

Recognizing and Addressing Moisture Concerns

by Mike Endredi

Moisture within a building can leave a building owner feeling panicked, perplexed and helpless. The myriad of moisture sources can be overwhelming. Moisture sources can be as simple as an obvious hole in the roof or as complicated as condensation from an improperly installed vapor barrier. Unfortunately, tracking down the source of moisture intrusion within a building envelope is not as easy as looking directly above a puddle.



Often times, moisture intrusion can be a reoccurring problem that leaves maintenance crews continually tracking leaks and attempting to bandage suspected sources. As a result, solutions are often knee-jerk reactions to the moisture and are hastily conceived without much investigation or thought.

Fortunately, there are methods for recognizing moisture sources and for ensuring that moisture control is a proactive process as opposed to a reactive one.

Identifying Moisture Sources

A systematic approach to moisture control is the most efficient alternative to constantly “fighting fires,” saving building owners both time and money. Admittedly, unless a building has been perfectly designed and maintained, moisture mitigation will always start with a reaction to a problem. The proper reaction is to thoroughly investigate all potential sources of moisture intrusion until the source is identified. Only then can the proper solution be developed and implemented. Thorough investigation begins with utilizing appropriate tools and methods to create a theory for moisture mitigation. Investigation can range from general scanning to more specific sampling.



(Figure 1 The source of water within a building is often difficult to identify.)

Single Ply Roofing Industry (SPRI) recommends beginning searches inside the building, starting with walls and ceilings. The interior condition will often direct the exterior visual investigation. When scanning for leak causes, it is important to keep in mind the common causes of roof problems. The National Roofing Contractors Association (NRCA) “Manual of Roof Maintenance and Repair” lists common causes of roof problems and states that the “greatest cause of premature roof problems” is lack of maintenance. Other contributors according to the manual include weathering, wind damage, improper design, drainage and a myriad of material and flashing issues.

Visual Investigation

Visual investigation is the simplest and most easily accomplished method of investigation. Visual investigation can be used to generate theories that can later be validated with other investigation techniques. Visual investigation involves casing a building and visually inspecting the roof and walls for obvious potential moisture sources. A comprehensive visual inspection may reveal failing materials, faulty installation or poor detailing—all potential sources of moisture within the building. Special attention should be placed upon details, joints, flashings and any other discontinuities or terminations. SPRI specifically recommends the following details in order of importance as critical for visual inspection:

- Cap Flashing
- Edge Metal
- Base Flashing
- Penetrations
- Field of Roof
- Ballast
- Roof adhesive and surface coatings

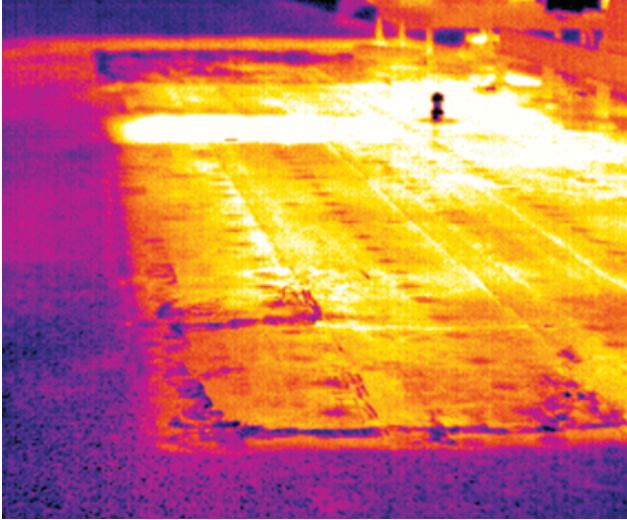


(Figure 2 A thorough roof investigation requires investigation of flashings for cracks.)

The NRCA “Manual of Roof Maintenance and Repair” reinforces SPRI’s emphasize on the criticality of flashing inspection and says that “many early roof problems are actually flashing problems” and that “the importance of maintaining them cannot be overemphasized.”

