Stucco Surveys Using Infrared Thermography

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INTRODUCTION

Thermal imaging use in the building science industry in gaining popularity as it allows inspectors to provide clients with rapid results with little disruption to the buildings occupants. Cladding evaluations are a great use of this technology. They allow us to identify potential hidden building failures in sheathing systems without major destructive testing.

Water infiltration in cladding systems will cause damage to the sheathing and/or structural components beneath the stucco system. Once moisture infiltrates it changes the thermal characteristics of the sheathing materials. While wet sheathing behind the stucco system is optimal, damaged dry sheathing may also be detected using infrared equipment. High-resolution equipment is the key to detecting the slightest anomalies. By thermal tuning your camera down to a span of 3-5 degrees Fahrenheit, even the slightest damage becomes easily detectable in most cases.

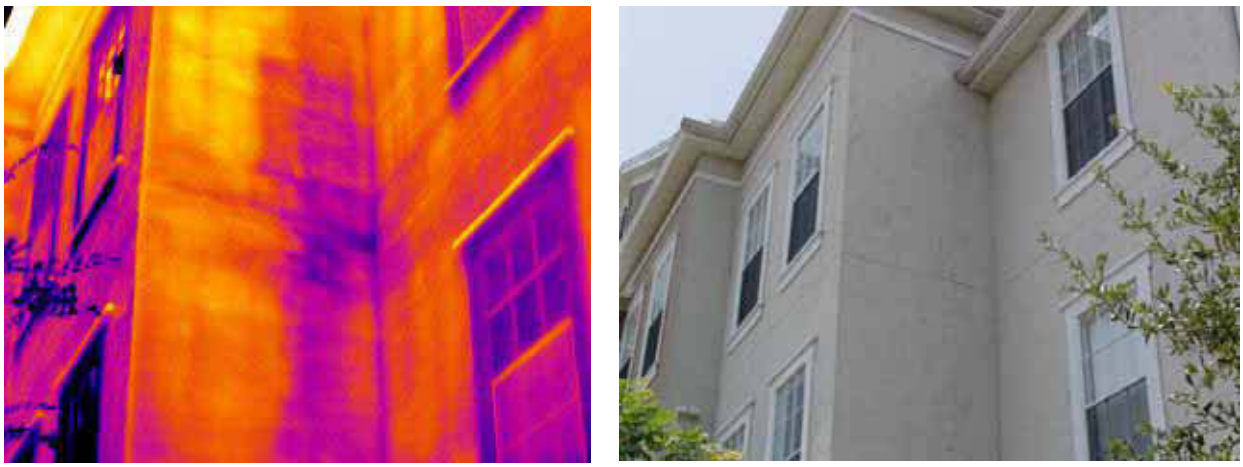

Figure 1. Thermogram/photo showing damaged sheathing behind stucco system

Figure 2. Test cut determined 100% moisture readings using hand held moisture meter.

Once you have determined a specific area, performing intrusive test cuts will help in data interpretation. This is extremely important as different conditions can distort your findings. Once a baseline condition is identified, interpretation of images will be much more accurate.

