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# IR Thermography In The Building Science Industry

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## ABSTRACT

Building assessments for water detection can routinely be performed using an Infrared (IR) thermal imaging camera. Infrared camera surveys were performed at various locations in buildings to evaluate if building material was wet or not. The rapid IR camera surveys allowed for hard to reach area evaluation, quick survey of the building as well as provided images for the survey report.

**Keywords:** Moisture detection, building diagnostics, IR surveys, infrared, thermography, building thermography, mold, thermal imaging.

## INTRODUCTION

Currently, building moisture surveys are performed using moisture-detecting equipment other than infrared imaging. These include non-destructive and penetrating moisture meters. Both types of these moisture meters require direct contact with the building material surface. This requires considerable time necessary to "scan" all surfaces of the building being surveyed. Because contact is required, hard to reach locations limit the effective use of moisture meter instruments. In contrast, an IR camera detects moisture by imaging the different temperatures of wet versus dry building materials. With the infrared camera a simple 'point and shoot' can locate probable wet conditions of building material surfaces and potential areas of mold and microbial growth. In addition the images provided by the camera can be used to visually document the condition of the building being surveyed, and are useful for inclusion in the survey report. Both the non-destructive and the penetrating moisture meters require the surveyor to record the readings onto paper, creating a potential for error or the introduction of false readings. The IR camera allows for nondestructive detection of water entry, quick survey of an area, automatic visual documentation and images that can reveal potential threats to property and life.

## CASE 1: NONDESTRUCTIVE MOISTURE DETECTION

Water staining was noticed at the center of a bedroom ceiling in a condominium that was directly below a cement patio indicating water intrusion. Four Star was called to the site to perform a non-destructive moisture detection survey. No obvious water intrusion points were observable on the cement patio directly above the ceiling showing the stain. A nondestructive water test was performed by applying water to various portions of the patio above the bedroom ceiling while inspecting the ceiling from below with an IR camera. During the infrared camera inspection, water could be seen entering the ceiling by means of its thermal signature before other moisture detection equipment could sense and identify the water intrusion.

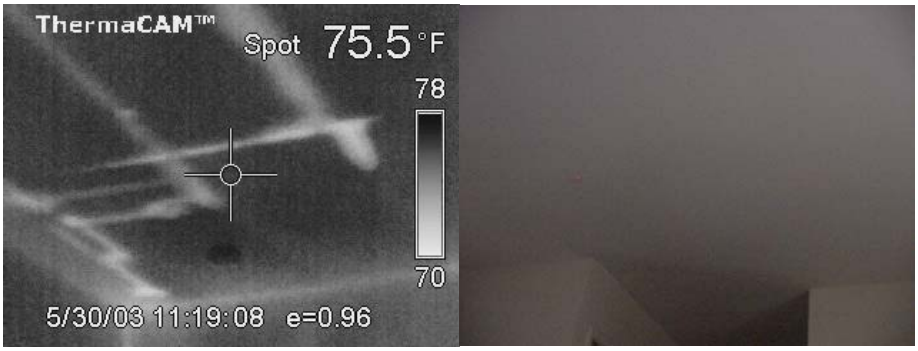


*Figure 1. Thermogram/photo pair showing moisture detected on a ceiling (lighter areas).*

Figure 1 shows the infrared image of the ceiling after the test. The lighter images indicate cooler wet sheetrock. A non-destructive moisture meter was used to confirm the presence of moisture where indicated by the IR imaging. At the beginning of the water test, moisture intrusion was visible beginning at the edge of the ceiling and not in the center of the ceiling where the water staining was first visible.

Further examination of the areas above the room revealed a failed door threshold just above the discovered intrusion point. Without the infrared camera we would have first removed the ceiling of the bedroom at the location of the water stain to pinpoint the water intrusion point. Because the actual leak was not directly above the stain it would have been difficult to pinpoint the source. When using the IR camera in conjunction with the water test we were able to pinpoint the water source without needing to open the ceiling, and possibly missing the entry point altogether.

## CASE 2: A DIFFICULT TO ACCESS SITE

A water pipe broke on the third floor of a hotel, sending water throughout the third floor and the two floors below. Four Star's water division was called to perform emergency services on the water-damaged structure. A quick IR camera survey of the three floors was performed allowing for a quick determination of the affected areas to evaluate swift and efficient placement of drying equipment. One area of the hotel that was of concern was the lobby ceiling. The ceiling was at a height and location that prohibited direct moisture testing using standard non-destructive and penetrating moisture meters. Ladders would have blocked entry and the procedure would have required a considerable length of time to adequately survey the whole lobby ceiling. As shown in Figure 2, within minutes moisture was located in the lobby's ceiling using the thermal imaging camera. Because the specific areas of the ceiling could be determined so quickly and precisely, we were able to place drying equipment only in the areas needed to safely dry the areas involved.

