an illegal or unreasonably dangerous limitation, complexity or complication exists, occurs or is  
48 discovered on a restoration project, the condition shall be resolved, or the project shall be refused, or the  
49 work shall be stopped.

50  
51 Restorers shall avoid any situation that results in an activity that is illegal or is likely to result in injury or  
52 adverse safety or health consequences for workers. Restorers should avoid any situation that results in an  
53 activity that is likely to result in injury or adverse safety or health consequences for occupants.

54



1 The reason for a work stoppage and the significant events leading to such a decision should be  
2 documented. It is recommended that a qualified attorney review a work stoppage decision.  
3  
4  
5

## 6 **12 Structural Restoration**

### 7 **12.1 Introduction**

8  
9  
10 The purpose of this section is to provide procedural guidance and assist restorers in applying principles of  
11 water damage restoration. The five principles are: provide for the safety and health of workers and  
12 occupants, document and inspect the project, mitigate further damage, clean and dry affected areas, and  
13 complete the restoration and repairs. This section is divided into three parts:  
14

- 15 ■ Initial Inspection and Planning Procedures;
- 16 ■ Remediation Procedures for Category 2 or 3;
- 17 ■ Initial Procedures for Category 1;
- 18 ■ Drying; and
- 19 ■ Completion of the Restoration Process

20  
21 If the preliminary determination is that the water is Category 1, then the restorer can proceed without  
22 contamination controls (e.g., erecting containment barriers, establishing pressure differentials). With regard  
23 to Category 2 or 3 water intrusions, remediation should occur prior to restorative drying. For humidity control  
24 in Category 2 or 3 contaminated structures, refer to Section 12.3.5.  
25

### 26 **12.2 Initial Inspection and Planning Procedures**

#### 27 **12.2.1 Rapid Response**

28  
29 Mitigation procedures should begin as soon as safely possible following the initial moisture intrusion. If  
30 building materials and structural assemblies are exposed to water and water vapor for extended periods,  
31 moisture penetrates into them more deeply. The more water they absorb, the more time, effort and expense  
32 is required to dry them.  
33  
34

35 With extended exposure to moisture, some materials undergo permanent damage that could have been  
36 partially or completely prevented with a more rapid response. In addition, in most environments the  
37 extended presence of water or excessive humidity can lead to microbial (e.g., bacteria and mold)  
38 amplification that can cause general deterioration of environmental conditions over time, potentially leading  
39 to significant health and safety hazards for workers and occupants.  
40

#### 41 **12.2.2 Administration and Job Coordination**

42  
43 It is recommended that job coordination takes place at or near the start of the water restoration project,  
44 though due to the time-critical nature of many emergency services, some aspects may be delayed until  
45 mitigation services are underway and additional information has been gathered. Refer to Section 9  
46 *Administrative Procedures, Project Documentation and Risk Management*.  
47

48 Restorers should execute a valid contract before beginning mitigation procedures and obtain informed  
49 consent for antimicrobial (biocide) application, if used.  
50

51 Detailed inspections should be conducted to identify the Category of water, the Class of water or extent of  
52 wetting, the types and quantities of affected materials, and apparent and potential damage. The information  
53 obtained should then be used to develop a preliminary determination, pre-restoration evaluation, scope of  
54 work and work plan. Thorough project documentation and recordkeeping are important while developing

1 the scope of work and the execution and completion of the work plan. The restorer should develop a drying  
2 plan. It is recommended that the components of the drying plan include, but are not limited to:

- 3
- 4     ▪ Target drying conditions (e.g., humidity levels, atmospheric and material temperatures, air velocity,  
5       vapor pressure differentials);
- 6     ▪ Type of drying system (open, closed, combination);
- 7     ▪ Environmental controls to be installed (e.g., equipment, containment barriers) and reasons initial  
8       sizing and subsequent adjustments (e.g., prevailing weather, build out density, building envelope);
- 9     ▪ Materials, assemblies, contents and systems the drying plan is intended to address;
- 10    ▪ Materials or assemblies requiring individual attention (i.e., Class 4);
- 11    ▪ Whether the HVAC system will be utilized as a resource; and
- 12    ▪ Concerns for potential secondary damage.
- 13
- 14

### 15 **12.2.3 Inspection**

16 Restorers should be qualified by education, training and experience to appropriately execute the skills and  
17 expertise required to safely perform the restoration of structure and contents. The restorer or another  
18 qualified individual should gather information, conduct an inspection, make a preliminary determination,  
19 communicate to materially interested parties, provide initial restoration procedures, and know when to  
20 involve specialized experts who can assist in decision-making and the performance of tasks. Specialized  
21 experts may include the use of an IEP to perform an assessment as a part of the pre-restoration or pre-  
22 remediation evaluation when elevated risk factors are present. When appropriate, the response can include  
23 implementing emergency response actions. Refer to Section 10, *Inspections, Preliminary Determination,*  
24 *and Pre-Restoration Evaluations.*

### 26 **12.2.4 Health and Safety Considerations**

27 Potential safety and health hazards shall be identified and, to the extent possible, eliminated or managed  
28 before implementing restoration procedures. Before entering a structure, the building's structural integrity,  
29 and the potential for electrical shock hazards and gas leaks shall be evaluated. Such evaluation or  
30 assessment may require a specialized expert (e.g., electrician, structural engineer). Customers should be  
31 warned of imminent hazards that are discovered. When hazards or potential hazards are discovered,  
32 appropriate steps, such as posting warning signs, shall be taken to inform workers and occupants. Refer  
33 to Section 8, *Safety and Health.*

### 34 **12.2.5 Examining Water Source**

35 Before restoration begins, the source or sources of moisture intrusion should be located and eliminated,  
36 repaired or contained to the extent practical. In some cases, it may be appropriate to mitigate the spread  
37 of damage by starting procedures (e.g., humidity control, extraction(s)) that prevent further water migration,  
38 even before the source is found and contained or repaired. Refer to Section 1, *Principles of Water Damage*  
39 *Restoration.*

### 40 **12.2.6 Determining the Category of water**

41 The categories of water, as defined by this document in Section 10.4.1, refer to the range of contamination  
42 in water, considering both its originating source and its quality after it contacts materials present on the job  
43 site. Time and temperature can affect or retard the amplification of contaminants, thereby affecting its  
44 category. Restorers should consider potential contamination, defined as the presence of undesired  
45 substances; the identity, location and quantity of which are not reflective of a normal indoor environment;  
46 and can produce adverse health effects, cause damage to structure and contents, or adversely affect the  
47 operation or function of building systems.

### 12.2.7 Determining the Class of Water Intrusion

Restorers should estimate the amount of humidity control needed to begin the project. The term “Class of water” as defined in Section 10.4.3 is a classification of the estimated evaporation load and is used when calculating the initial humidity control (e.g., dehumidification, ventilation). It is based on the approximate amount of wet surface area, and the permeance and porosity of the affected materials left within the drying environment at the time drying is initiated. Initial information to determine Class should be gathered during the inspection process. The Classes are divided into four separate descriptions: Class 1, 2, 3, and 4. The determination of class may be dependent upon the restorability of wet materials and access to wet substrates. Depending upon the project, this determination may occur at a different point of the initial restoration procedures.

### 12.2.8 Evaluating for Restorability

Information obtained from the preliminary determination and during the inspection should be used to evaluate the restorability of materials on the project. Based on this evaluation, a work plan can be developed to address the affected materials and protect the unaffected materials.

### 12.2.9 Contents

Steps should be taken as quickly as practical to minimize damage to contents. This includes, but is not limited to protecting contents from moisture absorption, which can result in stain release, discoloration of finish, splitting of wood components in direct contact with wet surfaces (legs, bases), staining, rusting, ringing or other forms of moisture damage. If contents restrict access to walls, ceilings or other areas, the restorer should manipulate them (e.g., move, relocate, discard).

**Note:** For Category 1 procedures, proceed to Section 12.4 *Initial Procedures for Category 1*.

## 12.3 Remediation Procedures for Category 2 or 3

Remediation should occur prior to restorative drying. Restorers should consider potential contamination, defined as the presence of undesired substances; the identity, location, and quantity of which are not reflective of a normal indoor environment; and can produce adverse health effects, cause damage to structure and contents, or adversely affect the operation or function of building systems (refer to Section 10, *Inspections, Preliminary Determination and Pre-Restoration Evaluations*). Contaminated environments can result from:

- Category 2 or 3 water;
- Condition 2 or 3 mold contamination;
- Trauma or crime scene; or
- Hazardous or Regulated Materials.

An environment can be contaminated as a result of pre-existing damage. The remediation procedures should not vary regardless of whether contaminants are the result of water intrusion or pre-existing damage. Restorers shall inspect the structure for the presence and location of contaminants as part of their site safety survey. Restorers shall develop a safety plan outlining how workers will be protected against hazards. Restorers should take appropriate steps to disclose known or suspected contaminants to other materially interested parties, and recommend appropriate precautions.

Where the following elevated risk factors are present on a Category 2 or 3 remediation project, an IEP should be retained by one of the materially interested parties. Risk factors include, but are not limited to:

- occupants are high risk individuals; (refer to Section 3, *Health Effects from Indoor Exposure to Microbial Contamination in Water-Damaged Buildings*);
- a public health issue exists (e.g., elderly care or childcare facility, public buildings, hospitals);

- 1       ▪ a likelihood of adverse health effects on workers or occupants;
- 2       ▪ occupants express a need to identify a suspected contaminant;
- 3       ▪ contaminants are believed to have been aerosolized; or
- 4       ▪ there is a need to determine that the water actually contains contamination.

5 If a pre-restoration or pre-remediation assessment is needed, then an independent specialized expert who  
6 meets the description of indoor environmental professional (IEP) should be used to conduct pre-remediation  
7 and post-remediation verification as needed. Indoor environmental professional skills include performing  
8 an assessment of contaminated property, systems, and contents; creating a sampling strategy; sampling  
9 the indoor environment; maintaining a chain of custody; interpreting laboratory data; and, if requested,  
10 confirming Category 1, 2, or 3 water for the purpose of establishing a scope of work and verifying the return  
11 of the environment to an acceptable or otherwise non-contaminated status. If mold is present or suspected,  
12 then refer to the current edition of ANSI/IICRC S520 Standard for Professional Mold Remediation.

### 13 **12.3.1 Restorer, Occupant Protection**

14  
15 Before entering structures that are known or suspected to be contaminated, either for inspections or  
16 restoration activities, restorers shall be equipped with appropriate personal protective equipment (PPE) for  
17 the situation encountered. Restorers can make recommendations regarding personal protection to persons  
18 entering structures, as appropriate. Restorers should refer occupants with questions regarding health  
19 issues to qualified medical professionals for advice.

### 21 **12.3.2 Engineering Controls: Containment and Managed Airflow**

22  
23 Restorers should prevent the spread of contaminants into areas known or believed to be uncontaminated.  
24 The procedures in this subsection (12.3.2) may be scaled back as appropriate for less contaminated  
25 environments. Contaminants can be spread in many ways:

- 27       ▪ solid and liquid contaminants can be: tracked on feet, spread on wheels or bases of equipment,  
28       carried on contents, bulk materials, or debris during manipulation or removal; and
- 29       ▪ airborne contaminants can be spread by natural circulation, an installed mechanical system, or by  
30       using air moving equipment. When drawing moist air out of potentially contaminated cavities using  
31       negative pressure, an in-line HEPA filter should be used to remove contamination before  
32       exhausting the air into the room.

33  
34 In grossly contaminated environments, restorers shall implement procedures to minimize the spread of  
35 contaminants. This can be accomplished by isolating contaminated areas, erecting containment, and  
36 employing appropriate work practices.

37  
38 The most effective way to ensure that gaseous and aerosolized contaminants do not spread is to isolate  
39 work areas by establishing critical barriers or by erecting containment (plastic sheeting) and maintaining  
40 adequate negative air pressure within contained work areas while maintaining a minimum of 4 air changes  
41 per hour (ACH). The primary purpose of this level of ventilation is to prevent buildup of excessive  
42 aerosolized contaminants by continuously diluting them with uncontaminated makeup air. Additionally,  
43 negative pressure of .02" w.g. (5 pascals) is normally considered adequate to prevent the escape of  
44 contaminants. The amount of negative pressure is a function of restriction on incoming air in relation to the  
45 volume of air exhausted, so it is usually necessary to erect isolation or containment barriers to maintain  
46 appropriate negative pressure.

47  
48 For details on the setup and maintenance of containment and airflow management, restorers should refer  
49 to the current edition of the ANSI/IICRC S520 *Standard for Professional Mold Remediation*. The principles  
50 of containment found therein, although specifically addressing mold contamination, are generally applicable  
51 to environments in which aerosolizing of other types of contaminants is likely.

52

1 AFDs used in contaminated areas should be sealed at the air intake side upon turning off to avoid releasing  
2 contaminants. Filters should be replaced as necessary following manufacturer's guidelines to maintain  
3 performance efficiency. Restorers should ensure that contaminated equipment is cleaned and  
4 decontaminated, or contained prior to moving through unaffected areas, transported, or used on  
5 subsequent jobs.

### 6 7 **12.3.3 Bulk Material Removal and Water Extraction**

8 Bulk contamination (e.g., solid waste, silt, debris) should be removed to expose structural surfaces or  
9 assemblies for further inspection and evaluation, prior to demolition or detailed cleaning. When extracting  
10 contaminated water or vacuuming contaminated dry material, restorers should take appropriate steps to  
11 prevent contaminants from becoming aerosolized in work areas or other parts of a building by using HEPA  
12 vacuum systems or directing a vacuum's exhaust to unoccupied areas of the building's exterior.

13  
14 Tools and equipment should be cleaned and decontaminated, or contained on the job site before being  
15 loaded for transport away from the site. Wastewater shall be handled, transported and disposed of in  
16 accordance with all local, state, provincial, or federal laws and regulations. Normally, this means disposal  
17 into a sanitary sewer system or, especially where HAZMAT is involved, at an appropriately licensed disposal  
18 facility.

### 19 20 **12.3.4 Pre-remediation Evaluation and Assessment**

21 Following the bulk removal of contaminants and water extraction, restorers should evaluate remaining  
22 materials and assemblies as specified in Section 10, *Inspections, Preliminary Determinations, and Pre-*  
23 *restoration Evaluations*. Further assessment may be necessary. When necessary, the assessment should  
24 be performed by an indoor environmental professional (IEP) or other specialized expert as dictated by the  
25 situation.

### 26 27 **12.3.5 Humidity Control in Contaminated Structures**

28  
29 The priority for restorers is to complete remediation activities before restorative drying. However, the  
30 restorer should control the humidity in contaminated buildings to minimize moisture migration, potential  
31 secondary damage, and microbial amplification. Restorers should maintain negative pressure in relation to  
32 uncontaminated areas. Maintaining negative pressure in an affected area can increase the dehumidification  
33 capacity needed to maintain desired psychrometric conditions. This may be implemented before, during, or  
34 after decontamination. Restorers should limit the velocity of airflow across surfaces to limit aerosolization  
35 of contaminants. Restorers should complete the drying process after the decontamination has been  
36 completed.