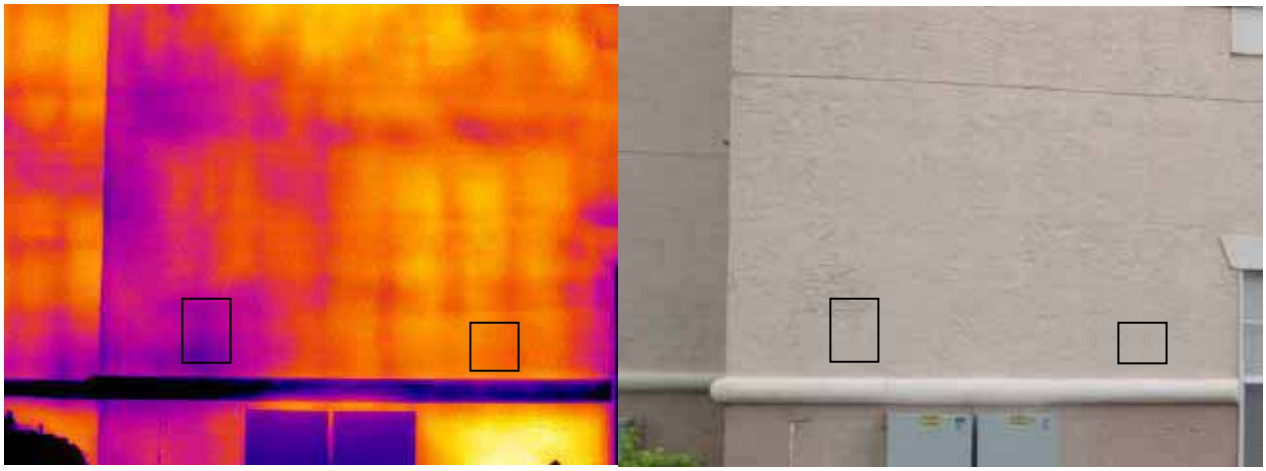

Figure 3. Thermogram/photo showing damaged sheathing behind stucco system

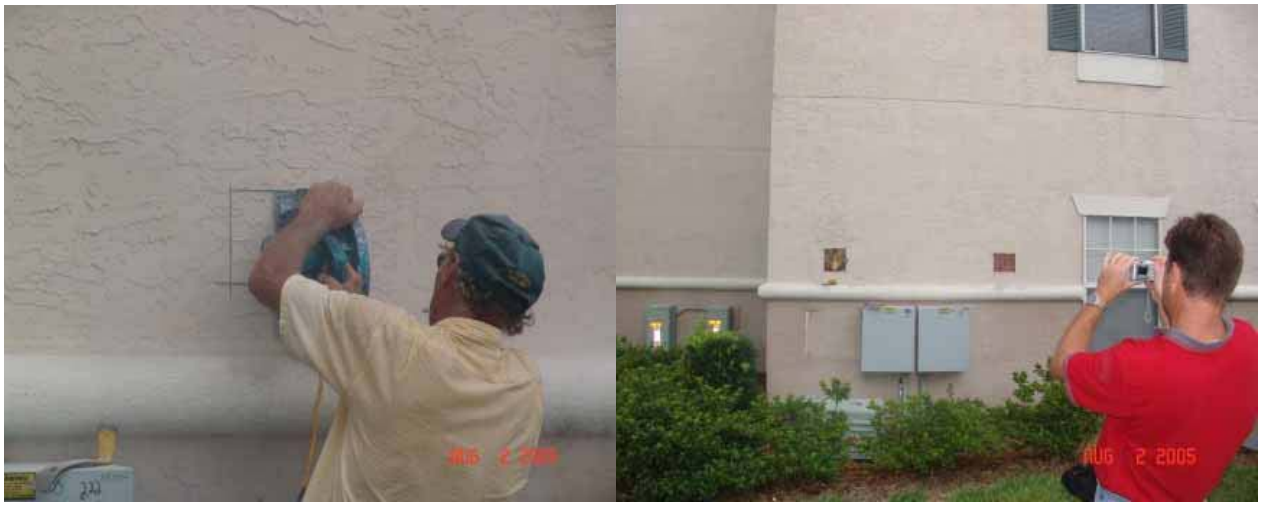

Figure 4. Test cuts are performed to determine a baseline for interpretation

Figure 5. Moisture readings are then taken to confirm IR findings; left photo has 72.9% moisture, right photo has 14.8%

Figure 6. Thermogram/photo showing no anomalies

Conditions are best when the inspection is performed 2-4 days after a substantial rain event. Different climates can change the “window of opportunity” for the inspection. In hot and humid climates, it is usually best to perform the inspection during the heating hours of the day, generally between 10am and 3pm. In cooler climates, inspection techniques are similar to roofing applications; the inspection may be performed in the late evening. Every climate is different, it is important to schedule evaluations during the right conditions.

Many building conditions can also cause false readings. Multi-story wood framing buildings will have 12 to 24 inch floor joists in between each floor. AC ducts, plumbing, and other systems are located in this space. Leaking air ducts can sub-cool the space and will show up as possible moisture in the exterior cladding. (see example below) We generally discount these areas unless the delta-T is extreme.

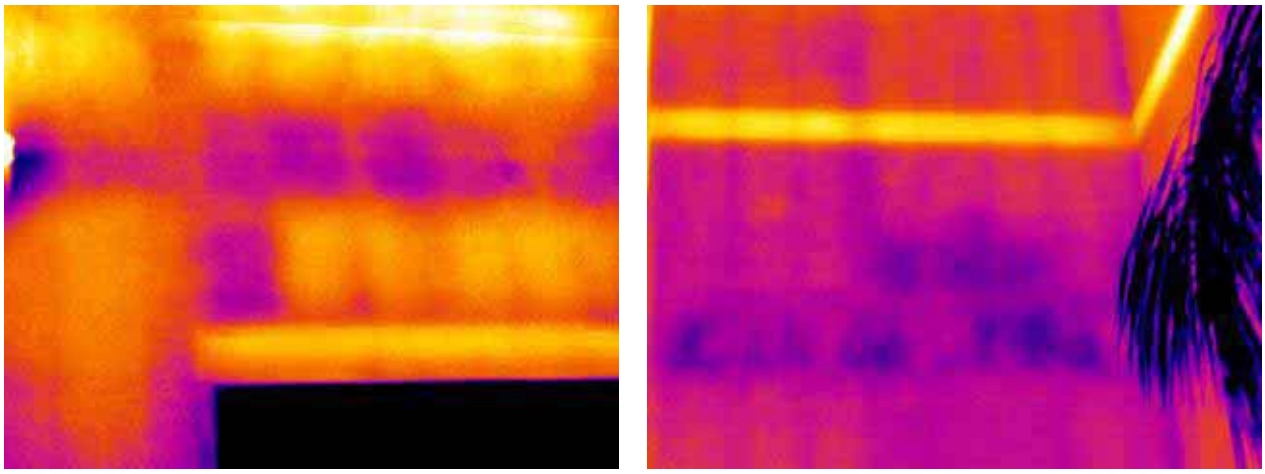

Figure 7. Images of false readings

SUMMARY

An in-depth evaluation of the building envelope enables the architect/engineer to develop accurate specifications for proper repairs. The key to accurate cladding surveys is baseline images with some minor destructive testing to “back up” your infrared findings.

Infrared technology can provide rapid evaluations of many cladding systems in large multi-family apartments and commercial properties; however, it cannot be used as a single source for cladding evaluations. The infrared camera should be used only as a tool, and not as a replacement for experience and knowledge in building construction and components. Verifying infrared data with moisture probes and/or small intrusive test cuts is recommended to minimize the possible misinterpretation of infrared images.

The quality of the initial field evaluation reflects directly on the quality and performance of repairs, as outlined in the specification documents. The time and expense to perform an initial, well-focused evaluation will save the building owner/manager money in the long run and result in repairs that extend the service life of the building.