New Technologies For Flood Abatement Can Save Money

by Paul Daniele

Recent innovations in restorative drying technologies are having a positive impact on flood abatement, an emerging area of facility management. Properly applied flood abatement techniques can result in dramatic savings in time and money for owners and tenants of flooded properties.

Why restorative drying?

Sometimes half loaf can be less than none. Point of example: we recently received a flood call from the management office of a large commercial complex. A maintenance manager reported 5,000 to 6,000 square feet of unoccupied office space had sustained water damage after a fire sprinkler was triggered accidentally by a workman.

On arriving at the scene, the operations supervisor met with the maintenance manager and explained the procedures we would use to dry the structure. Once written approval was received, the technicians began removing standing water, disinfecting carpets and setting up drying equipment. In order to determine the total extent of the damage, the operations supervisor took relative humidity readings and made moisture content tests.

Property management had made a wise decision in calling in a professional restorative drying company. Proper use of equipment and careful monitoring held the potential to dry the building to an extent comparable to pre-flood conditions and save the owners thousands in restoration costs.

The following day, the technician returned to the site for a progress check. Standard procedure suggests a follow-up survey of humidity levels and moisture content in walls and floors. But the tests were never made; the technician was met at the door by the maintenance manager and informed that "the facility manager wants all the equipment out of the building." When asked the rational behind such a decision, the response was, "The manager made a walk through and saw that carpets appeared to be dry. He just didn't want to spend any more money.

Regardless of the state of the carpets, the "dryness" of which was questionable, there was no question that walls still were saturated with water. Whatever the thinking behind the manager's judgment, the cosmetic appearance of the site and the real condition were two very different things. Whatever savings were achieved through premature termination of drying procedures surely were lost in costly, time-consuming restoration subsequent to the incident.

Improper drying and biological contamination

Unknown to the facility manager in this story, standing and surface water removal is only the beginning of proper flood restoration. Usually only 10 percent to 15 percent of water damage actually can be seen. The other 85 percent to 90 percent is hidden within walls and ceilings. If water has migrated into wall cavities and is left in place, mold and mildew will begin to grow. Eventually, it will affect the integrity of sheet rock and other structural elements.

Flooring is subject to similar degradation. Partially dried wood floors will buckle and cup. Wood that remains saturated with a moisture content of 30 per cent or higher eventually will succumb to dry rot. In the short term, indoor air qual ity (IAQ) will be unhealthy. Water-borne contaminates and residue

can permeate rugs, furniture, floors and walls, creating conditions that can become offensive, and even toxic, if not properly treated. An August 1989 report issued by the U.S. Environmental Protection Agency stated that, "Biological contaminates, an important dimension in indoor air quality, can be the principal indoor air problem in some buildings. They can spread infectious diseases, can cause or aggravate allergic response to allergens and can even (in extreme cases) result in death..."

A primary cause of biological contaminant stems from improper drying and disinfecting of water damaged structures and goods. Water, particularly that which is warmer than the surrounding atmosphere due to its location in the interior of a structure, is a breeding ground for biocontamination. Such occurrences as a breached roof membrane, HVAC malfunction, sprinkler damage, outside ground water, over flowing rivers or sewerage back flow can transform the most pristine of surroundings into a biological nightmare.

Of particular danger are sewerage-related cases. Sewerage back flows are rated as a Category 3 (very serious) situation by the Institute of Cleaning and Restoration Certification. Often referred to as "black water,' they are rife with pathogenic agents. While direct contact might seem to be a condition for infection in such instances, airborne vapor in the interior environment can be a source of contagion even after apparent damage has been abated, with structure and goods restored.

Time, temperature and humidity are the enemies that must be fought in order to restore healthful IAQ. Standing or dispersed water, with a structural humidity above 60 percent relative humidity and a temperature of 68 F, make a fertile breeding ground for contamination. Heightened humidity and temperature levels, when sustained, present an ever-increasing level of danger.

Biopollutants can attack through ingestion, inhalation or even skin permeation. Without proper treatment, wet, built environments can propagate gastroenteritis, dermatitis and infectious hepatitis, to name but a few life-threatening pathogens.