Moisture Scans

If visual inspections do not conclusively establish a source of moisture intrusion, an infrared or nuclear scan can be used to shed more light on where moisture may be located in a roof assembly. Further, any issues or concerns revealed during a visual inspection can be validated by a moisture scan. Infrared scans are often performed at night when a roof or wall surface cools down as the heat absorbed from the sun dissipates. Because moisture retains heat better than most materials, warmer temperatures often indicate the presence of moisture. Thermal images provide a map of plausible moisture sources. Nuclear scans are necessary over gravel and ballast surfaced roof assemblies where infrared does not work as well. Once moisture scans are complete, core cuts should then be taken to visually verify the results.



(Figure 3 Warm spots discovered in infrared scans indicate wet materials.)

Core Cuts

A core cut is the most intrusive of investigation techniques and involves cutting into the roof or wall substrate to obtain an understanding of the components within the assembly. A core cut on a roof or wall may validate information gathered from visual investigations and infrared scans. Special attention should be paid to where within the assembly moisture is first noticed. For instance, if moisture is noticed on the bottom of roof insulation – between the deck and the insulation – that’s an indication that moisture may be accumulating from the inside of the building or that the moisture is finding a path inside from a location not directly above the location of the core cut. Information gathered from a core cut can also be used to predict the performance of a wall or roof based upon the materials and the order they were installed.

Hygrothermal Analysis

If the investigation above leads one to believe that condensation is causing the moisture problem, a Hygrothermal analysis may be conducted. Hygrothermal analysis programs, such as WUFI, use known information or predictions regarding a roof or wall assembly and the internal and external environment to predict moisture mitigation through the various assembly materials. A hygrothermal analysis cannot be used to locate a “leak” in the typical sense, but can create a reasonable hypothesis of the way moisture moves through a particular assembly and whether that moisture should be expected to condense within the assembly. Problems recognized from hygrothermal analysis are typically relegated to faulty design, faulty detailing or failing material. Predictions made from other investigations can be validated by the hygrothermal analysis and can then be used to present a solution.

Addressing Issues

After the building has been thoroughly investigated, a solution can be proposed for addressing the suspected cause of moisture. The proper solution may range from a

simple patch, to the generation and installation of a new detail, or it may require the proper application of a specific product. In any instance, a comprehensive preventive maintenance program is a good start to preventing future moisture issues.

According to SPRI an inspection routine should be employed during transition periods between seasons as well as after severe events like storms or unusual weather.

Major focus points of a good preventive maintenance program are the things that are often overlooked. The list of potential points of surveillance is extensive, and it is not limited to those listed in this article. Debris buildup blocking a drain can lead to water ponding and flooding a roof. Sealants should be checked to ensure they have not become brittle due to exposure to the sun or from aging. Aged roofs or flashing membranes may be cracked and could benefit from restoration with a reflective coating. Masonry walls may have spalling joints which need to be re-tuck pointed or the wall may need to be coated to prevent the masonry from absorbing moisture. The list can go on and often times a custom set of solutions and recommendations must be generated based on the particular details of a building. The following steps for prevention of roof issues should be adhered to:

- Maintain a clean roof
- Train maintenance crews regarding the intricacies of the particular roof system
- Monitor drainage systems and ensure they remain functional
- Limit roof access to authorized personnel
- Perform a formal, consistent roof inspection at least once a year

For proper maintenance and inspection, owners should turn to partners who can provide guidance in identifying problems, proper repair material selection, and quality installation. Full-service manufacturers are ideally suited to this task as they are capable of bringing together the expertise, material, and qualified contractors to extend the life of our buildings.

Michael Endredi is a project engineer for The Garland Company, Inc., developing code compliant and waterproof designs. Michael has also managed the design calculation program for The Garland Company and also assists with the Garland Company's approval program.

Sources:

1. National Roofing Contractors Association, [NRCA/ARMA Manual of Roof Maintenance and Repair](#), 1988
2. Single Ply Roofing Industry, [How to Implement A Roof Maintenance Program](#)