

IICRC Technical Advisory on “In-Place” Drying

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While there are many methods for drying structural components and contents, the “in-place” (“top-down”) drying system has been taught in the industry and used by drying contractors since the early ’80s. In those days, this method of drying components, without significant removal of furnishings or fixtures, was somewhat restricted, due to limitations imposed by extraction, evaporation and dehumidification equipment. In recent years, however, drying technology (extraction, evaporation, dehumidification), along with better understanding of psychrometry, has advanced in major ways so that in-place drying has, in some cases, become far more safe and practical.

The Institute of Inspection, Cleaning and Restoration Certification (IICRC) has been asked by a number of concerned parties about the feasibility of using in-place drying of carpet and pad (cushion), which, although technically demanding, has the potential for saving time and complication for materially interested parties. In-place drying of Category 1 (clean water source) water losses by qualified and competent drying contractors can reduce the need for carpet disengagement, pad removal, and pad replacement and reinstallation, while reducing customer inconvenience at the same time.

Definitions

First, the correct term for this drying procedure is “in-place drying.” Certainly, technicians don’t dry walls and ceilings “top-down” (inside out?) and that term isn’t descriptive of how contents dry either.

Second, it is appropriate to borrow a few definitions of basic terms from the IICRC *Standard and Reference Guide for Professional Mold Remediation* (IICRC S520).

- **must:** when the term *must* is used in this document, it means that the practice or procedure is mandatory due to natural law or regulatory requirement, including occupational, public health and other relevant laws, rules or regulations, and is therefore a component of the accepted “standard of care” to be followed.
- **highly recommended:** when the term *highly recommended* is used in this document, it means that the practice or procedure is a component of the accepted “standard of care” to be followed, while not mandatory by regulatory requirement.
- **recommended:** when the term *recommended* is used in this document, it means that the practice or procedure is advised or suggested.

Categories of Water (abbreviated summary only; ref. *Standard and Reference Guide for Professional Water Damage Restoration* (IICRC S500):

Category 1, clean water at the source;

Category 2, begins with contamination, could cause sickness or discomfort if consumed by humans;

Category 3, highly unsanitary (sewage), could cause illness or death if consumed by humans. Category 1 or 2 water changes to Category 2 or 3 if left untreated for sufficient time.

Classes of Water Losses (abbreviated summary only; ref. IICRC ASD consensus documents):

Class 1, losses that are confined, caught quickly, and contain few absorbent materials;

Class 2, losses with quantities of highly absorbent flooring materials primarily, such as carpet and pad;

Class 3, water originates overhead; ceilings, wall frames, insulation, drywall, and highly absorbent flooring materials are affected;

Class 4, specialty drying of hardwood, concrete, stucco, plaster, masonry, saturated ground soil.

standard of care: practices that are common to reasonably prudent members of the trade who are recognized in the industry as qualified and competent.

Technician Qualifications

In-place drying is a technically demanding process with many potential advantages for all “materially interested parties”: the structure occupant, the restoration contractor and the party responsible for payment as well. Therefore, it is imperative that technicians performing this work be well qualified in several areas through both training and experience. Of course, the best way to authenticate that in-place drying procedures are going to be performed accurately and safely with documentation of satisfactory completion is by using IICRC-certified firms that specialize in water damage restoration. For the best potential results, it is recommended that firms use technicians who have attained IICRC “Journeyman” or “Master” Water Restorer status, which designations require:

Journeyman Water Restorer (JWR):

Water Restoration Technician (WRT)

Carpet Cleaning Technician (CCT or CMT)

Repair and Reinstallation Technician (RRT)

(a total of **6-8 days of formal instruction** and **three examinations**)

plus a minimum of **one year experience** since the date of first certification

Master Water Restorer (MWR):

Water Restoration Technician (WRT)

Applied Structural Drying Technician (ASD)

Applied Microbial Remediation Technician (AMRT)

Carpet Cleaning Technician (CCT or CMT)

Repair and Reinstallation Technician (RRT)

Health and Safety Technician (HST; including OSHA 10-hour card)

(a total of **15-17 days of formal instruction** and **six examinations**)

plus a minimum of **three years experience** since the date of first certification

Currently, among the IICRC’s 30,000 registered technicians, approximately 16,000 are IICRC-certified as Water Restoration Technicians (WRT), with approximately 2000 of those being certified in Applied Structural Drying (ASD). This number is growing daily. As many readers are aware, ASD is a 60% hands-on course in which demonstration houses representative of standard residential construction are flooded, extracted, monitored and dried throughout the three-day course - although three-day drying cannot be guaranteed. Many IICRC Certified technicians have attained the JWR status and are working toward MWR status.