37  
38 When using mechanical dehumidification equipment, restorers should establish an initial dehumidification  
39 capacity to establish humidity control for the anticipated evaporation load. The required capacity may be  
40 modified at any point after setup based on psychrometric readings. The restorer should document factors  
41 considered to determine the initial dehumidification capacity. Considerations may include but are not limited  
42 to:

- 43
- 44     ▪ installation of airmovers;
- 45     ▪ types of building materials, assembly and build-out characteristics;
- 46     ▪ class and size of the affected area;
- 47     ▪ prevailing weather conditions;
- 48     ▪ power available on the project; and
- 49     ▪ type and size of drying equipment available.

50  
51 Two examples of calculation methods to determine initial dehumidification capacity can be found in the  
52 appendix. After the initial installation, appropriate adjustments (e.g., increase, decrease, reposition) in  
53 dehumidification equipment capacity should be made based on psychrometric readings. The restorer  
54 should consider other factors that may require adjustments which can include but are not limited to:

- 1
- 2     ▪ an imposed deadline;
- 3     ▪ power is known to be less than adequate to serve the indicated inventory of equipment;
- 4     ▪ the building will be occupied during the drying process; potentially causing equipment cut-off;
- 5     frequent opening of doors, higher moisture load;
- 6     ▪ changes in expected weather;
- 7     ▪ an unusual schedule within which the restorer must work (e.g., retail store that wants to remain
- 8     open each day); and
- 9     ▪ required pressure differential to achieve contaminant control.

### 12.3.6 Demolition and Controlled Removal of Unsalvageable Components or Assemblies

14 During demolition, contaminants can be easily dislodged or aerosolized. Restorers should minimize dust  
15 generation and aerosolization by using appropriate engineering controls. Refer to the current version of  
16 the ANSI/IICRC S520 Standard for Professional Mold Remediation.

18 The cutting depth of saw blades should be set so that they do not penetrate past wallboard materials. This  
19 can avoid possible damage of plumbing, electrical or other components within the cavity. Wet or  
20 contaminated insulation should be removed carefully and bagged immediately, preferably in 6-mil  
21 disposable polyethylene bags. A razor knife or utility knife is recommended for cutting rather than tearing  
22 or breaking it into pieces.

24 Contaminated materials should be double-bagged if they are going to pass through uncontaminated areas  
25 of the building. Sharp items capable of puncturing polyethylene material should be packaged before being  
26 bagged or wrapped in a manner that prevents them from penetrating packaging material.

### 12.3.7 Pockets of Saturation

30 Restorers should open assemblies (e.g., walls, stairs, flooring, wall base areas, voids, built-ins) to access  
31 pockets of saturation and remove unsalvageable, contaminated materials and components. Exposed  
32 materials that remain in place should be cleaned and decontaminated, as appropriate.

### 12.3.8 HVAC System Components

36 Restorers should plan for component cleaning, using a specialized HVAC contractor as appropriate,  
37 followed by system reinstallation after structural restoration and remediation has been completed.  
38 Restorers should consult specialized experts when HVAC system removal, restoration, or replacement is  
39 complex or outside their area of expertise. Refer to Section 13, *Heating, Ventilation and Air Conditioning*  
40 *Restoration* and the current version of the *ANSI/IICRC S520 Standard for Professional Mold Remediation*.

### 12.3.9 Cleaning and Decontaminating Salvageable Components

44 Decontamination should be accomplished to the extent possible by cleaning. Restorers should employ  
45 cleaning methods that minimize aerosolizing contaminants while maximizing complete removal. However,  
46 low pressure washing to flush contaminants from salvageable components may be appropriate.  
47 Wastewater from cleaning processes should be collected and properly disposed. It is recommended that  
48 when decontamination cannot be practically completed by cleaning alone, that appropriate antimicrobial  
49 (biocide) or mechanical means be employed. Refer to the current version of the *ANSI/IICRC S520*  
50 *Standard for Professional Mold Remediation*.

### 12.3.10 Antimicrobial (biocide) Application

#### 12.3.10.1 Antimicrobial (biocide) Risk Management

1  
2 Restorers who use antimicrobials (biocides) shall be trained in their safe and effective use. Safety data  
3 sheets (SDS) for chemicals used during a water restoration project shall be maintained on the job site and  
4 made available to materially interested parties upon request. Restorers should obtain a written informed  
5 consent from the customer before they are applied, and occupants should be evacuated prior to application.  
6 Restorers shall follow label directions and comply with federal, state, provincial, and local regulations.

#### 7 8 **12.3.10.2 Customer “Right to Know” when using Antimicrobials (biocides)**

9  
10 Restorers should brief customers before antimicrobials (biocides) are applied. This can include providing  
11 customers with the product information label and obtaining informed consent of product use in writing. If a  
12 customer requests the product label or safety data, the restorers shall provide it. Written documentation  
13 should be maintained for each antimicrobial (biocide) application (e.g., type, application method, time,  
14 quantity, and location).

#### 15 16 **12.3.10.3 Biocide Use, Safety and Liability Considerations**

17  
18 Antimicrobials (biocides) can harm humans, pets and wildlife if used improperly. When using antimicrobials  
19 (biocides) in water damage restoration activities for efficacy, safety, and legal liability reasons, restorers  
20 shall follow label directions carefully and explicitly. In some countries, such as the United States, it is a  
21 violation of law to use these products in a manner inconsistent with the label. In order to minimize potential  
22 liability, restorers shall comply with applicable training, safety, use, and licensing requirements in their  
23 respective jurisdictions, and apply and dispose of products/container strictly in accordance with label  
24 directions.

25  
26 In addition, restorers should:

- 27  
28
- 29     ▪ Discuss potential risks and benefits with the customer, make available product information including  
30     the label and the SDS, and obtain a written informed consent with the customer’s signature before  
31     applying any antimicrobial (biocide).
  - 32     ▪ Inquire about any pre-existing health conditions that might require special precautions.
  - 33     ▪ Advise customers to remove occupants and animals from the product application site, particularly  
34     children and those with compromised health.
  - 35     ▪ When antimicrobials (biocides) are used, document all relevant biocide application details.
  - 36     ▪ Refrain from making statements or representations to the customer beyond those stated on the  
37     product label or in the efficacy claims made by the product and approved by the applicable  
38     governmental agency.
  - 39     ▪ Ask questions when in doubt. Consult the appropriate federal, state, provincial, or local  
40     governmental agency. In the United States, the Antimicrobial Division within the Office of Pesticide  
41     Programs of the USEPA, the respective state agricultural department, or other state agency with  
42     pesticide jurisdiction, should be consulted when there is a question about a specific antimicrobial  
43     (biocide) product, or its use and regulation.
  - 44     ▪ Apply products that have been tested and registered by appropriate governmental agencies.
- 45

#### 46 **12.3.10.4 Post Remediation Evaluation and Verification**

47  
48 At the completion of the remediation process of Category 2 or 3 projects, a post remediation evaluation  
49 should be conducted. The post remediation evaluation should include, at a minimum, a determination that  
50 all surfaces are visibly free of dust and debris and that malodors have been eliminated. The evaluation can  
51 be performed by a competent restoration professional, however where any of the elevated risk factors in  
52 the following list are present, it is recommended that an independent IEP conduct a post-remediation  
53 verification:  
54

- 1       ▪ occupants are high risk individuals; (refer to Section 3, *Health Effects from Indoor Exposure to*
- 2        *Microbial Contamination in Water-Damaged Buildings*);
- 3       ▪ a public health issue exists (e.g., elderly care or childcare facility, public buildings, hospitals);
- 4       ▪ a likelihood of adverse health effects on workers or occupants;
- 5       ▪ occupants express a need to identify a suspected contaminant;
- 6       ▪ contaminants are believed to have been aerosolized; or
- 7       ▪ there is a need to determine that the water actually contains contamination.

8  
9 Where the following elevated risk factors are present on a Category 3 project, an IEP should be retained  
10 by one of the materially interested parties:

- 11       ▪ occupants are high risk individuals; (refer to Section 3, *Health Effects from Indoor Exposure to*
- 12        *Microbial Contamination in Water-Damaged Buildings*); or
- 13       ▪ a public health issue exists (e.g., elderly care or childcare facility, public buildings, hospitals);

## 14       12.4 Initial Procedures for Category 1

### 15       12.4.1 Controlling Spread of Water

16  
17  
18 Excess water should be absorbed, drained, pumped or vacuum-extracted. Excess water removal may be  
19 required on multiple levels, in basements, crawlspaces, stairwells, interstitial spaces, HVAC systems, utility  
20 chases, or elevator shafts. Restorers should initially remove as much liquid water as is reasonably possible  
21 before any evaporative drying procedures are initiated. Repeatedly extracting materials and components  
22 may be required as water seeps out of inaccessible areas, especially in multi-story water restoration  
23 projects.

### 24       12.4.2 Controlling Humidity and Stabilization (Initial Humidity Control)

25  
26  
27 Humidity and temperatures within the structure should be controlled as soon as practical to minimize  
28 moisture migration, potential secondary damage and microbial amplification. While an increase in the  
29 humidity can occur at the beginning of a project, if it persists it can indicate an adjustment is necessary  
30 (e.g., additional ventilation, dehumidification equipment). Ventilating the structure during the initial stages  
31 of processing may be an effective way to reduce the build-up of excess humidity. If conditions are not  
32 suitable for using exterior air to control humidity, dehumidification equipment can be used; when  
33 dehumidification equipment is used in this way, it is recommended that equipment with sufficient  
34 performance and capacity be installed as soon as appropriate after arrival.

35  
36  
37 When using mechanical dehumidification equipment, restorers should establish an initial dehumidification  
38 capacity to establish humidity control for the anticipated evaporation load. The required capacity may be  
39 modified at any point after setup based on psychrometric readings. The restorer should document factors  
40 considered to determine the initial dehumidification capacity. Considerations may include but are not limited  
41 to:

- 42       ▪ installation of airmovers;
- 43       ▪ types of building materials, assembly and build-out characteristics;
- 44       ▪ class and size of the affected area;
- 45       ▪ prevailing weather conditions;
- 46       ▪ power available on the project; and
- 47       ▪ type and size of drying equipment available.

48  
49  
50 Two examples of calculation methods to determine initial dehumidification capacity can be found in the  
51 appendix. After the initial installation, appropriate adjustments (e.g., increase, decrease, reposition) in  
52 dehumidification equipment capacity should be made based on psychrometric readings. The restorer  
53 should consider other factors that may require adjustments which can include but are not limited to:  
54



- 1
- 2     ▪ an imposed deadline;
- 3     ▪ power is known to be less than adequate to serve the indicated inventory of equipment;
- 4     ▪ the building will be occupied during the drying process; potentially causing equipment cut-off;
- 5     frequent opening of doors, higher moisture load;
- 6     ▪ changes in expected weather;
- 7     ▪ an unusual schedule within which the restorer must work (e.g., retail store that wants to remain
- 8     open each day); and
- 9     ▪ required pressure differential to achieve contaminant control.

#### 10 **12.4.3 Controlled Demolition, as Necessary, to Accelerate Drying**

11 It is recommended that consideration be given to whether demolishing and removing structural materials is  
12 appropriate in setting up the drying system. Materials that are deemed unrestorable or that pose a safety  
13 hazard should be removed as soon as practical.

14 Controlled demolition should be done safely and removed materials should be disposed of properly. In  
15 some jurisdictions, firms performing demolition or other work practices may require licensing. If lead or  
16 asbestos-containing material (ACM) or presumed asbestos-containing material (PACM) are encountered,  
17 restorers shall comply with federal, state, provincial, and local laws and regulations regarding material  
18 inspection, handling, and disposal. Refer to Section 8, *Safety and Health*.

#### 19 **12.4.4 Final Extraction Process**

20 Multiple extractions of salvageable materials often are required to decrease drying time, especially for  
21 porous materials, such as carpet and cushion. Excess water that may have been inaccessible during the  
22 initial extraction process often seeps out of systems or assemblies into locations or materials where it can  
23 be extracted later.

24 Extracted water shall be disposed of in accordance with applicable laws and regulations. Normally this  
25 means disposal into a sanitary sewer system or, especially where HAZMAT may be involved, at an  
26 appropriately licensed disposal facility.

#### 27 **12.4.5 Initial Cleaning, Category 1 Water**

28 After controlled demolition and extraction of water have been completed, but prior to implementing the  
29 restorative drying effort (e.g., rapid air movement), restorers should clean materials and surfaces (e.g.,  
30 carpet, hard surface floors, exposed subfloors) to reduce the amount of soil or particulates that can become  
31 aerosolized. Restorers should employ cleaning methods that minimize aerosolizing particulates.

32 The drying process inherently tends to aerosolize soil and particulate present in the environment. As water  
33 evaporates from surfaces and materials such as carpet, more particles often become aerosolized, creating  
34 possible health, safety, comfort and cleanliness issues. Where cleaning cannot sufficiently remove soil or  
35 particulates, or there are high-risk occupants, restorers can install one or more air filtration devices (AFDs).

#### 36 **12.5 Drying (Post Cleaning Category 1, Post Remediation Category 2 and 3)**

37 After completing the initial procedures for category 1, or decontamination process for category 2 and 3,  
38 Restorers should implement the drying plan to control airflow (i.e., volume, velocity), humidity (i.e.,  
39 dehumidification, ventilation) and temperature (i.e., vapor pressure differential) to work towards the drying  
40 goals. These conditions should be managed throughout the drying process.

