The Case for Aerial Infrared

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FORWARD

Infrared thermography has become a very popular means of testing electrical and mechanical systems over the past fifteen years. As it relates to predictive/preventive maintenance (P/PM), infrared thermographers look at the thermal energy that is emitted from an object or group of objects, explain what is normal, see abnormalities, and report them. In turn, someone can act to fix whatever is wrong as long as they get the information in a usable, graphic and easy-to-understand fashion. This method works well on heat emissions from most objects, including building roofs. A well-prepared, graphic, accurate map of the infrared signatures of a roof can be of significant benefit to the roof consultant at all stages of that roof's service life. This type of testing is commonly referred to as an infrared roof moisture survey. Infrared thermography is not leak management, it is predictive maintenance. No matter how the water got into the substrate, the purpose of this type of survey is simply to find and document where the water is. Performing infrared roof moisture surveys while standing on the roof is not the best method because imagery from a walk-on survey is not as useful as aerial imagery.

The school of frozen toes

Our company began looking at roofs by walking them with infrared cameras early in 1990. A couple of facts became clear rather quickly:

a) Since there are so many types of roof systems in use, one standard testing plan for performing all roof moisture surveys was not going to work. Each roof system has different thermal properties: that is, it may absorb and emit heat at different rates.
b) Sometimes a roof cannot be successfully surveyed under any circumstances.
c) We did not know enough about the roofs we were surveying. The thermal patterns were sometimes fantastic. Clear outlines of subsurface moisture in one roof would be followed by very mottled and almost unreadable imagery on another. Conditions could and would change radically over the course of the night, sometimes before our very eyes when a cloud came over or dew formed on the roof.
d) The infrared camera's wavelength, filters, windows, and lenses could dramatically affect the quality of the imagery.
e) Even with a strong infrared signal, factors on the roof could affect the analysis and interpretation of the data. Some of these factors: water between multiple layers, old patches, heavy flood coats, reflective coatings, heat-producing equipment under the roof (or heat blowing down onto the roof), stains on the roof, ponding, heavy build-up of ballast at parapet walls and along edges, etc.
f) Surveying roofs was a labor-intensive, time-consuming, and at times, dangerous undertaking, requiring a great deal of planning and preparation.
g) Information on the target roofs was, at best, sparse; and at worst, non-existent, especially the drawings. Often, information on the roof types, repair history, and as-built drawings was simply not available. Many times the drawings were not to scale and were incomplete, lacking many of the objects that we saw when we climbed up on the roof.

These revelations did not discourage us from performing roof moisture surveys. We knew that it worked well on most roofs. We just had to figure out a better way to perform the inspections. In the case of roofs, infrared thermographers should see their role as providers of infrared imagery—nothing more, nothing less: the mappers of heat. We do not profess to know everything about roofs or how to fix them. Our role is to obtain and provide information that will help experts at roof construction, installation, and repair.

Once Upon a Roof

Many consultants have been on a roof when an infrared roof moisture survey was being performed.Those who have can relate to the following:

When we started conducting walk-on infrared inspections of roofs, we had no idea what nightmares these surveys could be.