# An IESO Standard for Catastrophic Water Damage Probes

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The use of thermal imaging or infrared (IR) thermography in water damage restoration is a relatively new concept. In 2004 IET invested over $15,000.00 in equipment and training on a basic entry level camera that we still use today with excellent results. Five years ago there were only a handful of contractors using these tools. Today you can purchase a camera with similar features to our original camera for under $4000.00.

IR cameras are becoming another toolbox item according to Neil Moyer of the Florida Solar Energy Center, similar to moisture meters and thermo-hygrometers for moisture and mold investigations. With the increased availability of these cameras, there has come the unintended consequence of, "Now that I have it, I think I know how to use it" syndrome. Performing an IR inspection needs to be defined. In this article we have interviewed four experts related to this field; Lew Harriman, Neil Moyer, Carl Grimes and Tim Toburen. We will share their feelings on why Indoor Environmental Standards Organization (IESO) should create a standard for the investigation of buildings for catastrophic water damage using IR cameras.

The IESO is a non-profit organization dedicated to the creation of consensus-based standards that provide solutions for healthy indoor environments. IESO was founded in 2002 and maintains a headquarters in Rockville, MD.

In 2006 IESO entered into the Unification Agreement with IAQA and AmIAQ. Shortly thereafter it became an accredited standards development organization by the American National Standards Institute (ANSI). Additional information, including how to propose a standard and how to participate in writing or reviewing standards is available at the IESO Web site http://www.indoorstandards.org.

Three standards already under development in 2006 were transferred to the ANSI process for IESO development. Subsequently, six more standards have been approved, including Thermography to Assist the Restoration of Catastrophic Water Damage.

According to Carl Grimes, one purpose of this IR standard is "… to reduce the all too frequent errors which result in either excess work or insufficient identification of water damage and mold growth. Either extreme leads to unnecessary costs, the potential for continuing harm to the occupants, and a bad reputation for the entire water damage restoration and mold remediation industry." The three most common myths associated with the use of IR cameras are:

1. IR sees through walls into wall cavities.
2. IR sees mold in wall cavities.
3. If IR doesn't see moisture, then there is no moisture and there can be no mold.

Infrared thermography detects the amount of thermal irradiation emitted by a surface. It **does not** see through walls or into wall cavities, directly detect mold or moisture or show that an area is either supporting mold growth or mold free. These erroneous concepts are commonly held by the uneducated camera operator and general public and have taken on somewhat of an urban legend status among neophyte camera users and their clients.

When IET's clients ask me if there is mold in the wall, while I am using our camera, I advise them that I left my X Ray glasses back on Krypton and then try to explain what an IR camera can and cannot do.

So what does an IR camera do? It detects temperature differentials. The amount of infrared radiation emitted by a surface increases with temperature. Warm and cool objects in the

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same image will have different color or contrast qualities that need to be interpreted correctly. In a catastrophic water loss, generally this contrast will be greatest at the beginning of the water intrusion event and gradually diminish as equilibrium moisture content of the materials not directly affected become closer to saturated, based on their hygroscopic qualities. With the establishment of an effective drying system, this process reverses itself, and temperature differentials again become more obvious, showing where materials are drying and what materials or areas need more drying resources.

### The Need for a Standard

Based on the erroneous perceived IR abilities, the proliferation of cameras as inspection tools, and the quality and quantity of reports generated with misinformation, the need for a standard has arisen. The quality and accuracy of many IR reports are lacking in content and useful information that will allow the reader or technician to make informed decisions. IESO has approved the development of a standard titled "Thermography to Assist in the Restoration of Catastrophic Water Damage."

The purpose of this standard is to help water damage restoration technicians reach useful, consistent and technically-correct conclusions as they use thermal cameras during the assessment, documentation and restoration of catastrophic water damage in buildings.

This standard applies to the use of thermal cameras to help locate and to document areas suspected of having elevated moisture content after a catastrophic water damage event. A catastrophic event is defined as an unexpected, unusual or one-time occurrence, and it is one in which the sources of the water and its initial locations or penetration points are generally well-understood.

This standard **does not** extend to the use of thermal cameras in forensic building investigations such as determining the causes and pathways of chronic water damage problems or determining the causes and pathways of water leaks through the exterior enclosures of buildings. A chronic water damage problem is defined as one which occurs repeatedly and intermittently over an extended period of time rather than as a one-time, unexpected, catastrophic event.

According to Lew Harriman, principle with Mason Grant Consulting, our industry needs this standard to "… reduce confusion and increase certainty about the scope of restoration needed for catastrophic water damage. With that clear focus, it will also distinguish between the level of training needed for water-damage operations as compared to the far more complex job of forensic investigations of chronic water damage, which is not part of this standard."

Tim Toburen, senior thermographer and building scientist with IET noted that, "… those using these cameras need to understand that absence of obvious and useful IR images during an inspection does not mean all materials are dry, as a wide variety of factors may contribute to a false negative. Similarly, many factors may result in false positives, showing significantly cooler surfaces in the absence of moisture."