41 During the drying of any material, two processes occur simultaneously, (1) evaporation of moisture at the  
42 surface, and (2) migration of moisture within the material toward the surface as a liquid, vapor or both.  
43 These two processes occur at different rates depending on the phase of the moisture movement (i.e. liquid

1 or vapor), the physical properties of the material (i.e., porosity, permeability, composition), the vapor  
2 pressure differential across the material, and its internal moisture gradient. Both of these processes  
3 continue throughout the drying period, and either can have an impact on the rate at which the other occurs.  
4

5 The rate of drying also occurs in three distinct but continuous stages: a constant drying rate stage followed  
6 by two falling drying rate stages. One of the most important factors influencing surface evaporation,  
7 especially during the constant drying rate stage, is airflow velocity. Generally, continuous rapid airflow is  
8 needed to enhance evaporation of the wet surfaces.  
9

10 A review of research in the wood industry has shown that airflow velocities across the material surfaces of  
11 600 feet per minute (FPM) or greater is generally adequate during this stage. As drying of the materials  
12 progresses into the falling rate stage, the velocity of airflow has a diminishing return as the water available  
13 for evaporation at the surface reduces.  
14

15 During the falling drying rate stages, research suggests that airflow velocities across the material surfaces  
16 of ~150 feet per minute (FPM) is generally adequate. This reduced velocity of airflow coupled with an  
17 increase in the vapor pressure differential between the material and the air can be especially beneficial for  
18 low evaporation materials (e.g., plaster, wood, concrete, masonry) due to the much slower internal diffusion  
19 of moisture. Additionally, over-drying the surface area of thick, dense materials (e.g., hardwood, timbers,  
20 concrete) can result in drying stresses and drying out of the wetted pore surfaces internally, resulting in  
21 reducing moisture migration even further.  
22

### 23 **12.5. 1 Controlling Humidity to Promote During (Implementing the Appropriate Drying System)**

24

25 When considering the use of outside air in the drying process, restorers should determine if the outside  
26 environment is favorable to their drying effort or can be used as a means of quickly reducing the humidity  
27 levels in the space temporarily. The decision on the approach to use is generally based on:  
28

- 29 ■ prevailing weather conditions anticipated over the course of the project;
  - 30 ■ humidity levels inside the affected area that are present or can be maintained; and
  - 31 ■ job logistics or other concerns (e.g., ability to maintain security, expected energy loss, owner  
32 preferences, potential outdoor pollutants).
- 33

34 The three system approaches are:  
35

#### 36 **12.5. 1.1 Open Drying System**

37

38 An open drying system introduces outdoor air without mechanical dehumidification to reduce indoor  
39 humidity ratio or remove evaporated water vapor. This ventilation or air exchange can be beneficial when  
40 outdoor humidity ratio is significantly lower than indoor humidity ratio, especially when evaporation rates  
41 are high (e.g., at the beginning of the project). When employing an open system, drier air from outdoors  
42 can require manipulation to control indoor temperature (e.g., heat exchanger, portable furnace).  
43

44 Restorers should exchange the indoor air at a sufficient rate to promote drying and prevent secondary  
45 damage. If indoor humidity level increases, (1) a greater rate of exchange may help; (2) supplemental  
46 dehumidification can be installed, converting to a combination drying system; or (3) the outdoor air  
47 exchange can be stopped, converting to a closed drying system.  
48

#### 49 **12.5. 1.2 Closed Drying System**

50

51 Closed drying systems are commonly used as they provide the greatest amount of control over the drying  
52 environment and the best protection from varying outdoor conditions while preserving building security.  
53 Restorers should isolate the building or affected area from the outside, and install dehumidification  
54 equipment. When appropriate, the existing building's HVAC system can provide some dehumidification,

1 though in many cases, it is not sufficient to achieve optimum conditions for restorative drying. A closed  
2 drying system is recommended when outdoor humidity levels (i.e., humidity ratio) are not significantly lower  
3 than indoor. A closed drying system is also employed when building security, changing weather patterns,  
4 energy loss, outdoor pollutants, available ventilation, or other issues cannot be overcome.  
5

### 6 **12.5.1.3 Combination Drying System**

7  
8 A third approach is to use a combination of the above, especially at the beginning of a project when indoor  
9 humidity levels are at their highest. Restorers may consider ventilating the moist air to the outside while  
10 bringing in the drier air. This is often done at the time debris removal, extraction, and initial cleaning are  
11 performed, since security is not typically an issue during the early stage of a project while restorer is actively  
12 working onsite. Once closed up, drying equipment can then be used to create the conditions needed.  
13

14 Restorers may also consider a continuous use of outdoor air while dehumidification systems are deployed,  
15 when conditions are appropriate.  
16

17 Air exchange and heat-drying equipment may be used in conjunction with dehumidification to provide dry,  
18 warm air to a space while maintaining security and filtering the incoming air. This combination should be  
19 considered when the use of an air exchange and heat system alone is insufficient to maintain proper drying  
20 conditions.  
21

22 Depressurizing the workspace can lower the humidity ratio by drawing in drier, outdoor air. Excessive  
23 depressurization or the improper placement of air moving equipment (e.g., airmovers, AFDs) within a  
24 structure can create safety hazards by potentially causing back-drafting of combustion appliances such as  
25 water heaters or furnaces, and thereby create possible carbon monoxide hazards or contamination  
26 problems by pulling contaminants into the structure from crawlspaces or other areas.  
27

### 28 **12.5.2 Using Mechanical Dehumidification to Promote Drying**

29  
30 When a closed or combination system is planned and mechanical dehumidification is not already in use,  
31 restorers should establish an initial dehumidification capacity to establish humidity control for the anticipated  
32 evaporation load. The required capacity may be modified at any point after setup based on psychrometric  
33 readings. The restorer should document factors considered to determine the initial dehumidification  
34 capacity. Considerations may include but are not limited to:  
35

- 36 ▪ installation of airmovers;
- 37 ▪ types of building materials, assembly and build-out characteristics;
- 38 ▪ class and size of the affected area;
- 39 ▪ prevailing weather conditions;
- 40 ▪ power available on the project; and
- 41 ▪ type and size of drying equipment available.  
42

43 Two examples of calculation methods to determine initial dehumidification capacity can be found in the  
44 appendix. After the initial installation, appropriate adjustments (e.g., increase, decrease, reposition) in  
45 dehumidification equipment capacity should be made based on psychrometric readings. The restorer  
46 should consider other factors that may require adjustments which can include but are not limited to:  
47

- 48 ▪ an imposed deadline;
- 49 ▪ power is known to be less than adequate to serve the indicated inventory of equipment;
- 50 ▪ the building will be occupied during the drying process; potentially causing equipment cut-off;  
51 frequent opening of doors, higher moisture load;
- 52 ▪ changes in expected weather;
- 53 ▪ an unusual schedule within which the restorer must work (e.g., retail store that wants to remain  
54 open each day); and
- 55 ▪ required pressure differential to achieve contaminant control.

1  
2 On projects involving significant water absorption into low evaporation materials and assemblies, it can be  
3 beneficial once surface water has evaporated to reduce airflow velocity across the surfaces and the vapor  
4 pressure differential should be increased (e.g., increase temperature of wet materials; reduce humidity of  
5 the surrounding air; or a combination of both).

### 6 7 **12.5.3 Controlling Airflow** 8

9 Airmovers are used to circulate air throughout the workspace to ensure drier air is continually displacing  
10 the evaporating moisture at the surface of wet or damp materials. Several different types of airmovers (e.g.,  
11 centrifugal, axial) are available.

12  
13 Airmovers should be set up to provide continuous airflow across all affected wet surfaces (e.g., floors, walls,  
14 ceilings, framing). In order to achieve this, it is recommended that restorers position airmovers to:

- 15
- 16 ■ ensure adequate circulation of air throughout the drying environment to include interstitial spaces,
- 17 ■ direct airflow across the affected open areas of the room,
- 18 ■ account for obstructions (e.g., furniture, fixtures, equipment and structural components), if their  
19 presence prevents sensible airflow across the affected surfaces,
- 20 ■ deliver air along the lower portion of the affected wet wall and edge of floor,
- 21 ■ point in the same direction with the outlet almost touching the wall, and
- 22 ■ deliver air at an angle (e.g., 5-45°) along the entire length of affected walls.

23  
24 Upon initiating the restorative drying effort, restorers should install one airmover in each affected room. In  
25 addition, add one airmover:

- 26
- 27 ■ for every 50-70 SF of affected wet floor in each room (to address floors and lower wall surfaces up  
28 to approximately 2 feet),
- 29 ■ for every 100-150 SF of affected wet ceiling and wall areas above approximately 2 feet, and
- 30 ■ for each wall inset and offset greater than 18 inches.

31  
32 Within the ranges stated above, the quantity of airmovers needed can vary between projects depending  
33 upon the build out density, obstructions to airflow, and amount and type of wet affected materials.

34 In circumstances where water migration has primarily affected lower wall sections and limited flooring (e.g.,  
35 less than 2 feet of migration out into the room or area), restorers should install a total of one airmover for  
36 each 14 affected linear foot of wall. This calculation is independent of the above SF calculation, and is not  
37 meant to be used in the same room or area.

38  
39 When a calculation for a room or space results in a fraction, the indicated number of airmovers should be  
40 rounded up. In small rooms (e.g., closets, pantries under approximately 25 SF) a single airmover may be  
41 adequate, especially if upper walls and ceilings are not affected.

42  
43 In Class 4 intrusions involving significant water absorption into low evaporation materials and assemblies,  
44 once surface water has been evaporated, vapor pressure differential should be increased (e.g., increase  
45 temperature of wet materials; reduce humidity of the surrounding air; or a combination of both). In these  
46 circumstances, it can be beneficial to decrease the velocity of airflow.

47  
48 After the initial installation, restorers should inspect and make appropriate adjustments (e.g., increase,  
49 decrease, reposition) to the number, type and placement of airmovers based on materials' moisture  
50 readings. The first of these inspections to monitor and make adjustments should be performed no later than  
51 the day following the initiation of restorative drying. The frequency of subsequent monitoring should be daily

1 until drying goals have been met, but may be adjusted by the agreed scope of work, potential for secondary  
2 damage, job site accessibility, or by agreement between the materially interested parties.  
3

4 Airmoving devices inherently tend to aerosolize soils and particulates present in the environment. As water  
5 evaporates from surfaces and materials such as carpet, more particles often become aerosolized, creating  
6 possible health, safety, comfort and cleanliness issues. Restorers should perform a preliminary cleaning of  
7 materials and surfaces (e.g., carpet, hard surface floors, exposed subfloors) to reduce the amount of soil  
8 or particulates that can become aerosolized, before activating airmoving devices. Where preliminary  
9 cleaning cannot sufficiently remove soil or particulates, or there are high-risk occupants, restorers can install  
10 one or more air filtration devices (AFDs).  
11

#### 12 **12.5.4 Controlling Temperature to Accelerate Evaporation**

13

14 The temperature within a work area, and the temperature of wet materials themselves, also impacts the  
15 rate of evaporation significantly. Increasing the temperature of wet materials can be accomplished by using  
16 the sensible (thermal) energy gained by airmovers, dehumidification, portable heating equipment or existing  
17 HVAC systems. The greater the temperature of wet materials, the more energy is available for evaporation  
18 to occur.  
19

20 Systems employing direct or indirect heat application may be used to increase the temperature of wet  
21 materials or assemblies. Restorers should consider the impact of high temperatures on building  
22 components and contents. Manufacturer's instructions and safety precautions shall be followed to reduce  
23 the potential for fire hazards and occupant safety issues. Restorers should be familiar with drying equipment  
24 and how ambient temperatures affect their performance. Considerations for using temperature to  
25 accelerate evaporation may include the efficient operating range of the installed dehumidification,  
26 ventilation or heat drying systems.  
27

28 After the initial installation, appropriate adjustments (e.g., increase, decrease, reposition) in heat producing  
29 equipment should be made based on subsequent monitoring readings. When drying low evaporation  
30 materials, once surface water has evaporated, it can be beneficial to reduce velocity of airflow across the  
31 surfaces and the vapor pressure differential should be increased (e.g., increase temperature of wet  
32 materials; reduce humidity of the surrounding air; or a combination of both).  
33

#### 34 **12.5.5 Using the Installed HVAC System as a Resource**

35

36 Restorers can use the installed HVAC system as a resource; provided contaminants will not be spread or  
37 the drying effort will not be negatively impacted. The HVAC system can add energy or remove it from the  
38 environment being dried. In conjunction with drying systems, HVAC systems can help restorers gain control  
39 of ambient humidity however they generally cannot create the conditions necessary for drying of the building  
40 and contents. In addition, they may not be able to control ambient humidity quickly enough to prevent  
41 secondary damage. When sensible energy is added (i.e., heating), it can enhance surface evaporation as  
42 well as vapor diffusion within the building materials. When energy is removed (i.e., cooling), it can be used  
43 to prevent overheating the space or allow occupants to remain in the work area. If conditions warrant the  
44 air conditioning system's use, latent cooling will provide additional moisture removal to augment the drying  
45 system.  
46

47 Installed HVAC systems are engineered primarily for the normal thermal and moisture load of a building,  
48 rather than the additional heat and moisture load typically encountered as a result of water damage.  
49 Therefore, they are not engineered as dehumidification systems.  
50

#### 51 **12.5.6 On-going Inspections and Monitoring**

52

53 Psychrometric conditions and moisture level or content measurements should be recorded at least daily.  
54 The frequency of monitoring may need to be increased or decreased based on many factors including but  
55

1 not limited to: the amount of moisture present, potential secondary damage, job site location and  
2 accessibility. Relevant psychrometric measurements normally include: temperature and relative humidity  
3 outside and in affected and unaffected areas, and at dehumidifier outlets. Also, the moisture level or  
4 moisture content of materials should be measured and recorded. Restorers may perform a second visit on  
5 the first day after the drying equipment is set up and running to evaluate the performance and proper  
6 function of equipment.  
7

8 Because differences in calibration occur from one instrument to another, restorers should use the same  
9 meter throughout a project or establish an in-house method to verify that the meters used are within a  
10 reasonable tolerance of each other. It is recommended that the restorer record readings at the same  
11 locations until drying goals have been met and documented. On each visit, if monitoring does not confirm  
12 satisfactory drying, restorers should adjust the drying plan (e.g., equipment placement, type or quantity;  
13 target conditions; limited intrusive measures to further expose structural materials for more efficient drying).  
14

### 15 **12.5.7 Verifying Drying Goals**

16 Restorers should use appropriate moisture meters to measure and record the moisture level or moisture  
17 content of specific structural materials and contents. Drying equipment should remain in operation on site  
18 until it has been verified and documented that the drying goals have been achieved.  
19  
20

## 21 **12.6 Completion of the Restoration Process**

### 22 **12.6.1 Post Restorative Drying Evaluation**

23 Restorers should evaluate structural materials, assemblies, and contents that have been cleaned and dried  
24 to ensure pre-determined goals have been met. In some cases, items that have been dried may need  
25 additional services including cleaning, repair or additional appearance enhancement. In some  
26 circumstances, structural materials, assemblies, and contents cannot be successfully restored and  
27 replacement or reconstruction is necessary despite a restorer's effort to salvage the items.  
28  
29

### 30 **12.6.2 Reconstruction/Repair**

31 After completing the drying plan, qualified and properly licensed persons should perform authorized and  
32 necessary structural repairs, reconstruction or cleaning.  
33  
34

### 35 **12.6.3 Final Cleaning**

36 Throughout the restoration and reconstruction process, foot traffic and settling of aerosolized particles  
37 results in the accumulation of soils on surfaces. As necessary, surfaces should be cleaned following  
38 reconstruction using appropriate methods.  
39  
40

### 41 **12.6.4 Contents Move-back**

42 The final step in the restoration process is usually returning contents to their proper location in the structure.  
43  
44

## 45 **13 Heating, Ventilating and Air Conditioning (HVAC) Restoration**

46 Since HVAC systems circulate the air that workers and occupants breathe when the system is operating  
47 both during and after restoration, it is a critical component in the overall water damage restoration work  
48 plan. Category 1 water should be drained or vacuumed thoroughly from HVAC ductwork, systems, and  
49 mechanical components as soon as practical. Once excess water has been removed, the system should  
50 be thoroughly dried. In situations where Category 2 or 3 water has directly entered HVAC systems,  
51  
52  
53  
54

1 especially where internal insulation or fiberglass duct board is present, it might not be possible or practical  
2 to decontaminate HVAC ductwork, systems, and possibly even mechanical components. Mechanical and  
3 other system components should be evaluated and cleaned by appropriately qualified contractors as  
4 necessary, following appropriate industry standards and guidelines (e.g., The National Air Duct Cleaners  
5 Association (NADCA) ACR Standard for the Assessment, Cleaning and Restoration of HVAC Systems,  
6 ACCA Standard, AIRAH Guideline, CSA 317.13).