For successful “in-place” drying, it is highly recommended that all supervisors or technicians performing the work be able to prove their qualifications both experientially and academically.

Equipment Technology

As with many industries, the water damage restoration industry has seen major advances in technology in the past few years. Consider:

- There has been a proliferation of new ***water extraction tools*** that achieve far superior extraction of both carpet and pad compared to the typical carpet cleaning wand. Similarly, in addition to truck-mounted extraction units, specialized portable extraction units with two, two-stage vacuum motors have been developed exclusively for water removal. The ***Water Extraction-efficiency Testing (WET) Study*** conducted by the International Society of Cleaning Technicians (ISCT) and Shaw Industries, the world’s largest carpet manufacturer, documents that specialized extraction units and tools can remove up to 97% of water from carpet and pad, with an average being some 85%. This

compares to only 40% of the water being removed from carpet and pad with traditional cleaning wands that, unfortunately, still may be used by untrained or unqualified restoration contractors today.

- **Carpet dryers** have changed considerably also. Low-amperage axial blowers that produce 1800-3000 cfm are being used to supplement traditional laminar airflow dryers that move air at 1150 cfm. Moreover, airmovers are being used in both a *vertical* as well as a *horizontal* drying mode. More airmovers are being installed for more efficient drying (one per 10-14 linear feet of wall area, as recommended by the IICRC ASD Committee), but they remain for fewer days. Airmovers not only increase the rate of moisture evaporation from materials, but they also eliminate the stagnant air conditions required for mold growth, while they create slight evaporative cooling on surfaces and materials. The combined effect of air movement and evaporative cooling normally minimizes the potential for mold growth and amplification on materials during the drying process.
- **Dehumidifiers** have improved considerably. Conventional refrigerant dehumidifiers are being replaced with “low-grain refrigerant” (LGR) or even high-capacity desiccant dehumidifiers on larger jobs, by trained drying contractors. With LGR technology, dehumidifiers are able to function efficiently down to 32 grains of moisture per pound of dry air (gpp) as compared to conventional refrigerant dehumidifiers that cease efficient operation at around 55 gpp in specific humidity. Compared pint-for-pint, LGR technology represents a 42% improvement in dehumidification potential. Desiccant dehumidifiers, where practical, dry to much lower specific humidity ranges.

For successful “in-place” drying, it is highly recommended that contractors employ equipment of sufficient quantity and quality, which is reflective of prevailing industry technology.

Principles of Drying

There are four essential principles that provide successful drying and minimize the possibility of microbial development. In order they are:

1. **Excess Water Removal** – Absorbing, draining, pumping and vacuuming all are methods for removing excess water from furnishings and structural materials. Unfortunately, excess water removal is the most violated principle of drying simply because some contractors are not willing to make the investment in equipment and time to remove excess moisture adequately. Water removal takes place in seconds or minutes, compared to evaporation and dehumidification of comparable quantities of water, which may take hours or days to accomplish. It may be anticipated that proper extraction can shorten the “typical” Category 1, Class 2 drying job by several days.
2. **Evaporation** – Evaporation means changing water from a liquid into a vapor. Rapid air movement from professional drying equipment increases the rate of moisture evaporation into the air, thereby reducing the surface moisture available to support microbial growth, along with evaporative cooling of structural and contents components, to further inhibit microorganism growth and amplification.
3. **Dehumidification** – Once moisture evaporates from materials, the relative humidity (RH) and specific humidity (SH) of air increases, along with a corresponding increase in vapor pressure. Vapor pressure is the force exerted by substances in a gaseous state. It is vapor pressure that forces evaporating moisture into structural materials and cavities, and contents, which ultimately results in substantial secondary damage, while dramatically increasing the water damage scope and cost. Conversely, dehumidification lowers vapor pressure and draws moisture out of materials into the air to expedite drying.