Neil Moyer, a building scientist with the Florida Solar Energy Center (FSEC) believes that a camera is only as good as the "nut" behind the wheel. "A standard would provide a minimum guideline in its use. What it can and should be used for." In his experience, he has seen documentation of IR images that have made statements that are "… clearly wrong, such as seeing through walls, moisture detection, and the only tool required. These phrases worry me. The industry needs to sharpen its vision and promote trained professionals."

Standards have defined how we do our work in this field. The better we outline the IR inspection process, the greater the level of credibility will be attached to the reports generated following these guidelines. Giving our industry a measuring stick to judge the level of care and technique needed to accomplish our specific restoration tasks has proven worthwhile over the years. Standards for water damage restoration, carpet cleaning, applied structural drying, asbestos and radon mitigation and mold remediation are just a few that directly guide us in the work we do. Training has been a key to documenting the qualifications of the technicians performing this work and these training classes reference the current standards for each field. IR inspections need such a standard.

When asked about the importance of an IR standard for our industry, Neil Moyer responded "Standards provide a level playing field to the market. They also can provide a minimal level of competency required for the IR camera operator." He went on to say that the complex nature of construction and construction materials today and the variable climates a thermographer is likely to experience all have to be considered when diagnosing a catastrophic water loss.

According to Tim Toburen, "A thermal imaging standard has great potential to define the inspection process. This compliments water damage restoration procedures and can make them more understandable to the property owner, occupant or insurer. IR's ability to show graphic representations of wet areas is invaluable in this regard, as its potential to show drying progress over time and then document successful completion of the project. A recommended standard procedure for thermal imaging in these environments would help standardize reports and make them more useful to those concerned. It is also critical that those using these cameras know how to use them properly and what they can and cannot do."

According to the experts that were interviewed for this article, a standard should be specific as to the minimum level of skill required to perform the task; it should define the procedures for performing the task; and it should discuss the advantages and limitations of the equipment and procedures with relation to the task. It is important to consider the

relevance of a multi disciplinary background necessary to perform moisture investigations. A strong working background in applied structural drying, construction and building science are closely tied with each IR project; as these separate disciplines all need to come together when creating your report. The field notes as well as the report should all be part of your company's standard inspections operations procedure manual to ensure consistency in your reports.

Lew Harriman goes on to say, "Only those things relevant to the use of IR cameras for catastrophic water damage situations should be included. These types of water damage are less complicated than forensic investigations of chronic water intrusion. There is no real benefit to the cost of training for forensic investigation when all that is required for catastrophic water damage is a basic understanding of thermal imaging and the importance of validation of thermal images with moisture meters."

Toburen agrees in concept with Mr. Harriman: "The standard should include a description of the training appropriate for a restorer using thermal imaging as well as a description of how to interface IR images with moisture meter readings. Photographic documentation should be outlined in a report format and include recommendations for side by side or picture-in picture visible light/IR images, which are necessary for most people to interpret the images."

With these comments from our experts, we begin to see an emerging pattern of consistency showing a need for a laser focused IR standard for catastrophic water damage losses using this relatively new technology. When the key pieces of information related to a specific project are generated by data comprised of IR images and the interpretation of these images, it becomes crucial that this information is accurate and that those generating this data are educated in the technology and qualified to do so.

The interpretation of IR images must be based not on the image alone, but on supporting auxiliary data that confirm or deny the hypothesis that the image portrays, because it is only a hypothesis until it is supported. IR cameras make our job easier. They can scan a room in moments where moisture mapping with meters can take hours. During the hurricane seasons of 2004 and 2005, IET performed dozens of large commercial projects where the use of this technology provided us with easy access to 40 foot ceilings in church sanctuaries and the rapid scanning of multiple hotel rooms. All initial readings were supported by moisture mapping and T/H readings. As patterns emerged we were confident that we understood the data properly and could make accurate and informed decisions.

Many companies performing moisture investigations have a history of creating in-house standard operating procedures for these types of inspection. These SOP's provide in-house guidance for the technicians in performing their tasks and ensure consistency in the reporting process. An IESO IR standard will provide us with an industry standard; a measuring stick we can use to guide us. This proposed standard will be created by industry experts and industry review consensus agreement on how an effective IR investigation for catastrophic water damage should be performed. IESO welcomes participants to the creation of this new standard and can be contacted at http://www.indoorstandards.org.

Thank you to the contributors to this article. They can be reached at:

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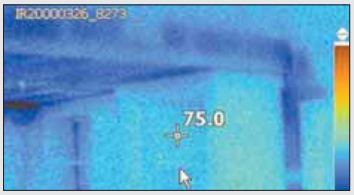


*Thermal image of water damage from burst water pipe several floors above.*

*Visible image of the same photo with technician.*