### 8 **13.1 The Relationship between a Building and Its HVAC System**

9 Heating, Ventilating and Air-Conditioning (HVAC) systems, when directly contacted by water, can cease to  
10 operate, or they can function inefficiently or spread excess humidity throughout both affected and  
11 unaffected areas of a structure. If contacted directly by Category 2 or 3 water, they can spread  
12 contamination to unaffected areas. Even if an HVAC system is not directly contacted by water, when  
13 operating, it can spread humidity or contamination from affected to unaffected areas. Further, microbial  
14 growth from other causes can be carried to the interior of HVAC system components where it can  
15 accumulate and degrade HVAC component operation.

16  
17 In addition, HVAC systems can have a major impact on controlling the conditions that lead to secondary  
18 damage. The design, installation, operation, and maintenance of HVAC systems can be important factors  
19 in controlling microbial growth and dissemination. This can lead to the spread of contamination by the  
20 system and increase the scope of the microbial problem by dispersing contaminants throughout a building.  
21 Materially interested parties should be advised of known conditions that place the future integrity of the  
22 building at risk.

23  
24 HVAC technologies, configurations and distribution systems can vary greatly in residential, commercial and  
25 industrial buildings. A building engineer may be necessary when dealing with a commercial mechanical or  
26 HVAC System. In a typical system, the fan or blower circulates conditioned air through the return ducting,  
27 filter, heating or cooling coils, and through the supply ducting into various parts of the building. The system's  
28 mechanical components can be located in the mechanical room, outdoors, or in other locations. Residential  
29 systems vary in configuration and type depending on regional climate variations.

30  
31 Contaminated HVAC systems should not be used during water damage restoration. Refer to Section 13  
32 *Heating, Ventilating and Air Conditioning (HVAC) Restoration* for information regarding the use of HVAC  
33 systems during the restoration and drying process. The restorer shall comply with any applicable laws or  
34 regulations prior to servicing an HVAC system.

35  
36 In addition to the HVAC system, there are many other systems that can impact the control of indoor climate.  
37 including but not limited to: building exhaust vents, plumbing vents; combustion appliances; chimneys;  
38 fireplaces; air-exchange systems; energy recovery systems, economizers, elevators, recessed light fixtures  
39 and central vacuums. These systems can create air pressure differentials inside of the structure which  
40 should be considered during restoration projects. For more information on this, refer to Section 13 *Heating,  
41 Ventilating and Air Conditioning (HVAC) Restoration*.

### 43 **13.2 HVAC System and Ducting Types**

#### 45 **13.2.1 Residential HVAC Systems**

46  
47 Typical residential HVAC systems include up-flow, down-flow, split and horizontal systems. Organic  
48 construction materials near the system can provide an excellent food source for microbial contamination if  
49 moisture from the HVAC is allowed to accumulate on or inside the unit. Downflow and horizontal systems  
50 are typically installed with duct work running beneath the occupied space and can allow moisture  
51 accumulation to go undetected for extended periods of time. Down-flow and horizontal systems are  
52 typically not located inside the conditioned space and can be difficult to access. Horizontal systems may  
53 be beneath the occupied space, or in attics, and can accumulate moisture. Moisture accumulation in HVAC  
54 systems for extended periods can lead to advanced microbial contamination.

### 13.2.2 Commercial HVAC Systems and Components

Commercial mechanical systems incorporate more variations and combinations of HVAC system design and components, compared to residential systems. Typical commercial systems may include, but are not limited to: single-zone, multi-zone, single-duct variable-volume, double-duct or dual-duct, and induction systems. Commercial systems are larger and more complex to inspect and service than residential systems. Commercial systems have additional components, which can include: mixing boxes, chillers, and variable air volume (VAV) boxes.

When a building containing widespread contamination is remediated, special attention should be given to restoring the HVAC system that supports the building's indoor environment. Also, HVAC systems should be inspected as described in this section and returned to an acceptable condition as part of the overall restoration project.

Causes of visible or suspected contamination should be identified, and moisture sources controlled, before restoring or remediating either building components or the HVAC system. An indoor environmental professional (IEP) should perform this assessment. Building design or construction-related moisture accumulation can often be beyond the capacity of properly designed, maintained, and operated HVAC system. These issues raise serious questions about the project scope and overall loss responsibility. Water damage restoration or microbial remediation does not include activities that would modify either a building or its mechanical systems from their original design.

### 13.2.4 Ductwork

Sections of internally lined ductwork, duct board or flexible ductwork affected by water damage is often more effective to replace rather than dry or remediate. When such ductwork is affected with microbial contamination, it should be removed and replaced with new materials.

## 13.3 Evaluating HVAC Systems

The description of what constitutes an adequate engineering evaluation of HVAC system, condition, and capacity is beyond the scope of this standard. It is recommended that qualified engineering professionals or HVAC contractors be consulted for such an evaluation.

Affected HVAC systems should be inspected for cleanliness and returned to acceptable status as part of the structural restoration. The National Air Duct Cleaners Association (NADCA) standard, *Assessment, Cleaning and Restoration of HVAC Systems* (ACR current version), includes specifications for acceptable levels of cleanliness for HVAC systems, and appropriate inspection techniques. Often, it is recommended that HVAC systems that require cleaning or remediation are cleaned or remediated after other building restoration procedures are complete to avoid cross-migration of contaminants into mechanical systems. When this is not possible and the environment is contaminated, HVAC system components should be isolated from the rest of the indoor environment.

Restored HVAC system components that are exposed to potential recontamination during drying and restoration activities should be inspected and cleaned if necessary after demolition and reconstruction activities are complete. This inspection should be conducted prior to removing any pressure differential containments or isolation engineering controls. It may be necessary to provide temporary heating, cooling and other environmental controls within areas undergoing restoration when they are not being served by their normal mechanical systems. When supplemental systems are utilized inside critical containments, such equipment should be decontaminated or wrapped prior to removing from containment.



1 Filtration is important in decreasing the spread of microbial spores from one part of a building to another.  
2 Filtration upgrades should be considered in buildings that have experienced Condition 3 contamination  
3 (actual mold growth and associated spores) or Category 3 water as part of a strategy to prevent future  
4 problems. In many cases, existing filter housings or tracks will accommodate upgraded filtration. In others,  
5 modifications should be made to the HVAC system layout to accommodate upgraded filtration.  
6 Modifications made to an HVAC system to upgrade the filter should not restrict the systems designed airflow  
7 and pressure drop rating.  
8

### 9 **13.4 HVAC SYSTEM ASSESSMENT, CLEANING AND RESTORATION**

10 Once the HVAC system's condition has been assessed for cleanliness, and mechanical corrections and/or  
11 enhancements have been completed, cleaning should be carried out in accordance with appropriate  
12 industry standards and guidelines (e.g., NADCA ACR current Standard for the Assessment, Cleaning and  
13 Restoration of HVAC Systems, ACCA Standard, AIRAH Guideline, CSA 317.13).  
14

#### 15 **13.4.1 Contamination Considerations**

16  
17 Determining the extent of contamination present in an HVAC system can be challenging. Cleanliness  
18 verification methods are described in the NADCA ACR current version. These methods include visual  
19 inspections, surface comparison tests and the NADCA vacuum test. The minimum requirement is that the  
20 systems must be visibly clean as described in the NADCA ACR current version. Multiple cleanings may be  
21 required to achieve satisfactory results.  
22

23 The complex nature of HVAC system construction provides interior reservoirs for spores, viable organism  
24 collection and other contamination. There can be numerous amplification sites in HVAC system interior  
25 components that may or may not be of concern. Specialized experts procuring and interpreting samples  
26 should be IEPs with specific training in identifying contamination issues within HVAC systems.  
27

28 All portions of each heating and cooling coil assembly should be cleaned in accordance with current  
29 relevant industry standards or guidelines. Both upstream and downstream sides of each coil section should  
30 be accessed for cleaning. Where limited access is provided between close proximity or zero-tolerance  
31 heating coils in an air-handling unit, cleaning may require removal and/or replacement. Coils that are not  
32 completely cleaned of soil, accumulated microbial growth, or other contamination can restrict airflow and  
33 have reduced latent capacity (i.e., ability to remove moisture).  
34

35 After the coils have been cleaned, an inspection should be performed. However, visual inspections of coil  
36 surfaces can be misleading; therefore, it is recommended a static pressure drop test be performed before  
37 and after the cleaning process to demonstrate the effectiveness of such efforts. This type of  
38 measurement, which can be performed using a magnehelic gauge, or manometer, is a more accurate  
39 indicator for the presence of debris that has either been removed or remains within the coil.  
40

41 Since HVAC systems circulate the air that workers and occupants breathe when the system is operating  
42 both during and after restoration, it is a critical component in the overall water damage restoration work  
43 plan. Category 1 water should be drained or vacuumed thoroughly from HVAC ductwork, systems, and  
44 mechanical components as soon as practical. Once excess water has been removed, the system should  
45 be thoroughly dried. In situations where Category 2 or 3 water has directly entered HVAC systems,  
46 especially where internal insulation or fiberglass duct board is present, it might not be possible or practical  
47 to decontaminate HVAC ductwork, systems, and possibly even mechanical components. Mechanical and  
48 other system components should be evaluated, and cleaned, as necessary, following current relevant  
49 industry standards or guidelines.  
50

## 14 Contents Evaluation and Restoration

### 14.1 Introduction

For purposes of this document the term “contents” generally is defined as personal property and fixtures that are not included in the building plans of a structure. These could include appliances, clothing, electronics, furniture, food, and many other items.

When a water intrusion occurs, often it is not just the structure that is impacted, but the contents as well. An appropriate response is often the difference between successful restoration or repair, or costly replacement. When water intrusion occurs, many items that have become affected by moisture are not damaged initially. Affected contents should be evaluated and, if restorable, appropriate mitigation procedures be taken to protect them from further damage, including secondary damage.

This process begins with a visual inspection, including documentation, to determine the extent of the damage. It is recommended contents be inventoried and documented before being removed from the building. The restorable water-damaged contents are cleaned by various methods and dried to appropriate moisture level or moisture content. In many cases damaged items require storage until a professional evaluation is made and confirmation of the need for repair or replacement is determined. Disposal of non-restorable contents should be handled by the protocols described below. Finally, certain types of contents require special handling and procedures.

### 14.2 Overview of the Contents Restoration Process

Effective restoration of contents from a water intrusion generally includes, but is not limited to the following tasks:

1. determine the Category (1, 2 or 3) of water and separate contents by their likely restorability;
2. determine the composition of affected materials. Porosity also can help determine restorability. General categories of contents are defined as follows:
  - Porous: Materials that absorb or adsorb water quickly, (e.g., clothing and other textiles, padded or upholstered items, leather, taxidermy, paper goods, and many types of fine art);
  - Semi-porous: Materials that absorb or adsorb water slowly can support microbial growth, (e.g., unfinished wood, concrete, brick, OSB) and
  - Non-porous: Materials that do not absorb or adsorb moisture easily (e.g., finished wood, glass, plastic, metal).
    - provide options related to the relative cost of cleaning versus the cost of replacement;
    - determine whether to clean and store contents on-site or in-plant;
    - determine the method of cleaning;
    - dry to an acceptable moisture level or moisture content;
    - determine those contents requiring restoration by specialty restoration professionals, (e.g., fine art, electronics, rare books, priceless keepsakes);
    - communicate with materially interested parties to make final determinations on restorability;
    - inform all materially interested parties and obtain written authorization before disposal; and
    - properly dispose of non-restorable contents.

### 14.3 Inspection and Evaluation for Restorability

The restorability of contents is dependent upon several factors, including but not limited to:

- category of water;
- time of exposure;

- 1       ▪ basic material composition;
- 2       ▪ cost of restoration;
- 3       ▪ value or cost of replacement; and
- 4       ▪ types of value (e.g., sentimental, legal, artistic, cultural, historical).

5  
6 The type of service required for each content item may be categorized in one of three ways:

- 7
- 8       ▪ restore: Items that will be dried, and if required, cleaned or resurfaced, and returned to the client in
- 9       an acceptable final condition, if possible.
- 10      ▪ dispose: Items that will not be cleaned because the owner has no interest in salvaging and/or the
- 11      value does not justify the cost of restoration (refer to Disposal section).
- 12      ▪ preserve: Items that are irreplaceable but cannot be properly restored to an acceptable final
- 13      condition.
- 14

15 Materially interested parties should participate in decisions about whether to restore or dispose of contents.  
16 Recommendations supplied by a specialized expert can be beneficial in making these decisions, especially  
17 when high-value items are involved.

#### 18 19 **14.3.1 Time of Exposure**

20 The longer the time from the initial moisture exposure to completion of the restoration process, the less  
21 likely the contents can be restored. Prolonged exposure to moisture can result in swelling, cracking, color  
22 migration, material degradation, or microbial amplification. Restorers should separate, contain, and  
23 document items that have been affected by mold according to standards set forth in the current version of  
24 the ANSI/IICRC S520 *Standard for Professional Mold Remediation*.

#### 25 26 **14.3.2 Removing Contents from Affected Areas**

27  
28 Before moving affected contents to another location, it is recommended the restorer or a specialized expert:

- 29
- 30       ▪ inspect all contents prior to inventory, if practical;
- 31       ▪ determine and document the condition of contents, which can include actual or perceived value;
- 32       ▪ photo-document high-value or damaged items; and
- 33       ▪ consider the possibility of drying contents in the affected area.
- 34

#### 35 36 **14.3.3 Inventory, Packing, Transport and Storage**

37 An inventory of the contents to be removed from the building should be performed that may include but is  
38 not limited to the following information:

- 39
- 40       ▪ description;
- 41       ▪ quantity;
- 42       ▪ condition;
- 43       ▪ location within the structure; and
- 44       ▪ an inventory number for each item, box, or group of items.
- 45

46 It is recommended that the inventory be performed prior to removal of contents from the building and a  
47 chain of custody be maintained.

48  
49 Clients should accept the inventory as representative of the existence and actual damage or condition of  
50 the contents by signature. It is recommended the client signature is secured before restorers assume  
51 responsibility for contents.

52  
53 The inventory method may include but is not limited to:

- 54       ▪ visual documentation (e.g., photographs video);

- 1           ▪ written descriptions (e.g., quantity, type, location)
- 2           ▪ moisture readings
- 3           ▪ damages (e.g., pre-existing, primary, secondary)
- 4           ▪ restorability

5  
6 A copy of the inventory should be retained with the job records.

7  
8 Contents should be packed, transported, and stored using appropriate measures to minimize breakage,  
9 damage, loss, or contamination of affected contents. Wet restorable contents should be dried prior to being  
10 packed and stored. Contents should not be returned to the affected area until restoration of that area has  
11 been achieved.

#### 12 13 **14.3.4 Drying or Cleaning First**

14  
15 In each loss, once a determination is made to restore an item, decisions should be made about whether to  
16 dry or clean the item first. Generally, if the item has been affected by Category 1 water, it is dried first, re-  
17 evaluated, and cleaned. If the water is Category 2 or 3, the item should be cleaned first and then dried.  
18 This helps remove as much contamination as possible and controls the spread of contaminants during the  
19 drying process.

#### 20 21 **14.3.5 Drying of Contents**

22  
23 To stop potential damage, steps should be taken to return items to a normal moisture level or moisture  
24 content. Usually, this is accomplished by physically removing excess water from the surface. Additional  
25 moisture can be removed by using dehumidification, controlling temperature control, and by directing airflow  
26 across the affected items.