A brief history of the drying industry

Flood damage restoration has come a long way since the 1960s, when it was considered a "wet carpet drying service rather than a technologically sophisticated approach to restoration. In the past, wet carpets were removed and transported to off-site facilities for drying. Carpet dryers, having no restoration skills, did not concern themselves with the physical structure of a flooded building or its contents. Standard procedure was to let floors, contents and walls air-dry, resulting in carpeting disintegration and the necessary replacement of walls and floors.

By the mid-1970s, facility maintenance vendors were divided into two camps on the drying issue, with the background of individual floor restoration companies determining where they stood on the question. Janitorial and construction companies were the two dominant participants in the field at that time.

For obvious reasons, the restorer with a construction background was more apt to want to remodel or replace. Those with janitorial backgrounds were more inclined to save as much of the water-damaged structure and its contents as possible, absent remodeling revenues.

Subsequently, powerful portable drying equipment and sophisticated sensing devices have led the industry to one line of thought. The credo? To save as much of the structure and contents of the water-damaged property as possible through the application of carefully monitored drying regimens.

In part, this is possible because the technical means at the disposal of the drying specialist has changed. Restoration companies now utilize high-volume refrigerant and desiccant dehumidifiers that are extremely effective in removing large volumes of moisture in a relatively short period of time. High

speed air movers, essentially directional fans, have been developed especially for drying applications. Impedance devices derived from industrial applications can monitor precisely the moisture content of wood and other materials.

Using non-destructive methods, sensors transmit a low voltage current into building materials such as wood and plaster. Variances in the signal strength are converted into analog values on a visual scale, alerting restoration specialists to the presence of water. This allows the water damage restorer to inspect a structure without having to penetrate or damage fragile building materials such as wallpaper, sheet rock or wood paneling.

With the industry now of a single mind, professional standards and certification have come to the fore. Water damage restoration professionals commonly are members of the Institute of Cleaning and Restoration Certification (IICRC). This organization sets standards for and administers the training and testing of professional personnel. It is made up of 13 cleaning and restoration organizations throughout North America.

The IICRC promotes communication among its members and sets high standards. It also serves as a clearinghouse for new equipment and methods.

Basic flood restoration techniques

Flood abatement

The primary responsibility of a flood restoration company is to return all affected structures and materials to a dry state. This process entails five key steps.

Step one—make a flood-related safety inspection. Check for dangerous conditions such as structural damage, electrical hazards, pathogenic bacteria, mold and mildew. If any of these hazards are found, they should immediately be reported to the facilities department. A determination as to what extent water has actually migrated into a facility should be undertaken by means of a hydrosensor (moisture detector).

Step two—remove as much water as possible via pumps, portable extraction units and truck mounted extraction systems. Move or elevate any and all building contents that might be damaged permanently. Books, documents and other printed materials that are water soaked should be frozen immediately in anticipation of further remediation.

Step three—if carpet padding is present, compress carpets with a carpet roller to push out remaining water out of the padding. Re-extract the carpeting.

Step four—disinfect carpet. If it's not glued down, disinfect any underlayment to prevent mold and mildew growth.

Step five—set up dehumidifiers and air movers.

These five steps are applicable in virtually any water damaged environment. The restorer's special talent lies in the application of this five-step process in the actual drying of a water-damaged facility. In practice, the restorer surveys a damaged structure and assesses both building materials and contents that may require drying. This is followed by the creation of an artificially-dry interior atmosphere. The drier the environment, the faster the structure can be dried out.

To achieve this state, commercial grade dehumidifiers and air movers are utilized. The function of the air movers is to pull moisture out of structural materials, such as wood flooring, carpeting, drywall, plaster and framing materials, and transfer this moisture into the atmosphere. Then the dehumidifier (refrigerant) pulls the moisture laden air over its coils, converting the vapor to a liquid that can be

collected and pumped away, thus dehumidifying the air.

For drying wooden floors, sometimes desiccant dehumidifiers are necessary. Moist air is drawn in and directed over a water-adsorbing material. The product of this process is extremely dry air, which is exhausted into the area being dried with a relative humidity in the single digits. Such an approach also has the advantage of being able to dry in sub-freezing conditions.

