TWO VIEWS Infrared imaging (right) can reveal problem spots on roofs not normally visible to the naked eye (left).

Locating Leaks

Infrared technology can help uncover roof moisture problems

By Jeffrey L. Gadd | Photos courtesy of Vision Infrared Services

Waterproofing problems manifest themselves in two ways: leakage and entrained moisture contamination. Leakage is pretty simple, although the leak inside the building rarely directly relates to the exact spot on the roof, since the water flows down the slope of the roof to a spot that is not sealed and into the building at that point. Most leaks on the roof occur where the waterproofing is not sealed or where a penetration through the roof is not sealed. Detecting entrained moisture contamination can be more problematic. Since most types of roof systems absorb some amount of water, it is harder to find the exact spot of water contamination in the insulation because it may not leak into the building until it has absorbed all the water it can hold.

There are three types of surveys that are used to find water in a roof: nuclear gauges (which count neutrons), capacitance meters (which measure resistance) and infrared (which measures heat). Both nuclear gauges and capacitance meters are used to take spot readings on a 5' x 5', 10' x 10' or 20' x 20' grid on the roof. These measurements are used to extrapolate where the water is, from the readings obtained by the gauges. These surveys are very labor-intensive and sample a relatively small area. They are good for types of roofs that do not gain or lose much solar energy and, therefore, do not lend themselves to infrared. However, when circumstances permit, infrared is the best option.

Roof infrared basics

During the day, the sun radiates energy onto the roof and into the roof substrate, and then at night, the roof radiates the heat back into outer space. This is called radiational cooling. Areas of the roofs that are of a higher mass (wet) retain this heat longer than that of the lower mass (dry) areas. Infrared imagers can detect this heat and "see" the warmer, higher mass areas, during the "window" of uneven heat dissipation.

Roof inspections

On-roof inspections are a good option when the roof is 100,000 square feet or less. It is more cost-efficient and often can be completed in one evening.. Think of wet areas on a roof as a pop tart and dry areas as a piece of toast. The wet

areas retain their heat longer than dry areas making them visible with infrared.

Aerial infrared

Aerial infrared is of superior quality. With this process, larger roofs, from 100,000 square feet to over 1,000,000 square feet, can be surveyed in one evening. Another benefit is that there is no need for coordination of technicians being on the roof at night. The entire roof is captured in one image for comparison to the digital photograph as well as an AutoCAD drawing highlighting areas of probable moisture contamination. The quality and accuracy of aerial infrared is unparalleled to other methods.

Difficult roofs

Different types of roofs lend to different challenges varying in degree. Roofs with multiple layers, roofs with reflective coatings and heavy ballasted roofs are difficult and have their own unique challenges. They are not impossible to inspect but offer more challenges than other roofs.

Roof leaks can be a facilities nightmare if not resolved quickly. I would encourage building owners to have an infrared inspection done prior to the expiration of any roof warranty – before problems arise. Obviously any areas of moisture contamination would still be covered under warranty. There are a few methods for locating roof leaks but infrared is fast and noninvasive.

Infrared also allows you to locate the wet areas and repair only a small portion of the roof instead of a complete tear-off. Some building owners think they need a completely new roof and may be sadly mistaken. If 15% of a roof is wet, it only makes sense to repair/restore those areas while the majority of the roof can be left intact. P

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