27  
28 Consider drying affected contents in the area of the moisture intrusion in conjunction with drying the affected  
29 structure. This helps minimize cost and inconvenience for occupants. However, if the amount and type of  
30 damage to the structure prevents drying contents in the area of the moisture intrusion, or if contents require  
31 special handling, specialized drying chambers can be created to process the contents outside the affected  
32 area.

33  
34 Specialized drying chambers can be as simple as another room separated by containment where the  
35 humidity, airflow, and temperature can be used in a controlled manner to dry contents, and as complex as  
36 sublimation (i.e., vacuum freeze drying) chambers used for books, documents, and electronic media.

#### 37 38 **14.3.6 Cleaning Contents**

39  
40 Cleaning is the traditional activity of removing contaminants and other undesired substances from an  
41 affected environment or surface to reduce damage or potential harm to human health or valuable materials.  
42 The goal of contents restoration is to clean items by maximizing the physical removal of soil, contaminants,  
43 and odors.

44  
45 Contents restoration implies returning items to as close to an acceptable condition as practical. It does not  
46 necessarily mean that an item has been improved in appearance. There are factors involving client  
47 expectations that could be addressed. It is recommended that appropriate appearance enhancement  
48 processes, as discussed below, be applied to items after the items have received initial cleaning and have  
49 been dried to predetermined drying goals.

50  
51 As with structural restoration, additional damage can be discovered or created during the contents  
52 restoration process. When additional damage to contents is discovered, restorers should document the  
53 damage and notify materially interested parties.

1 Contents can be cleaned either on-site or in-plant. There are advantages and disadvantages to each  
2 alternative listed depending on the specifics involved in a project. Some or all of the following can apply.  
3

#### 4 **14.3.7 On-site versus In-plant**

##### 6 **14.3.7.1 Advantages of on-site cleaning can include:**

- 8     ▪ items remain in the client's property;
- 9     ▪ expenses of packing, transport, and storage are eliminated;
- 10    ▪ normally, there is less chance of breakage or "mysterious disappearance;" and
- 11    ▪ an on-site cleaning system, as discussed below, can be set up to process items before being moved  
12 to an unaffected area.

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#### 14.3.7.2 Disadvantages of on-site cleaning can include:

- it may extend the wait time before start of the structural restoration;
- cleaning systems set up on-site can be significantly less efficient than well-designed plant facilities; and
- contents not removed from affected areas can require several “rounds” of cleaning, similar to structural materials.

#### 14.3.7.3 Advantages of in-plant cleaning can include:

- minimizing the time before structural restoration begins;
- allowing the use of specialty cleaning systems that cannot be set up onsite, and
- allowing structure and contents restoration to proceed simultaneously, potentially reducing total job time.

#### 14.3.7.4 Disadvantages of in-plant cleaning can include:

- significant costs are associated with inventory, packing, transport, and storage;
- it increases the possibility of breakage, “mysterious disappearance,” or accusations of theft; and
- the restorer assumes responsibility for the contents.

Regardless of whether contents are cleaned on-site or in-plant, appropriate precautions should be taken to prevent the spread of soils or contaminants from affected areas into unaffected or uncontaminated areas.

#### 14.3.8 Outdoors

It is recommended that restorers take relevant factors into consideration before deciding to perform contents cleaning outdoors (e.g., weather, safety to workers and contents, possible public alarm at the sight of people attired in PPE).

When cleaning affected contents outdoors, cleaning should be performed at a distance from a structure to create a safe working environment. When cleaning outdoors, restorers should use appropriate measures to protect the contents from any further damage. Restoration workers handling or working near contaminated contents shall wear appropriate PPE; refer to Section 8, *Safety and Health*.

### 14.4 Cleaning Methods

It is recommended restorers use appropriate cleaning methods given the material composition, the Category of water, and the location where contents are to be cleaned. A combination of cleaning methods can be necessary to facilitate contents restoration.

#### 14.4.1 Air-based Methods

- HEPA-vacuuming, or vacuuming with other units that exhaust a safe distance outside the structure;
- air washing is a method that uses an air stream to blow contaminants or moisture off surfaces, which can result in aerosolization. This method should only be used outdoors, in laminar-airflow cleaning system (e.g., downdraft table), or in other situations where engineering controls are adequate to prevent excessive concentration of contaminants and minimize spreading of contamination in Category 2 or 3 water. Air washing has the potential to drive contaminants deeper into porous materials (e.g., padded or upholstered items).

#### 14.4.2 Liquid-based Methods

1 The liquid-based cleaning methods rely on water combined with physical or mechanical cleaning processes  
2 to dislodge contamination. The following are examples of liquid-based cleaning methods:

- 3
- 4     ▪ immersion cleaning with an appropriate cleaning agent;
- 5     ▪ ultrasonic cleaning;
- 6     ▪ washing with an appropriate cleaning agent;
- 7     ▪ damp wiping with a cleaning agent;
- 8     ▪ steam cleaning with live steam systems;
- 9     ▪ cleaning with non-water-based liquid solutions;
- 10    ▪ low-pressure flushing;
- 11    ▪ high-pressure washing is a method that causes “splattering,” resulting in aerosolization and an  
12 increase in RH. High-pressure washing techniques should be limited to situations in which  
13 aerosolization is not a critical factor (e.g., outdoors); and
- 14    ▪ hot water extraction with truck-mounted or portable units.
- 15

#### 16 **14.4.3 Appearance Enhancement**

17  
18 There are many methods that are effective in improving the appearance of contents. Although removing  
19 contaminants and drying to an acceptable drying goal are the primary focus of contents restoration, there  
20 are client expectations that should also be addressed. It is recommended that contents be “appearance  
21 enhanced” to the extent practical before being returned to the client. This can include, but is not limited to  
22 refinishing, polishing, waxing, and buffing using such products as:

- 23
- 24     ▪ chemical strippers;
- 25     ▪ rubout products for finishes;\_
- 26     ▪ toners and bleaches;
- 27     ▪ stains, glazes, and grain fillers;
- 28     ▪ solvent-based finishes;
- 29     ▪ gold leafing kits;
- 30     ▪ touch-up products; and
- 31     ▪ finishing and waxing products.
- 32

#### 33 **14.5 Cleaning Porous, Semi-Porous and Non-Porous Contents**

34  
35 Because of the nature of porous contents, particularly textiles, it is important to note the Category of water  
36 and the presence of contamination. Special care should be taken when unaffected contents are stored  
37 with affected contents to control potential cross contamination. Dry soil removal by thorough vacuuming  
38 and/or brushing with a soft bristle brush are the most commonly used methods for cleaning porous contents  
39 after being dried to an acceptable drying goal. A liquid-based or abrasive method may be necessary after  
40 the dry soil extraction has been performed. Rapid drying and any practical appearance enhancement follow  
41 cleaning methods.

##### 42 **14.5.1 Porous and Semi-Porous Contents**

43  
44 Discussed below are general guidelines, by Category of water, for restoring porous and semi-porous items  
45 that are affected during a water intrusion. These contents can include, but are not limited to:

- 46
- 47
- 48     ▪ books, documents and manuscripts;
- 49     ▪ family records, scrapbooks, and photographs;
- 50     ▪ clothing, fabrics, and other textile items;
- 51     ▪ area rugs, tapestries, and loose carpet;
- 52     ▪ upholstery and mattresses;
- 53     ▪ wicker furniture and similar items;
- 54     ▪ paintings, sculptures, and other art; and

- 1       ▪ unfinished or unsealed wood.

#### 2 3 **14.5.1.1 Porous and Semi-Porous Contents – Category 1 and 2 Water**

4  
5 After carefully examining items for restorability, the proper cleaning method selected should be based on  
6 material composition and manufacturer instructions. It is recommended restorers know the type of affected  
7 material when determining the type of restoration needed. For fabrics with heavy odor, a deodorization  
8 process, such as confined use of ozone or application of deodorizers, can be desirable prior to or following  
9 laundering or dry cleaning and drying to an acceptable goal.

#### 10 11 **14.5.1.2 Porous and Semi-Porous Contents – Category 3 Water**

12 Restorers should dispose of porous and semi-porous contents affected by Category 3 water that are not  
13 generally restorable (e.g., inability to clean all areas of saturation, staining, discoloration or fiber damage).  
14 Clothing and other household fabrics may be restorable with submersion washing in appropriate detergents.  
15 High-value or irreplaceable items of sentimental value may justify cleaning and restoration or preservation  
16 using specialized techniques discussed later in this section. The restorer should recommend to the client  
17 that post remediation verification by an indoor environmental professional (IEP) be performed on porous  
18 and semi-porous contents.

#### 19 20 **14.5.2 Non-Porous Contents**

21 All items should be examined first for restorability. Some glass and plastic items can be etched or stained  
22 by long-term exposure to water and associated microbial growth. Metal items can be unrestorable due to  
23 corrosion, which can be accelerated by acids produced by fungal growth; refer to ANSI/IICRC S520  
24 *Standard for Professional Mold Remediation*. Discussed below are general guidelines by Category of water  
25 for restoring non-porous items affected during a water intrusion.

#### 26 27 28 **14.5.2.1 Non-Porous Contents – Category 1 and 2 Water**

29 Non-porous items are generally restorable. Cleaning can be accomplished by using one or more of the  
30 methods listed in 15.5.4.1 and 15.5.4.2.

#### 31 32 33 **14.5.2.2 Non-Porous Contents – Category 3 Water**

34 If an item is non-porous, remediation can be completed using the applicable cleaning methods discussed  
35 for Category 1 and 2. After thorough cleaning and any applicable biocide application, restorers should  
36 remove cleaning product and biocide residues, followed by rapid drying and appearance enhancement, if  
37 necessary. If bonded porous or semi-porous materials have been affected by water intrusion and are  
38 deemed non-restorable, the item should be discarded following guidelines for non-restorable contents  
39 discussed later in this section. It may be advisable to review the owner's manual for water-damaged  
40 contents, if applicable and available, for special or recommended cleaning methods, or considerations that  
41 could affect warranty or restorability.

#### 42 43 44 **14.6 High-value and Irreplaceable Contents**

45 High-value contents are those with high monetary value or replacement cost. Irreplaceable contents are  
46 those with unusual historical, sentimental, cultural, artistic, legal or other value. Specialized cleaning and  
47 restoration techniques may be appropriate for these contents. Such procedures can be as simple as  
48 repeated cleanings, using standard practices as described above, or can require the use of specialized  
49 experts.

50  
51 For many types of high-value and irreplaceable contents, specialty restoration services are available. Some  
52 restorers may provide these services in-house, while others may out-source the work. Specialty restoration  
53 services include, but are not limited to:  
54



- 1
- 2     ▪ art restoration or conservation for paintings, valuable books, works of art on paper, documents,
- 3     objects, frames, tapestries and other textiles;
- 4     ▪ collectable doll restoration;
- 5     ▪ sublimation (i.e., freeze drying) for valuable books and documents;
- 6     ▪ area rug cleaning and repair;
- 7     ▪ electronics and machinery restoration;
- 8     ▪ data recovery;
- 9     ▪ collectable or vintage firearms restoration; and
- 10    ▪ musical instrument restoration.
- 11

12 Cleaning processes should start with soil and contaminant removal. If heavy odors exist, multiple cleanings  
13 and deodorizing attempts may be needed. Post remediation verification by an indoor environmental  
14 professional (IEP) should be performed and documented to ensure decontamination before the item is  
15 returned to the client. Organic materials such as leather objects, taxidermy articles, and similar items are  
16 highly susceptible to mold growth after water damage and might not be restorable; refer to the current  
17 version of the ANSI/IICRC S520 *Standard for Professional Mold Remediation*. Such additional or specialty  
18 restoration procedures might not return these items to an acceptable condition. Depending on the item  
19 restored and the level of contamination, a specialized expert may be necessary to determine whether or  
20 not an item has been restored. If items are not restorable, materially interested parties should be consulted  
21 to determine an acceptable course of action with respect to the disposition of the items.

## 22

### 23 **14.7 Unrestorable Contents**

#### 24

25 Unrestorable contents should be inventoried, photo-documented and removed or disposed of in compliance  
26 with the removal and disposal recommendations later in this section. Unrestorable contents should not be  
27 disposed of without documented permission of the client or other materially interested parties, as applicable.  
28 It is recommended that unrestorable contents be removed from the work area before restoration services  
29 begin. When returning contents that have not been restored to an acceptable condition, restorers should  
30 inform the client of the circumstances involved, advise them in writing of the potential consequences of  
31 accepting contaminated contents, and attempt to obtain a written waiver and release of liability for those  
32 potential consequences.

### 33

### 34 **14.8 Disposal**

#### 35

36 It is recommended that waste materials be moved from the work area to a waste container in a manner that  
37 minimizes the possibility of cross-contamination of unaffected areas. It is recommended that sharp items  
38 be packaged in such a way as to prevent penetrating the container to prevent leakage and contact by those  
39 handling the waste material. It is recommended that bags not be dropped, thrown, or handled roughly.

40  
41 If timely disposal of affected contents is not practical, it is recommended that staged debris be stored in a  
42 reasonably secure location. Generally, no special disposal provisions are recommended for water-  
43 damaged materials; however, federal, state, provincial, and local disposal laws and regulations apply. If  
44 waste-materials are contaminated, then procedures listed above should be followed.

### 45

### 46 **14.9 Specific Handling Recommendations**

#### 47

#### 48 **14.9.1 Sculptures, Artwork and Other High-Value Collectables**

#### 49

50  
51 Inventories should include the artist, title, subject, date, size, medium, inscriptions or markings,  
52 distinguishing features, condition history, the value if known, and a photographic image. A copy of this  
53 inventory should be kept in a secure location at a site separate from the collection in the event of any

1 potential harm that may occur to the collection itself. A professional conservator will also keep a copy of  
2 the records.

#### 3 4 **14.9.2 Books, Documents, Film and Electronic Media**

5  
6 Because damage can occur rapidly, these items should be removed if they may become exposed to high  
7 humidity or contaminants during drying. Restorers should begin the recovery effort on affected items as  
8 soon as reasonably possible, to minimize the potential for damage and/or mold growth. When sending  
9 affected items to a recovery specialist, restorers should package the materials in accordance with the  
10 specialist's specification. It is recommended that the restorer contact and partner with these appropriate  
11 specialists ahead of time to obtain the procedures that need to be followed in order to properly stabilize  
12 them and prepare the items for transport. Refer to the National Archives and Records Administration (NARA),  
13 Library of Congress (LOC), British Library or other recognized authorities for additional information.

#### 14 15 **14.9.4 Draperies**

16  
17 Draperies that have not been directly affected should be placed on hangers or removed from the immediate  
18 area of the moisture intrusion. If any of the synthetic material items have become wet, it is usually best to  
19 wet out the entire panel and then place in a dryer for uniform drying.

20  
21 Draperies made with natural fibers can shrink and/or develop water stains or sizing rings that might not be  
22 correctable. Commercial laundries that specialize in drapery cleaning might be able to steam and re-stretch  
23 the fabric. Note that many draperies have become weakened from use and exposure to sunlight and might  
24 not withstand restoration procedures.