Structural differences lead to varied approaches

While current restorative drying methods are largely standardized, every drying job is unique. No two buildings are the same, and owners and tenants have differing needs. Additionally, the type and extent of damage varies widely, as does the manpower and equipment required for remediation. The following three examples indicate the wide latitude in conditions encountered by water restoration specialists in their everyday work.

Example one: **An experimental high school**

A heating malfunction causes pipes to break on nine lower floors of an older, multi-story high school of concrete construction. Walls, floors and ceilings from the ninth floor to the mezzanine level are inundated with water. More than 100 air movers and 20 large capacity refrigerant dehumidifiers are required to begin abatement.

The mezzanine floor is carpeted, while its ceiling is partly embellished with hand-carved architectural plaster moldings, the form of which is threatened by water penetration. On the remaining nine floors, interior construction consists of sheet rock walls, metal framing studs and vinyl tile floor tiles glued to a concrete subflooring.

Time is a factor due to the fact that the facility must be ready to receive students at the beginning of a school term which is less than one week away. Our technicians explain to facility management that it will most likely take four to five days to dry the building. The hand-carved plaster moldings will need special attention.

To meet time constraints, as many air movers as can be obtained economically are utilized. Technicians also place more than 20 high-capacity dehumidifiers throughout the affected floors. They then remove cove baseboards and drill one inch venting holes in all affected walls. This allows air movement in otherwise isolated wall cavities. As with most drying jobs where inundation is a factor, equipment is run continuously.

In the mezzanine where the damaged plaster moldings are located, the ceiling is vented around the damaged moldings and specialized directional guides are utilized to blow dry air into ceiling cavities.

In an ironic twist of fate, a blizzard inundates the city on the day school is set to open. Yet because the building is structurally sound and no water penetration occurs from exterior sources, the delay allows a crucial extra day of drying time when school is canceled. Drying can continue, with ample time to remove equipment in the morning hours prior to the arrival of students. As school busses roll up in front of the school for the first day of classes, the last pieces of equipment are removed from what is now a fully dried building.

Example two: **A nationally recognized horticulture society**

One of the foremost horticulture societies in North America experiences the unthinkable: an overwhelming flood sends torrents of water through its headquarters and swamps its archival vault, damaging many priceless manuscripts and illustrated volumes. Within one minute of bursting, it is estimated that more than $1 million (U.S.) of rare books are damaged.

The first order of business is to remove all standing water utilizing truck-mounted extraction units. Work must be under taken with extreme care, in that while numerous volumes remained undamaged, the presence of large amounts of water presents the possibility of secondary damage to the remaining volumes due to elevated humidity levels within the vault.

Hygroscopic (water absorbing) materials such as books, whose molecular structure is highly porous, will absorb water vapor from the surrounding environment. This condition requires us to bring high-volume dehumidification devices into play.

In consultation with society personnel and rare book conservators, volumes are patted down with absorbent paper within hours of the break and removed directly to truck-mounted commercial freezing units that have been procured on a contingency basis. The rational behind this action is that freezing slows, then stops entirely re-liquefaction and running of ink. Additionally, mold and mildew are arrested immediately, preserving leather bindings and fragile pages. In similar fashion, the glue used in bindings is preserved. Within 90 minutes of the break, books are being frozen, boxed and inventoried prior to removal to an ice company warehouse to await complete restoration under controlled conditions.

Yet a further challenge awaits the drying team. Voluminous quantities of printed materials remained in-place on the shelves of a library facility surrounding the vault where the original rupture has occurred. This presents a unique problem—the building structure requires immediate drying if wholesale loss is to be avoided, yet the library staff asks that certain criteria be observed in order to preserve valuable texts.

First, relative humidity has to be held at approximately 50 percent. Second, temperatures of approximately 60 F are a requirement. Glues used in fabrication of old books maintain their integrity within a relatively narrow humidity range. Too much softens them inordinately; too little leads to cracking and powdering.