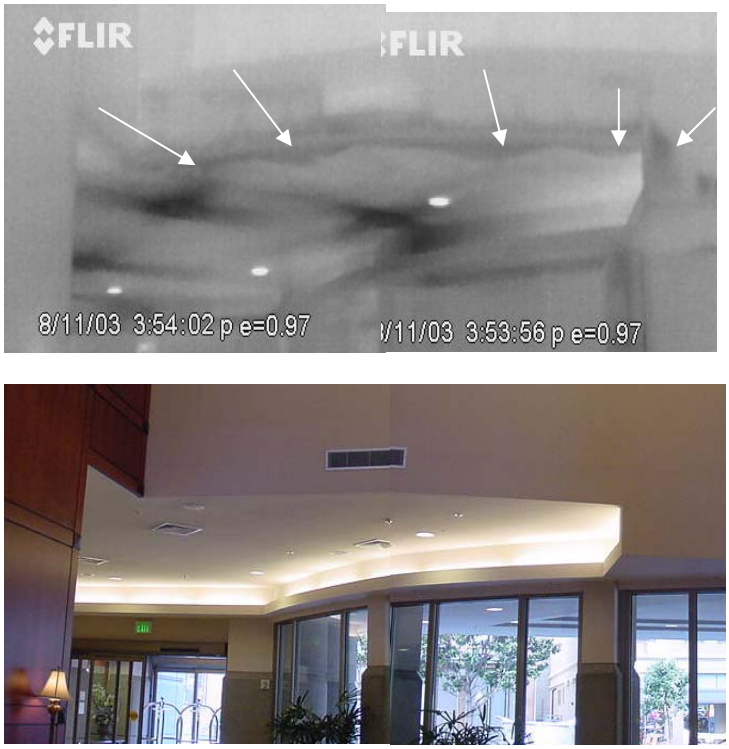


*Figure 2. Thermogram/photo pair showing moisture detected on the ceiling of a hotel lobby.*

## CASE 3: POTENTIAL HAZARD DISCOVERY

*Fire occurred at a garment dying facility. We were called to perform emergency services and were on-site about 10 hours after the fire was knocked down. An infrared thermographic inspection revealed a potentially explosive drum of sodium hydrosulfite that was still hot hours after the fire was extinguished. Figure 3 shows the 32-gallon drum still sitting in the ashes of the fire. Water reacts with sodium hydrosulfite to produce poisonous hydrogen sulfide gas, and enough heat to cause spontaneous combustion and a potential explosion in the sealed container. A hazardous waste hauler, the fire department, and HAZMAT were called and disposed of the drum, preventing a possible catastrophe.*

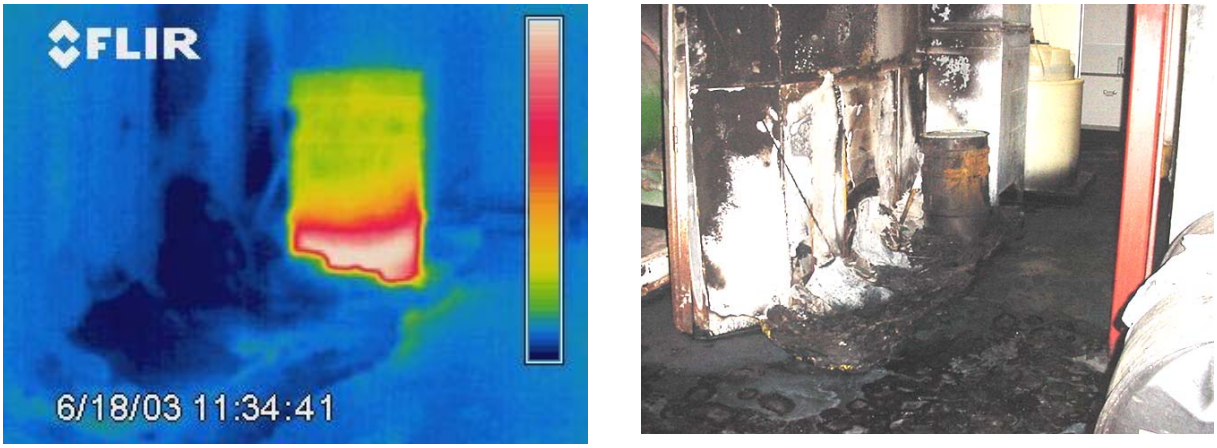


*Figure 3. Thermogram/photo showing the heated sodium hydrosulfite in a 32 gallon drum.*

## SUMMARY

Current building moisture surveys performed using moisture-detecting equipment such as moisture meters are slow and prohibit surveying hard to reach locations. An infrared thermal imaging camera detects moisture by imaging the different temperatures of wet versus dry building materials making it the ideal tool for a building moisture survey. Nondestructive water intrusion testing can be performed using the IR camera. Areas surveyed by the IR camera can be located before standard moisture detection equipment can. A moisture survey of water damage can be performed with the infrared camera simply by walking through the affected building. Areas inaccessible to standard moisture meters can be surveyed with the IR camera quickly, easily, and with little hindrance to the customer. The IR camera survey allows input of actual images documenting the areas precisely and clearly. Using infrared, potential threats to property and life can be discovered such as the exothermic reaction of the 32-gallon sodium hydrosulfite solution.

## REFERENCES

1. Sean Fallon, “Moisture meters help detect, locate, measure water in building materials”, *Indoor Environment Connections*, October 2002.

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