#### 25 26 **14.9.5 Mattress, Box Springs, Pillows and Upholstered Furniture**

27  
28 Items affected by Category 1 water, if deemed restorable by the restorer, may be extracted, cleaned, and  
29 dried. Mattresses, box springs, pillows, and upholstered furniture or other stuffed fabrics contaminated with  
30 Category 2 or Category 3 water are generally unrestorable. In the case of irreplaceable or high-value items,  
31 it is recommended that materially interested parties be involved in making this decision. Refer to the IICRC  
32 S300, *Standard for Professional Upholstery Cleaning*.

#### 33 34 **14.9.7 Case Goods**

35  
36 Affected case goods (e.g., bookcases, chests of drawers, dining or bedroom furniture) should be blocked  
37 up and wiped dry with an absorbent towel to limit potential damage. Case goods made of soft or hard wood  
38 can typically be restored by cleaning, drying to normal moisture level or moisture content, and using cream  
39 refinishers to remove white discolorations from excessive moisture. If necessary, it is recommended that  
40 furniture requiring light or full refinishing be referred to a specialized expert.

41  
42 If the case goods are made of compressed wood and have already swelled, it is recommended that the  
43 restorer consult with the client and other materially interested parties to determine the course of action.  
44 Normally, these case goods are non-restorable and should be discarded. In the case of Category 3 water,  
45 case goods made of compressed wood should be discarded at an appropriate disposal site.

#### 46 47 **14.9.8 Pianos and Musical Instruments**

48  
49 The construction components of a piano and its internal mechanisms are subject to instability and variation  
50 because of its surroundings. Typical piano construction includes a cast iron plate, reinforced beams,  
51 hardwood multi-ply bridges and pin-blocks, and steel strings. The recommended ambient relative humidity  
52 range for pianos is 35% to 55%.

53  
54 The objective in restoring a piano affected by a water intrusion is to return the instrument to its quality of  
55 sound, the precision and sensitivity of its action, and its appearance and value.

1  
2 Restorers should retain a specialized expert to transport or restore a water-damaged piano. If it becomes  
3 necessary for the restorer to transport the piano off-site, it should be carefully padded and placed sideways  
4 on a professional skid-board for moving. The legs and pedal assembly (lyre) should be removed and  
5 carefully padded, additional blankets should be added for extra protection, and the piano should be secured  
6 in an appropriately equipped vehicle for transportation. It is recommended that the owner of the piano visit  
7 the piano restoration company upon completion of the restoration to inspect the piano before having it  
8 returned to the client's premises.

9  
10 Other portable instruments that have been directly or indirectly affected by a water intrusion should be  
11 documented and inventoried by the restorer and either dried in the affected area or referred to a specialized  
12 expert for restoration. If an instrument has high value, restorers should ensure that it is delivered into the  
13 care of a specialized expert who is acceptable to the client, as soon as possible.

#### 14 **14.9.9 Pool and Snooker Tables**

15  
16 When pool or snooker tables are affected by a water intrusion, the restorer needs to be aware that there  
17 are degrees of restoration that could affect the value of the table. An antique pool table could be entirely  
18 rebuilt with all new marquetry and veneers, in which case its authenticity and collectible value could be  
19 decreased.

20  
21 Restoration could be as simple as drying the table in the affected area to normal moisture level or moisture  
22 content. More elaborate steps could include a new billiard cloth, re-leveling, re-rubbing the rails, applying  
23 hot oil and wax finish, honing the slate, and replacing damaged sections or pockets by a specialized expert  
24 that is acceptable to the client.

#### 25 **14.9.10 Area Rugs, Loose Carpeting and Tapestries**

26  
27 Cleaning procedures for area rugs and carpet are found in the current edition of ANSI/IICRC S100,  
28 *Standard for Professional Cleaning of Textile Floorcoverings*. Thorough moisture extraction and rapid  
29 drying are critical if restoration is to be successful. As with clothing and soft goods, deodorization may be  
30 conducted with appropriate techniques. One or more repeat cleanings might be needed to remove odors  
31 and further reduce contaminant levels. Appearance enhancement, as practical, follows cleaning.

32  
33 It is recommended that area rugs and tapestries be cleaned at an in-plant facility by a specialized expert.  
34 Spreading contaminants during cleaning can be a potential problem. Submersion cleaning of area rugs  
35 under water is less likely to aerosolize contaminants. If a high-value area rug or tapestry is saturated with  
36 Category 3 water and there is a decision to attempt salvage, it should be cleaned with submersion pre-  
37 cleaning, followed by saturation with appropriate antimicrobials (biocides) and a secondary submersion  
38 cleaning. The severity of contamination in the case of Category 3 water may necessitate involving an IEP  
39 for post-restoration testing to ensure complete decontamination. Documentation of complete  
40 decontamination should be obtained from the IEP and included in job records. Furthermore, loose carpeting  
41 affected with Category 3 water should be discarded and replaced, as with affected installed carpet, due to  
42 the cost and unfeasibility of restoration.

#### 43 **14.9.11 Clothing, Bedspreads and Other Porous Articles**

44  
45 Wet clothing should be separated into darks, colors, and whites, and laundered according to the  
46 recommended care labels. Using a detergent in the laundering process facilitates removing contaminants.  
47 Laundry sanitizers may be added, if textile manufacturer directions permit. They help reduce  
48 microorganisms, and may significantly reduce odors. For fabrics that are not chlorine bleach safe, adding  
49 oxygen bleaches, such as sodium perborate or sodium percarbonate can provide similar benefits, if  
50 permitted by manufacturer directions. Increasing the water temperature can also enhance the laundering  
51 process. Care should be taken not to exceed the manufacturer's water temperature recommendations.  
52  
53  
54  
55

1 When dry cleaning, restorers should follow manufacturer label directions, and standards of care for the dry  
2 cleaning industry, based on fabric or material type. In addition to traditional solvent-based processes, new  
3 liquid carbon dioxide dry cleaning and other alternatives are available, and can be better suited for some  
4 items. As with laundering, the primary goal of dry cleaning is the physical removal of contaminants and  
5 associated odors, rather than microbial kill. Repeat laundering or dry cleaning may be needed to  
6 satisfactorily eliminate microbial odors, as well as to provide an additional measure of assurance of  
7 maximum contaminant removal. The decision to perform multiple launderings or dry cleanings involves  
8 professional judgment in consultation with the property owner or other materially interested parties.  
9

#### 10 **14.9.12 Furs and Animal Trophies**

11  
12 If fur clothing or items are affected by Category 1 water, it is recommended that restorers consult with a  
13 specialized expert. When restoring furs and animal trophies on site, it may be appropriate to shake off  
14 excess moisture and let the fur dry naturally by hanging it. The heat and low humidity generated in the  
15 course of normal structural drying can dry out the fur to its original texture. If the fur is drenched, blotting  
16 from the inside (not the fur side) with clean white towels is recommended. Using moth or cedar balls for  
17 deodorizing near a fur coat during drying is not recommended, as the smell often adheres to fur and creates  
18 unpleasant odors that can be difficult to remove.  
19

20 After drying a fur, it can need further care by a professional to condition and re-glaze the animal skin.  
21 Glazing is a process that replenishes essential oils necessary to maintain the fur's longevity.  
22

23 When animal skins and hunting or fishing trophies are affected by a water intrusion, these items should be  
24 documented and inventoried, then sent to a specialized expert for restoration. Usually, these items are  
25 specially treated and can have stuffing material that needs to be replaced to prevent on-going damage.  
26 Restoration can include re-casing, creating new scenery or groundwork, and appearance repairs including,  
27 but not limited to new eyes, new fins, recapping, and recoloring.  
28

#### 29 **14.9.13 Appliances and Electronics**

30  
31 If direct wetting of appliances and electronics takes place, evaluation and restoration by a specialized expert  
32 should be accomplished. Restorers should remove electronic components from high-humidity  
33 environments as soon as practical. Only a short period of time exists between initial wetting or exposure  
34 to high humidity and the onset of damage that could necessitate replacement of costly equipment. It is  
35 recommended to test, evaluate and clean appliances, electronic, and other electrical equipment before  
36 damage occurs. These items can include, but are not limited to:  
37

- 38 ▪ televisions;
- 39 ▪ stereo equipment and speakers;
- 40 ▪ computer-related equipment (e.g., servers, personal computers, monitors, printers, scanners,  
41 speakers, miscellaneous hardware);
- 42 ▪ appliances (e.g., refrigerators, freezers, ranges, washing machines, dryers, water coolers);
- 43 ▪ small appliances (e.g., toasters, coffee makers, convection ovens, microwaves, air filters, fans,  
44 clocks, telephones); and
- 45 ▪ power equipment and tools.

#### 46 47 **14.9.14 Aquariums**

48  
49 If aquariums need to be moved or removed from an area that has been affected by a water intrusion, fish  
50 or other inhabitants should be removed by the client and the tank should be emptied to avoid unnecessary  
51 stress and possible failure of tank seals. In the event that an aquarium and its inhabitants are of significant  
52 value, a specialized expert should be retained to care for the inhabitants until restoration is complete. If  
53 aquariums do not need to be removed, then restorers should work with clients to plan a schedule of  
54 maintenance for inhabitants during restoration.  
55

### 14.9.15 Firearms and Ammunition

If firearm restoration is necessary, it is recommended it be performed by a specialized expert. Restorers shall comply with applicable laws and ordinances for handling and transporting firearms. Sources for finding firearms restoration professionals may be obtained through recommendations from local law enforcement agencies or gun clubs.

If firearms or ammunition are present at the worksite, clients should collect firearms or ammunition in a work area and move them out for closer evaluation. If there is no one available to collect firearms or ammunition, restorers should communicate with company management for instructions. Firearms should not be handled by someone who is unfamiliar with proper handling protocols.

Precautions should be taken if ammunition has visibly deteriorated. When appropriate, officials (e.g., police or bomb squad) should be contacted to determine whether or not ammunition has become unstable. A specialized expert may be used to check ammunition before returning it to clients for use.

## 15 Large or Catastrophic Restoration Projects

### 15.1 Introduction

Large projects generally involve four basic types of structures: commercial, industrial, institutional, and complex residential. Large projects involve many building materials, components, systems, and methods of construction different from those found in typical residential structures. Differences in large projects are especially apparent in the size and intricacy of mechanical and HVAC systems and electrical systems, the presence of low voltage and special wiring systems (e.g., fire suppression, security systems), and in more complex building materials and construction methods. Large projects also involve challenges related to public access, security, authority, or organizational hierarchy.

- Large projects are handled differently from other water damage restoration projects and usually require a higher level of project management or administration. The management and administration might be accomplished in-house or outsourced to a specialized expert. Questions that should be asked at the beginning of a large project include, but are not limited to:
  - Is the use of the structure or facility commercial, industrial, institutional, or complex residential?
  - Who are the materially interested parties that are involved?
  - Is the project complex enough to necessitate the use of one or more specialized experts?
  - Is public safety and health a concern?
  - Are property owners self-insured or do they have a substantial deductible?
  - Are the impacted areas extensive, involve multiple buildings, or are special security areas involved?
  - Was the project a sudden, accidental, natural, or weather-related occurrence?
  - Is there a third-party agency involved (e.g., government, a multinational, or corporate office in another location)?
- Does the structure contain high-value, sensitive or historical materials or contents that require special insurance coverage, additional security, procedures or personnel to perform specific restoration services?

### 15.2 Types of Structures

Large projects generally involve four basic types of structures: commercial, industrial, institutional, and complex residential. Large projects can result from improper maintenance, casualty (e.g., accidents, failure of building components), intentional acts (e.g., vandalism) and weather-related events.

#### 15.2.1 Commercial

1 Commercial structures are buildings or facilities where the use is primarily for retail, office, mixed-use, and  
2 warehousing. These structures usually have limited power availability, partitions or demising walls, and  
3 have multiple finished surfaces and fixtures.  
4

#### 5 **15.2.2 Industrial**

6  
7 Industrial structures are buildings or facilities where the use is primarily for manufacturing, foundry, and  
8 distribution. These structures usually have heavy power availability, few partitions or finished surfaces.  
9

#### 10 **15.2.3 Institutional**

11  
12 Institutional structures are buildings or facilities where the use is primarily for public facilities such as  
13 schools, hospitals, municipal buildings, sports complexes, airports, libraries, or other governmental  
14 facilities. These structures can have power availability, public access and security challenges, or various  
15 layers of authority and organizational hierarchy.  
16

#### 17 **15.2.4 Complex Residential**

18  
19 Complex residential structures are residential facilities including: townhouses, condominiums, apartment  
20 complexes, hotels, multi-family dwellings, or large single-family mansions or estates. These structures  
21 may have multiple owners and insurance policies, and common construction components and accessibility  
22 challenges.  
23

### 24 **15.3 Building Systems**

25  
26 Because of the wide variety of uses of large structures, there are numerous building components and  
27 systems which are not found in typical residential construction. Many building materials and methods of  
28 construction in large structures are different from those used in residential structures.  
29

#### 30 **15.3.1 Mechanical and HVAC Systems**

31  
32 Mechanical and HVAC systems in large projects are generally larger in size and more intricate in design  
33 than residential systems. A specialized expert may be necessary when dealing with a commercial  
34 mechanical or HVAC system; refer to Chapter 12, *Specialized Experts*. Large project HVAC systems can  
35 be roof-mounted, ceiling-mounted; or they may be located in an area completely separate from the area of  
36 water intrusion. These systems can have several intermediate heating and cooling elements and several  
37 air distribution systems. They can also have electronically controlled climate sensors, dampers, fire  
38 dampers, barometric pressure relief systems, fire suppression, exhaust and fresh air systems, as well as  
39 other systems of which the restorer should be aware when working with or around such systems. Insulation  
40 can be on the interior or the exterior. The ductwork can be fixed or flexible and can be constructed from a  
41 variety of materials. Commercial mechanical and HVAC systems are to be carefully evaluated and handled  
42 by restorers or specialized experts; refer to Chapter 14, *Heating, Ventilation and Air Conditioning*  
43 *Restoration*.  
44

45 Other commercial mechanical systems (e.g., plumbing, fire suppression, electrical, gas) can be dramatically  
46 different from residential systems, and may vary depending upon building use. These systems can have  
47 fault sensors, pressure switches and electronic distribution systems. Many systems are monitored by in-  
48 house or third-party monitoring services, which detect faults, system failures, and manual tampering.  
49 Monitoring systems should be controlled or shut down before working around or servicing them. Failure to  
50 do so can result in costly repairs and unnecessary procedures to reset or recharge the system.  
51

#### 52 **15.3.2 Electrical, Low Voltage, and Special Wiring Systems**

1 Similar to mechanical and HVAC systems, commercial electrical systems are larger and more intricate than  
2 residential systems, and include low voltage and special wiring. A specialized expert might be necessary  
3 when dealing with commercial electrical, low-voltage, or special wiring systems; refer to Chapter 12,  
4 *Specialized Experts*. Special wiring systems can include: CAT 5 or other computer wiring, fiber-optic wiring,  
5 alarm and security systems, coax cabling, and other wiring or cable systems. Low-voltage wiring can  
6 sometimes be particularly difficult to work with since many systems are wired to special transformers and  
7 relays.