Careful testing shows most effected areas to have a relative humidity of 80 percent in the period immediately following the flood, well above ideal levels. Clearly, remediation is required, yet the notion of bringing humidity levels in the structure itself down to only 50 percent is outside of accepted drying practice.

Standard procedure requires that relative humidity quickly be brought as low as possible for reasons noted earlier. Yet conservators are concerned for the physical integrity of the society's collections. The compromise adds substantially to the time and cost required to dry both books and structure to acceptable levels, but in the end, saves much of what constitutes one of North America's great collections of horticultural literature.

A footnote to this exceptional case lies in the circumstances surrounding those volumes so thoroughly soaked as to require freezing. Safely at rest in a massive commercial freezer facility in upstate New York, they await the attentions of conservators who will freeze dry them, much as fruits and vegetables are prepared in making light-weight packaged foods.

Once sufficiently restored so as to allow handling, each volume will be scanned to a CD disc. With a digitally precise copy preserved forever on easily accessible computer media, the twin goals of conservatorship have been achieved—original volumes can be protected from environmental extremes while access to "virtual originals" will be no more complex than making a keystroke on a computer.

Example three: **A personal residence of historic significance**

On the third floor of an estate home in a well-to-do suburban location, a domestic water service pipe ruptures. Without the knowledge of household members, water runs continuously for an estimated 48

hours, collapsing ceilings on the second floor and cupping wooden floors on the first floor. Walnut paneling on the first floor also is inundated with water and begins to split.

One desiccant and two refrigerant dehumidifiers, along with more than 30 air movers immediately are brought into play. The wood floors and walnut paneling are of particular concern to insurers, who estimate the cost of replacing the paneling alone at $75,000. A complicating factor lies in the express desire of the property owner to make the property available for rental within a matter of weeks.

A desiccant dehumidifier is brought to bear on the rooms where paneling is located. Desiccant drying is useful for its ability to pull high amounts of moisture out of the air while returning exceptionally dry air back into affected areas. This allows moisture in structural and finished wood to be removed very effectively.

The application of appropriate drying devices is relatively straightforward and quickly accomplished. The mansion, with its walnut paneling and spacious wood floors, is saved from lengthy and expensive rehabilitation. The insurer incurs some costs, but substantially less than might otherwise have been the case. Likewise, a considerable amount of the owner's potential rental income also is saved.

Implications for facility managers

In qualifying and entering into an agreement with a flood abatement firm, a number of factors come into play, not the least of which are notions of ready response and field force capability consistent with practices that might be observed by a well-managed municipal fire or police department.

In practice, flood abatement companies must have substantial equipment and manpower resources if they are to serve effectively. Operational depth is crucial for those occasions, such as heavy rainfall or pervasive ice damming, when numerous facilities will be impacted virtually simultaneously.

In order to offset this conflict, facility managers should interview and qualify a water restoration company well before a problem or protracted time of risk due to seasonal factors occurs. New Year's Eve, when your entire accounting section is under water, is not the time to initiate a search.

Qualifying a water restoration company

What are some of the criteria you can use in assessing the readiness and field capabilites of a water abatement specialist?

- Ask about manpower complements and actual procedures in the event of a flood. Numberous, well-trained personnel are essential for timely, correctly implemented water abatement. Written case histories help confirm professional capabilities.
- Determine the type and extent of equipment actually held in the vendor's depot(s), including pumps, air movers, dehumidifers and portable and truck-mounted water extractors. This is of particular importance for two reasons: additional equipment is not easily obtained in times of flooding and larger, multi-story commercial facilities can require large-scale remediation.
- Determine ready-response and communications capabilities. True, 24-hour service and on-call management is a baseline requirement.
- Ask for IICRC membership and in-service training certificates. Flood abatement professionals seek membership in this organization for access to current methods and quality assurance programs.

Be prepared

An amazing 70 percent of all insurance claims are water related. The odds of a flooding incident in a

facility under your management are high across an extended period of time, whether due to weather or system failure.

As a facility manager, your mandate is straightforward: maintain all properties under your direction in a fully usable state. Professional flood abatement services can be a useful means overcoming a disaster while minimizing disruption and preserving property.

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