4. **Temperature Control** – Effective temperature control affects the rate of evaporation, the rate of dehumidification and ultimately, the ability of microorganisms to grow.

For successful “in-place” drying, it is highly recommended that water restoration technicians employ all the essential “principles of drying” to the maximum extent practical.

Moisture Measuring Devices

It is inconceivable that any drying contractor would arrive on a job site without essential moisture measuring equipment to include, but not be limited to:

Moisture Probe – This tool defines the perimeter of moisture migration in carpet and pad. It is essential to define both the scope and cost of a water loss.

Thermo-hygrometer – Responsible contractors must determine the temperature and RH of the air outside and inside the structure in order to establish an optimum drying system. When employing a closed drying system, the thermo-hygrometer enables technicians to monitor the condition of ambient inside air, dehumidifier output, the air exiting the HVAC system, and even the air in unaffected areas. When temperature and humidity are known, technicians can calculate dew point temperature to avoid condensed moisture on components, specific humidity (the physical weight or quantity of moisture in air) and the vapor pressure. This essential instrument is the “key” that unlocks the door to the science of psychrometry.

Non-penetrating Moisture Meter – This tool enables technicians to detect pockets of moisture within walls or ceilings, under non-porous flooring (e.g., sheet vinyl, melamine laminates) or even under solid wood flooring. It provides a reasonably accurate measurement of the moisture content (MC) of structural wood as well. Once pockets of saturation are known, appropriate wall and floor drying systems can be installed for maximum drying effectiveness. Infrared imaging technology has been developed to enhance the restoration contractor’s ability to pinpoint and document pockets of saturation.

Penetrating Moisture Meter – This tool can be used throughout the drying job to ensure that materials are returned to a reasonable approximation of pre-loss condition before drying assets are removed. Penetrating meters with insulated probes give the contractor a layer-by-layer evaluation of moisture within a material to ensure drying to a pre-loss condition.

For successful “in-place” drying, it is highly recommended that water restoration technicians have available and use instruments for the detection of moisture, evaluation of drying conditions and ultimately for ensuring that structure and contents materials are dried to industry standards.

Documentation

It is highly recommended that at least two essential records be updated daily throughout a drying job to document proper drying that minimizes the risk of microbial growth. They are:

1. **Daily Humidity Record** – This is a record of the outside, inside, unaffected area, dehumidifier outlet and, when appropriate, HVAC temperature and RH. When the temperature and RH are known, technicians can employ a psychrometric chart or calculator to determine dew point temperature, specific humidity and vapor pressure, all of which are predictors of proper drying conditions. When updated during daily monitoring, equipment adjustments may be made to ensure optimum conditions for drying.
2. **Structural Materials MC Record** – The Daily Humidity Record ensures that proper drying conditions exist; *however, it does not confirm that materials are dry.* In each wet area, it is highly recommended that technicians use a penetrating moisture meter to confirm that the moisture content of structural materials has returned to a reasonable approximation of “pre-loss” conditions. Until predetermined drying goals are met, it is highly recommended that drying equipment remain in place and operational. Once drying goals for materials have been met and documented,

contractors can provide reasonable assurance that microbial growth, at least as it relates to the current water loss, cannot occur.

For successful “in-place” drying, it is highly recommended that contractors monitor drying jobs daily and maintain, at a minimum, a Daily Humidity Record and a Materials MC Record to confirm that proper drying conditions were established, and that drying goals were met. This provides reasonable assurance that mold cannot grow as a result of excess moisture remaining in structure or contents materials.

Summary

Whether or not to use “in-place” drying is dependent on several factors, all of which must be carefully evaluated if inadequate drying and subsequent microbial growth are to be avoided. They include but are not limited to:

- technician qualifications (academic and experience) and IICRC Certifications
- availability of technologically advanced equipment (extraction unit and tools; dryers and dehumidifiers)
- the technician’s understanding and use of the four “principles of drying” throughout the job, as well as the *Categories* of water and *Classes* of losses
- the availability and proper use of accurate moisture measuring instruments (moisture probe, thermo-hygrometer, moisture meters)
- written documentation of proper drying conditions (Daily Humidity Record) and results (Materials MC Record)

Limitations and Complexities

Even when the above criteria are met, there are limiting factors that make in-place drying inappropriate in every situation.