8  
9 The greatest variability in a commercial environment is the electrical system. Depending upon the  
10 requirements, a system can have single phase and three phase power, voltages can vary from 110 to 480,  
11 and breakers can be 15 to 300 amps or more. Portable generators may be advisable when the available  
12 power is known or suspected to be insufficient for the project. Also, portable generators can be necessary  
13 when access to the in-house power supply is restricted or prohibited.

### 14 **15.3.3 Building Materials and Systems**

15  
16 Commercial, industrial, institutional, and complex residential structures vary greatly in composition,  
17 construction, and materials. Ceilings can have open steel or wood framing, drywall or plaster, and acoustic  
18 ceiling tiles, among others. Walls can consist of different structural compositions such as drywall, plaster  
19 or brick over steel, wood or masonry, and be insulated or non-insulated. While the most common flooring  
20 materials are carpet, vinyl composition tile (VCT), or concrete, there are many new specialty materials being  
21 introduced into the market that can necessitate special treatment during the restoration process. It is  
22 recommended that restorers stay informed about the latest construction methods and materials.

## 23 **15.4 Administration**

### 24 **15.4.1 Cost and Pricing Methods**

25  
26  
27 The cost and pricing methods below are commonly used in the administration of large projects. The  
28 increased need for equipment, products, materials and labor in large projects can create extraordinary  
29 demands on restorers and their vendors. These methods include:

#### 30 **15.4.1.1 Cost-plus-overhead-and-profit**

31  
32  
33 This method involves tracking the actual cost of labor, materials or products; equipment cost or rental; and  
34 subcontracted invoices. The sum of these costs plus a predetermined margin of overhead and profit,  
35 constitute the total cost of performing services. The advantages of this method include: eliminating the  
36 need for a predetermined or published price guideline, and eliminating the need to spend time on measuring  
37 and making decisions on a scope that can change many times throughout the project. The disadvantages  
38 include: lower margin of profit, the uncertainty that might result without an advance agreed-upon scope of  
39 work, and the necessity to renegotiate overages that might exceed the previously-set budget for time,  
40 materials, equipment and subcontract costs.

#### 41 **15.4.1.2 Time-and-materials**

42  
43  
44 This method involves tracking the actual cost of labor, materials or products, equipment cost or rental, and  
45 subcontracted invoices. The data are then compiled and assigned an amount based on a predetermined  
46 or published pricelist. Data collected early in a project can be broken down into units that can be used to  
47 estimate the total potential cost of a project. This allows restorers to concurrently establish a budget to  
48 follow. The advantages of this method include: streamlined data compilation for auditing and estimating; a  
49 balanced margin of profit; creation of a budget to aid in the processing of payments on the project; and  
50 avoiding the need to spend time on measuring and making decisions on a scope that can change many  
51 times throughout the project. The disadvantages of this method include the uncertainty that might result  
52  
53

1 without an advance agreed-upon scope of work, and the need for a predetermined or published price  
2 guideline.

### 3 4 **15.4.1.3 Measured Estimate or Bid**

5  
6 This method involves measuring and inventorying the project, and calculating the exact scope and price for  
7 performing the services. Changes involving scope or price during the course of the project should be  
8 documented by a written change order, signed by an authorized party, and the restorer.

9  
10 Advantages of this estimating method include: more precision in estimating and implementing a project;  
11 lower administration cost during the project; a fixed budget and margin of profit, and the development of a  
12 scope agreed-upon in advance. Disadvantages of this method include: a greater expenditure of time on  
13 project estimating prior to the services being performed; higher likelihood of work stoppage for processing  
14 potential change orders; an incentive to increase the rate of production, which might compromise service  
15 quality; and reduced opportunity for restorers to apply professional judgment when implementing and  
16 completing a project.

17  
18 For projects performed on a cost-plus-overhead-and-profit basis, or time-and-materials basis,  
19 administration may be completed by in-house daily reports of time, material, and products usage, and  
20 equipment rental and subcontract expenses. An on-sight project manager or administrator collects these  
21 reports; then compiles them for auditing and billing.

22  
23 The administration required to mobilize, implement, and complete a large project can be extensive,  
24 especially if the project is performed on a cost-plus-overhead-and-profit basis, or a time-and-materials  
25 basis. Regularly scheduled monitoring, inspection, and evaluations are more crucial when processing a  
26 large project because of size, complexity, and potential variables. Many times, a large project is  
27 administered or audited by a third party, ensuring accuracy and transparency in billing. Even when projects  
28 are based on a measured estimate or bid, proper coordination of administrative practices during a large  
29 project is essential.

### 30 31 **15.4.2 Payment Schedules**

32  
33 To expedite large project administration, payment (draw) schedules are required to finance the project  
34 through completion. A payment schedule is a means of payment for portions of the project at regular  
35 intervals. These schedules should be predetermined, agreed upon and incorporated within the project  
36 contract. The type of payment schedule is usually dependent on the size, complexity, and method of  
37 handling the project.

38  
39 In the case of a measured estimate or bid, the schedule may be based on weighted percentages of the  
40 estimate during the course of the project, such as an initial payment, a number of equal interval payments  
41 and a final payment contingent upon successful completion. In the case of a cost-plus-overhead-and-profit  
42 project or time-and-materials basis, the schedule may consist of a down payment, interval payments based  
43 on invoices for work completed, and a final payment based on substantial completion.

44  
45 The funding for a large project can be escrowed by a third party, the customer or an insurance company.  
46 In these situations, draw schedules are often negotiated so as not to affect on-going cash-flow needs of the  
47 restorer.

### 48 49 **15.4.3 Communication**

50  
51 As with any other project, communication is one of the most important factors in successfully completing a  
52 large project. The difference is in the extent and frequency of communication necessary to complete it. In  
53 a typical residential water damage restoration project, the restorer should communicate with the owner or  
54 owner's representative, restorer's crews, subcontractors and specialized experts, and possibly an  
insurance company representative. On large projects, however, there often is an on-site manager for the



1 restorer, a facilities manager, a board of directors, an insurance auditor, legal counsel, and other materially  
2 interested parties. A communication structure or “tree” should be established and strictly adhered to before,  
3 during, and after completing a large project.  
4

5 In the case of catastrophic large projects, (e.g., widespread flooding, hurricanes, and tornadoes) federal,  
6 state, and local government agencies can be involved. Examples in the United States include: Federal  
7 Emergency Management Agency (FEMA), state or local boards of health, building inspectors, and Housing  
8 and Urban Development (HUD). Many of these agencies offer loans, grants, and other aid to victims of  
9 disasters. In many cases, when dealing with these agencies, legal counsel or certified public accountants  
10 may be necessary to file the correct documents allowing for prompt service and payment.  
11

#### 12 **15.4.4 Project Documentation**

13  
14 Consistent documentation at regular intervals during a large project is essential. Many of the daily logs,  
15 notes and reports are similar to those outlined in Chapter 9, *Administrative Procedures, Project*  
16 *Documentation and Risk Management*. In addition to limiting liability for restorers, documentation is  
17 necessary for communicating, billing, and reporting to the customer. The amount of documentation  
18 necessary to administrate a large project is often the primary justification for an on-site, full-time or third-  
19 party administrator. The expense associated with documentation should be considered in estimating the  
20 cost or billing for a large project.  
21

### 22 **15.5 Security**

23 Large restoration projects require special security considerations, including, but not limited to: working in  
24 commercial buildings that already have a full-time security staff, projects where restorers out-source  
25 security, projects where the restorer’s staff provides a safety watch without activity documentation, and  
26 government or high-security projects where personnel must pass security clearance to work in restricted  
27 project areas.  
28

#### 29 **15.5.1 Full-Time Staff Security**

30  
31 Generally, commercial buildings and large corporations have a full-time security system in place, which  
32 includes security personnel on-location around the clock. Restorers can be required to work with building  
33 security in large projects. Security companies usually issue security badges and obtain general information  
34 about the restoration company, and make sure that appropriate insurance certificates are filed with the  
35 building manager. The restorer should comply with the rules and policies of building security or third-party  
36 security provider.  
37

#### 38 **15.5.2 Security Contracted by Restorer**

39  
40 There are also many large project job sites where the building does not have security in place. On these  
41 projects, restorers may want to consider hiring an outside company to assist in securing the project site.  
42 When considering security outsourcing, restorers should evaluate whether or not it is prudent for security  
43 to be outsourced, the experience and qualifications of the security company (e.g., indoor or outdoor security  
44 or other special needs), and the necessity for the security company to be licensed and bonded. Restorers  
45 should work with the building owner or manager, the insurance company and other materially interested  
46 parties regarding the financial aspects of hiring and securing a large project site.  
47

#### 48 **15.5.3 Monitoring provided by Restorer**

49  
50 In many large projects, restorers may want to use a safety-watch option. This is an option in which restorers  
51 actually provide around-the-clock monitoring without record keeping. The purpose of this lower level of  
52 security is to monitor for potential operational problems and unauthorized attempts to enter the premises  
53 or remove equipment.  
54

#### 15.5.4 Regulated Security Areas

If the large project is a regulated security site, information on all employees may be requested for the background investigation of project employees. When providing such information, restorers shall comply with applicable data-protection or privacy laws and regulations. Investigations can include: criminal background, homeland security, and credit checks of restoration company owners, as well as those entering the site on the company's behalf. Restorers may be required to provide training about working in high-level security areas, on how to observe specialized security policies, and on complying with applicable regulations.

### 15.6 Labor

#### 15.6.1 In-House and Contract Employees

While it is preferable to use trained, in-house employees, sometimes on large projects it is necessary to employ temporary labor, trained restorers from other restoration firms or on-call contract help. Frequently, it is not financially feasible to maintain a permanent staff large enough to handle large projects.

The ability of restorers to manage people, such as employees, contract help, and subcontractors, is important to the successful completion of a large project. Therefore, it is recommended that restorers performing large projects maintain a well-trained, full-time staff with the skills required to manage a quantity of contract employees, as well as the technical competence to handle their assigned portion of a large project.

#### 15.6.2 Subcontractors

Many times, subcontractors are needed to staff a large project. A large project restorer should consult a legal professional to draft a formal subcontract agreement for use when engaging subcontractors. There are many differences between subcontractors and contract employees, including the degree of control asserted over them. Subcontractors are independent contractors having greater discretion and control over the conduct of their activities than employees. Subcontractors can indemnify a restorer for acts and omissions, including those caused by negligence, and they usually carry insurance covering their operations.

### 15.7 Equipment

It is usually preferable to use equipment owned by the restorer. However, it is unlikely that any large project restorer will have enough equipment to handle multiple large projects simultaneously. Therefore, using equipment from various sources, such as equipment sharing plans with other restorers, short-term leases, job-specific rentals, or obtaining equipment from other sources might be necessary. Often on large projects the required size and number of pieces of equipment is much greater than that required on residential projects. Tracking equipment can be a challenge. Equipment inventory, tracking, and movement systems should be used to maintain efficiency and effectiveness on large projects.

### 15.8 Working out of State, Province, or Country

When working on large projects outside the restorer's home state, province or country, restorers shall comply with pertinent federal, state, provincial, and local laws and regulations applicable to their activities in those areas. Restorer insurance requirements, including those for general liability, workers compensation, and pollution liability, can vary by jurisdiction. Licensing and permits, as well as laws regulating the conduct of a restoration business, also can be different between jurisdictions.

Generally, laws and regulations applicable in the jurisdiction where a large project is located apply to restorers performing services there even when they are based in a different jurisdiction. Restorers shall

1 comply with business regulations, licensing, and insurance requirements applicable in jurisdictions in which  
2 they conduct business.  
3  
4  
5

## 6 **16 Materials & Assemblies**

7

8 Buildings are constructed in such a way that the restorer cannot consider specific materials without regard  
9 to others as they are designed to work together in various structural, flooring, roofing, and mechanical  
10 assemblies. Restorability and cleaning should be determined by the assembly, and not the specific material.  
11

### 12 **16.1 Evaluating the Restorability of Building Materials and Assemblies**

13

14 Restorers should consider several criteria when determining that materials or parts of an assembly are  
15 restorable. The restorer should understand the affected materials and construction. This can include but is  
16 not limited to the presence of interstitial spaces, vapor barriers, integrity of the top finish-coat or other finish  
17 material. While some affected materials can be readily restored, they may require removal in order to  
18 access other components. Understanding the affected materials and assemblies will help the restorer  
19 determine a successful approach to drying.  
20

21 Much of the information is obtained during the initial inspection. When materials are determined restorable  
22 but contamination issues exist, restorers should employ the appropriate remediation procedures prior to  
23 drying efforts defined in this section.  
24

### 25 **16.2 Materials, Assemblies and Restoration Procedures**

26

#### 27 **16.2.1 Pre-restoration Evaluation of assemblies**

28

29 Evaluating layers or assemblies of materials should be done when it is suspected that water has migrated  
30 under or into it. Restorers should understand the particular construction in order to determine the best  
31 restoration approach. Properly inspecting, cleaning, drying, and restoring these assemblies can require  
32 removal of surface or multiple layers of them. If finished wall material (e.g., gypsum board, plaster) requires  
33 replacement, restorers should commence removal first; then properly dry exposed sub-surfaces and  
34 framing to the predetermined drying goal prior to reinstallation of finish materials.  
35

36 For more information on the following assemblies that are prone to water migration refer to the Appendix  
37 (not included in public review copy):

- 38 ■ flooring assemblies comprised of finish flooring (e.g., hardwood, engineered hardwood, laminate),  
39 vapor barriers (e.g., polyethylene sheeting, rosin paper) and subfloor materials (e.g., plywood,  
40 OSB);
- 41 ■ multiple layers of gypsum board walls;
- 42 ■ gypsum walls potentially having sound attenuation or insulation in the assembly;
- 43 ■ suspended ceilings with insulation;
- 44 ■ gypsum board ceilings that are wet or sagging;
- 45 ■ fire-rated wall;
- 46 ■ plaster walls;
- 47 ■ wood paneled walls;
- 48 ■ wallpaper (e.g., vinyl, textile);
- 49 ■ carpet and carpet pad/underlayment;
- 50 ■ vinyl sheet and vinyl composition tile;
- 51 ■ residential hardwood floors or hardwood sports floors having interstitial spaces within the  
52 construction;
- 53 ■ surrounding walls of elevator shafts, mechanical rooms and chases (e.g., trash chutes, plumbing,  
54 electrical, HVAC); and

- 1       ▪ concrete masonry unit walls.

### 2 3 **16.2.2 Remove and replace unrestorable materials**

4  
5 Some affected materials or assemblies should not be restored due to (1) quick developing impacts of  
6 moisture sorption, (2) inability to adequately clean or sanitize, or (3) inability to ensure achievement of  
7 drying goals throughout the assembly. Materials and assemblies that should be removed and replaced  
8 include but are not limited to:

- 9  
10       ▪ gypsum board ceilings that are sagging due to saturation;  
11       ▪ gypsum board that has obvious physical damage;  
12       ▪ laminate flooring; and  
13       ▪ many multi-layer flooring systems (e.g., laminate, vinyl sheet, parquet, engineered wood) under  
14        which water has migrated cannot generally be sufficiently dried, cleaned, or sanitized.