Category of Water – “In-place” drying of carpet, pad and affected materials is appropriate only when processing Category 1 water (clean source). Even then, professional judgment on the part of qualified and competent technicians is required. In Category 2 situations, separate carpet cushion always must be removed and replaced with “like kind and quality” (LKQ), based on consumer specifications. With Category 3 water damage, in addition to removing unsalvageable structural components, due to porosity or in order to expose pockets of saturation, both carpet and cushion must be removed and replaced, followed by cleaning, sanitizing and drying salvageable components.

Carpet – If carpet is discolored by furniture or other forms of staining or dye migration, or if it is severely delaminated, replacement of both carpet and cushion is appropriate.

Cushion – If carpet cushion has a non-porous polyethylene vapor barrier (skin) or if the pad is deteriorated by age or other factors, it is highly recommended that the carpet be disengaged, the pad removed, the carpet and structural components dried to industry standards, and new pad of LKQ, along with the restored carpet, be installed based on property owner specifications and in compliance with appropriate industry installation standards (Carpet and Rug Institute ***Standards for Installation of Commercial or Residential Carpet*** – CRI 104 or 105; IICRC S500).

Subfloor – If the subfloor is composed of a highly-porous wood material, which is likely to warp or sustain additional damage during drying; or if the carpet and cushion are installed over solid wood flooring, which requires specialized drying techniques to remove trapped moisture from pockets of saturation, then it is highly recommended that carpet be disengaged, pad (and carpet) be removed, and carpet and structural materials be dried to industry standards. Complete drying must be confirmed by comprehensive testing with appropriate instruments. This may be followed by installing new pad and restored or new carpet of LKQ (based on owner specifications) according to industry standards, followed by final cleaning, as required.

Commercial Buildings or Specialized Materials and Assemblies - In-place drying is appropriate primarily in residential and light commercial constructions. In addition, many materials and building assemblies require much more time or specialized procedures for drying. Finally, "A building is dry when it is dry." Specific drying times are determined by the trained and experienced contractor responsible for that job.

Conclusion

This may appear to be more information than most people desire when asking about the appropriateness of "in-place" drying. However, to provide overly simplistic answers to a seemingly simple but, in reality, complex question, not only results in increased potential liability for contractors and insurance carriers alike, but it also underestimates the importance of education, experience and professional judgment on the part of professional restoration firms and technicians. Further, modifications in this and other documents on similar subjects will be required as industry technology advances.

It is important to note that subsequent research, study and investigation taken during the pending revision of the IICRC S500 may change if, when and how the in-place drying technique is proper or appropriate, and the IICRC reserves the right to change or rescind portions of this paper, which are attributed to it.

Ultimately, it is highly recommended that insurance claims representatives, insureds and other materially interested parties ensure that they are hiring contractors who are exercising "due diligence" defined as: *proper care, attention or persistence in doing a thing; such a measure of prudence, activity, or assiduity, as is properly to be expected from, and ordinarily exercised by, a reasonable person under the particular facts and circumstances.* Further, it is highly recommended that those firms and technicians embrace the industry "standard of care" defined as: *practices that are common to reasonably prudent members of the trade who are recognized in the industry as qualified and competent.*

Regardless of any IICRC Technical Advisory on "in-place" drying, in every water damage loss and restoration circumstance, it is highly recommended that the selection and application of appropriate structural drying methodology, including "in-place" drying, be subject to the professional judgment of a qualified and competent water damage restoration professional. Therefore, this Technical Advisory cannot be relied upon to make project-specific decisions relating to the use of "in-place" drying. Any and all use of or reliance upon this Technical Advisory, and any use of "in-place" drying, is at the user's own discretion and risk. Furthermore, all water damage restoration projects are unique and in certain circumstances, common sense, experience and professional judgment may justify a deviation from the guidance set forth in this Technical Advisory. The IICRC expressly disclaims, and shall not be liable for, any and all damages of any nature whatsoever, whether direct or indirect, arising from or relating to the publication, use of or reliance on the information contained in this Technical Advisory, and this negation of damages is a fundamental element of the use of the information contained in this Technical Advisory, which would not have been issued without such limitations.

The IICRC invites and encourages professional and public review and comment. Please direct comments, suggestions and questions to:

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