#### 15 16 **16.2.2.1 Remove and replace in Category 2 or 3 intrusion**

17  
18 Following a Category 2 or 3 water intrusion, affected materials or assemblies that should be removed and  
19 replaced include, but are not limited to:

- 20  
21       ▪ carpet cushion (pad, underlay);  
22       ▪ HVAC internally lined duct board;  
23       ▪ HVAC external insulation on metal duct;  
24       ▪ wall insulation (e.g., loose-fill, cellulose, mineral wool, fiberglass, open-cell foam);  
25       ▪ particleboard or MDF; and  
26       ▪ many multi-layer flooring systems (e.g., laminate, vinyl sheet, parquet, engineered wood) under  
27        which Category 2 & 3 water has migrated cannot generally be sufficiently dried, cleaned, or  
28        sanitized.

#### 29 30 **16.2.2.2 Remove and replace in Category 3 intrusions**

31  
32 Following a Category 3 water intrusion, affected materials or assemblies that should be removed and  
33 replaced include, but are not limited to:

- 34  
35       ▪ gypsum wallboard (single-layer, multiple-layers, both standard and fire-rated);  
36       ▪ mineral fiber lay-in ceiling tiles;  
37       ▪ wall insulation;  
38       ▪ sound attenuation board;  
39       ▪ wallpaper (e.g., vinyl, textile);  
40       ▪ wood paneling; and  
41       ▪ carpet and carpet cushion (pad, underlay).

#### 42 43 **16.2.2.3 Asbestos Containing Materials or Presumed Asbestos Containing Materials**

44  
45 If restorers encounter ACM or PACM, they shall stop activities that can cause the materials to become  
46 friable or aerosolized (e.g., dry sweeping, scraping, breaking). A qualified asbestos abatement contractor  
47 or Class III-Trained Employee shall be used to perform the abatement. Many states require that licensed  
48 inspectors perform asbestos inspections prior to disturbing building materials, which are presumed to  
49 contain asbestos.

50  
51 If Asbestos Containing Materials (ACM) or Presumed Asbestos Containing Materials (PACM) are  
52 encountered, restorers shall comply with federal, state, provincial, and local laws and regulations regarding  
53 the inspection and handling of these materials.

54 Assemblies that are more likely to have ACM or PACM include but are not limited to:

- 1
- 2     ▪ mineral fiber ceiling panels;
- 3     ▪ gypsum drywall joint compounds;
- 4     ▪ resilient flooring (e.g., vinyl composition tile, vinyl sheet, linoleum);
- 5     ▪ flooring adhesives;
- 6     ▪ pipe insulation; and
- 7     ▪ concrete masonry unit (CMU) block loose-filled with vermiculite, perlite, etc.
- 8

9 If the ACM or PACM shows signs of compromise, a specialized expert should be used for further evaluation.

### 11 **16.2.3 Controlled demolition of assemblies**

12  
13 If it is determined that a layer or layers of material require removal in order to facilitate inspection, drying,  
14 cleaning, or restoring an assembly, it should be done as soon as practical after the decision is made.  
15 Removing exposed layer(s) of the assembly can facilitate cleaning and drying of the framing or other  
16 substructure materials.

### 18 **16.2.4 Post-drying evaluation of assemblies**

19 Once drying goals have been achieved in some assemblies, further inspection should be done to ensure  
20 prolonged exposure has not created unacceptable damage. Assemblies that are particularly prone to  
21 damage of this nature include but are not limited to:

22         Multiple layers of subfloor materials (e.g., OSB, plywood)

## 24 **16.4 Specific Procedures for Miscellaneous Assemblies**

### 26 **16.4.1 Heavy Timber framing**

27  
28 Restorers drying saturated timber-framed buildings might encounter issues related to drying stresses  
29 created as a result of differences in radial, tangential, and longitudinal shrinkage. Timbers that are saturated  
30 should be dried slowly and monitored regularly to reduce the potential for stress cracks and damage

### 32 **16.4.2 Engineered Wood (e.g., plywood, OSB)**

33  
34 Restorers should inspect to determine if water has migrated into engineered wood materials. If it has,  
35 restorers should determine if the engineered material needs to be removed due to progressive deterioration.  
36 If Category 2 or 3 water has migrated into the assembly, surface materials should be removed and substrate  
37 evaluated for drying, cleaning, and sanitizing, prior to replacement.

### 39 **16.4.3 Brick**

40  
41 The appearance of a brick building can be permanently altered by inappropriate cleaning techniques or by  
42 the use of an incompatible cleaning agent. The product manufacturer (e.g., brick, cleaning agent, sealer)  
43 instructions should always be followed when using acids and other proprietary cleaning chemicals.

### 45 **16.4.4 Walls, Insulated**

46  
47 Restorers should inspect walls for the presence of insulation and evaluate if drying is preferable to removal  
48 of finished wall material (e.g., gypsum board, plaster) and removal/replacement of the insulation would be  
49 quicker and more desirable.

50  
51 Insulation will typically be found in all exterior walls, ceilings, and sometimes under floors in crawlspaces  
52 and basements. If wet, it should be dried or replaced to return its insulating value to pre-intrusion condition.

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#### **16.4.5 Walls, fire-rated**

Any opening of fire-rated walls shall be properly repaired to restore the fire rating.

#### **16.4.6 Carpet and Carpet Cushion (pad, underlay)**

Restorers should evaluate the components of the carpet and pad system to determine the extent of water intrusion under the carpet and pad and into the substrate. Some carpet installations (e.g., direct glued, closed cell polyurethane, rubber) can inhibit water migration into the subfloor.

Following a Category 2 water intrusion, carpet cushion (pad, underlay) should be removed and discarded. Restorers can consider on-location drying of carpet after proper cleaning. Following cleaning and drying, clearance may be performed as necessary.

Following a Category 3 water intrusion the carpet and cushion should be removed, and its substrate evaluated for cleaning and drying.

#### **16.4.7 Concrete**

Water can migrate under floor coverings, around the perimeter of installations or between concrete and framing. The hidden issues with wet concrete can become evident well after the project is completed and new finish materials have been reinstalled. Flooring and the sub-structural assemblies should be inspected to determine the extent of moisture migration and/or damage.

In situations where water has migrated deeply into the concrete and restorative drying must be done to facilitate the reinstallation of moisture sensitive floor coverings, it should be expected that drying times could be significantly longer.

Restorers are cautioned that measuring and validating that a concrete floor is sufficiently dry to ensure suitability for the installation of moisture sensitive or impervious floors (e.g., hardwood, bamboo, roll vinyl, VCT) should be done by a competent and qualified expert in accordance with applicable standards (e.g., ASTM F1869, F2170) in order for the customer's floor to be warranted.

#### **16.4.8 Vinyl sheet & VCT**

Restorers should inspect to determine if water has migrated under finish floor materials. If it has, restorers should determine if the flooring needs to be removed due to progressive deterioration of the subfloor or finished floor materials. If Category 2 or 3 water has migrated or collected under the floor, the finish floor should be removed and substrate evaluated for drying, cleaning, and sanitizing, prior to replacement of finish flooring.

#### **16.4.9 Hardwood floors (i.e., residential and commercial)**

Restorers should inspect to determine if water has migrated under finish floor materials. If it has, restorers should determine if the flooring needs to be removed due to progressive deterioration of the subfloor or finished floor materials. If Category 2 or 3 water has collected in interstitial spaces under the floor, finish flooring should be removed, and the subfloor evaluated for damage. If the substrate can be cleaned and sanitized, it should be dried to acceptable moisture level or moisture content prior to replacement of finish flooring.

##### **16.4.9.1 Performance Sports and Dance Floors**

Restorers should inspect to determine if water has migrated under performance sports or dance floors. Due to the construction of these floors, in the case of Category 2 water intrusion a specialized expert should be

1 considered to determine if the floor system can be restored. If Category 3 water has collected in interstitial  
2 spaces under the floor system, it should be removed, and the substrate evaluated for restorability.

#### 3 4 **16.4.10 Engineered and laminate floors (e.g. bamboo, cork, parquet)**

5  
6 Restorers should inspect to determine if water has migrated under finish floor materials. If it has, restorers  
7 should determine if the flooring needs to be removed due to progressive deterioration of the subfloor or  
8 finished floor materials. If Category 2 or 3 water has migrated or collected under the floor, the finish floor  
9 should be removed and substrate evaluated for drying, cleaning, and sanitizing, prior to replacement of  
10 finish flooring. Regardless of the category of water, if flooring swells, it is unrestorable. Restorers should  
11 check for subsurface moisture using an appropriate meter. If there is trapped moisture present in cushioning  
12 material or the subfloor, the flooring material should be replaced.

#### 13 14 **16.4.11 Solid Surface (e.g., stone, granite, slate, tile, engineered marble) floors**

15  
16 When substrate is wood, it should be checked for moisture migration and if damaged, it is recommended  
17 that a specialized expert be consulted. Restorers should inspect to determine if water has migrated under  
18 finish floor materials. If it has, restorers should determine if the flooring needs to be removed due to  
19 progressive deterioration of the subfloor or finished floor materials. If Category 2 or 3 water has migrated  
20 or collected under the floor, and the substrate is a wood product, the finish floor should be removed and  
21 substrate evaluated for drying, cleaning, and sanitizing, prior to replacement of the finish flooring. When the  
22 flooring is installed over a concrete substrate, the restorability of the installation should be evaluated by an  
23 appropriate specialized expert.

#### 24 25 **16.4.12 HVAC Duct; internally & externally insulated**

26  
27 When ductwork insulation has become contaminated with Category 2 or 3 water, it should be removed and  
28 replaced. When ductwork insulation has become contaminated with Condition 3 contamination (actual mold  
29 growth and associated spores), restorers should follow the NADCA ACR current Standard for the  
30 Assessment, Cleaning and Restoration of HVAC Systems.

#### 31 32 **16.4.13 Elevators**

33  
34 Any services provided (e.g., pump out, cleaning, debris removal) to the equipment, shaft, or pit should be  
35 performed under the guidance of the building engineer or contracted service and considered a “permit  
36 required confined space” (PRCS) requiring additional procedures. Prior to performing any work in an  
37 elevator pit, restorers shall ensure the safety of workers and the general public. The elevator shall be shut  
38 down and locked out securely. Signs shall be posted notifying the public of maintenance work and an  
39 adequate supply of filtered and unfiltered air should be arranged through ventilation in the pit. Qualified  
40 personnel shall perform elevator cleanup and maintenance in accordance with local regulations. These  
41 procedures are beyond the scope of this document. An elevator pit is considered a confined space.  
42 Restorers shall have documented safety training and signage prior to work depending on the work being  
43 performed.

44  
45 Due to the elevator pit being in the lowest part of most buildings, it will collect considerable amounts of  
46 water and likely can contain other debris, trash, dead animals, hydraulic fluids, etc. For that reason, it may  
47 be considered Category 3 or contain Regulated Hazardous Materials.

#### 48 49 **16.4.14 Electrical Systems**

50  
51 Caution shall be used when entering a flooded or flood-damaged building. Restorers shall employ safe  
52 work practices. If necessary, a specialized expert should be employed.

1 Electrical systems and equipment exposed to water can be quickly compromised, especially if it is  
2 contaminated (e.g., sea-water, chemicals). Compromised systems should not be reenergized until  
3 evaluated by a specialized expert.

#### 5 **16.4.15 Electrical Systems (e.g., low voltage, special wiring systems)**

7 Deposited residue should be cleaned from metallic surfaces after a water intrusion to reduce the potential  
8 long-term corrosion concern.

9  
10 Equipment should be evaluated and reconditioned by qualified persons.

#### 12 **16.4.16 Fire-suppression systems**

14 Any work performed on sprinkler systems should be done by qualified specialized experts. Generally, these  
15 water intrusions may be considered a Category 1 source when connected to a public water supply. It is  
16 recommended the restorer contact the individual or company responsible for the fire suppression system  
17 maintenance to determine the service maintenance schedule and potential additives present in the system.  
18 Fire suppression systems in older structures can contain ethylene glycol. Structures affected by ethylene  
19 glycol shall be handled according to federal, provincial and local laws and regulations. If there are  
20 indications that potential contamination associated with the fire suppression system discharge exists, or if  
21 the system is connected to a non-potable source, the Category of the water can be Category 2 or 3. When  
22 insufficient information is available to determine Category, the restorer should employ testing to establish  
23 the level of contamination.

#### 25 **16.4.17 Insulation; cellulose or other loose-fill organic material**

27 Wet cellulose insulation should be removed, regardless of the category of water, and after structural drying,  
28 replaced with new material.

#### 30 **16.4.18 Insulation; mineral wool, fiberglass, rock wool**

32 Compacted or contaminated materials should be removed and replaced.

#### 34 **16.4.19 Cabinets, attached and built-in**

36 Restorers should identify and eliminate moisture migration below or behind built-in cabinets or fixtures. A  
37 complete inspection can require drilling holes in inconspicuous areas and evaluating levels of moisture and  
38 drying options. If removal is necessary, it should be completed near the beginning of the project

#### 40 **16.4.20 Stairs & mechanical rooms**

42 Restorers should open assemblies (e.g., walls, stairs, flooring, wall base areas, voids, built-ins) to access  
43 pockets of saturation and remove unsalvageable, contaminated materials and components. Exposed  
44 materials that remain in place should be cleaned and decontaminated, as appropriate.

46 Stairwells that are fire exits shall not be blocked during open hours, unless cleared by local officials.

#### 48 **16.4.21 Sub-grade walls (e.g., basements)**

50 Restorers should check for trapped moisture between decking and subfloor materials, or on the vapor  
51 retarder over bat insulation in basements or crawlspaces installed between joists, and directly under  
52 subfloors.



1 Restorers shall consider the possibility of electrical shock and other hazards when entering a flooded  
2 basement. When appropriate, electrical power should be turned off at the meter.  
3

#### 4 **16.4.22 Crawlspace**

5

6 Restorers should be knowledgeable about the operation of an active ventilation system prior to making any  
7 modifications to a system. Restorers should check for and address moisture trapped by vapor retardant  
8 materials by pulling back or removing the vapor barrier, and ensure that residual moisture in the soil will not  
9 cause a rewetting of the structural assemblies above their normal seasonal moisture level. Crawlspace  
10 generally meet the definition of a confined space. Restorers shall comply with the federal, provincial or local  
11 laws and regulations associated with confined space entry.  
12

13 Normal ambient conditions and soil moisture levels in crawlspaces can vary widely depending on region,  
14 season, local geography, and construction methods. Ambient Conditions can vary in crawlspaces resulting  
15 in different dry standards relative to conditioned areas. Restorers should control the environment (e.g.,  
16 temperature, relative humidity, dew point, air pressure differentials) in affected portions of crawlspaces as  
17 soon as practical to minimize moisture migration, potential secondary damage, and microbial amplification.  
18 While an increase in the humidity can occur at the beginning of a project, if it persists it can indicate an  
19 adjustment is necessary (e.g., additional ventilation, dehumidification equipment). Containments can be  
20 utilized to minimize the area that needs to be controlled. Exposing large areas of saturated soil by removing  
21 vapor retardant materials can create high evaporation loads. When prevailing conditions are favorable, the  
22 restorer should use an open or combination drying system to control the space during high evaporation

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