



Whitepaper:

Seeing **RED** – The Infrared Advantage

How Infrared Thermography works, and its application to home inspections.

By:

John B. Elson

Technical Leader and Director of Education

Inspect-It 1st Property Inspection



&

Dave Sorge

Owner, Inspect-It 1st Property Inspection of

Jacksonville, Florida



September, 2010

Inspect-It 1st Property Inspection
7100 E. Pleasant Valley Rd.
Suite 300
Independence, OH 44131
877.392.6278
www.inspectit1st.com

Introduction

The world of property inspection is ever-changing. There is a dizzying array of new devices designed to improve our profession. One of the most exciting, complex and valuable devices is the infrared thermal imager. The imager is a handheld camera that has many uses. In the property inspector's hands it is used for defect recognition. (see Photo 1)

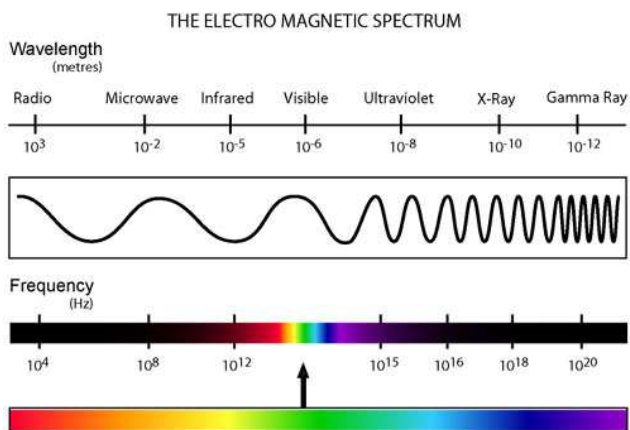


(Photo 1: Infrared Camera)

There are many misconceptions about how infrared works and its role during the home inspection. This whitepaper will describe the science behind infrared and use actual sample inspection photos to illustrate its applications. The limitations of infrared will also be discussed.

What Is Infrared?

Most people have experienced the power of infrared without really knowing it. That sacred remote control that you use every night to change channels on your TV is a simple example of infrared technology. The remote transmits an infrared signal by means of LED infrared pulses to the TV's receiver.



(Exhibit 1: Infrared Is Beyond The Visible Field)

Infrared refers to “beyond red” in the electromagnetic spectrum. The color red is in the visible band width for humans, but infrared waves are even longer than red waves. They have lower energy, lower frequency and are **therefore invisible to the human eye.** (see Exhibit 1)

Infrared thermography (IRT) is the process of creating visual images based on surface temperatures. The term “thermo” means “connected with heat” and “graphy” means “the method of creating an image”. Thermography is therefore “heat imaging”.

Anything that performs work requires energy. Energy manifests itself as heat, which is the movement of energy between molecules. The infrared camera identifies heat anomalies. Interestingly, even sub zero ice displays molecular movement and therefore generates heat. In fact, molecular movement stops at temperatures below - 459.7 degrees Fahrenheit. So, for practical purposes, everything that we see in our world displays heat.

Infrared thermography provides thermal images that have been used successfully by both the military and the health care industry for many years. Whether identifying enemy positions on the ground from military aircraft, or helping to diagnose a patient's condition, the science of thermography provides rich detail that would otherwise go unnoticed by the human eye.

Unlike digital cameras, the infrared thermographic imager requires significant training, knowledge and experience to be used effectively. Viewing “heat anomalies” under differing conditions makes the science of thermography very complex. High winds, full sun, partial shade, moist or wet conditions and interior versus exterior temperature differences all impact both the thermal image and its interpretation.

This means that the thermal imager is not a “point and shoot” piece of equipment. The proper interpretation of the infrared image is the most critical element in the equation.

When used during a home inspection, infrared technology can provide additional information about:

- 🏠 Heating and air conditioning systems
- 🏠 Pool heating and plumbing leaks
- 🏠 Plumbing systems
- 🏠 Roof and building envelope integrity
- 🏠 Electrical components and systems
- 🏠 Air distribution performance
- 🏠 Energy efficiency

“He uses a thermal instrumental device that can explore where the eyes can not.”

- Debbie Amoroso, REALTOR®

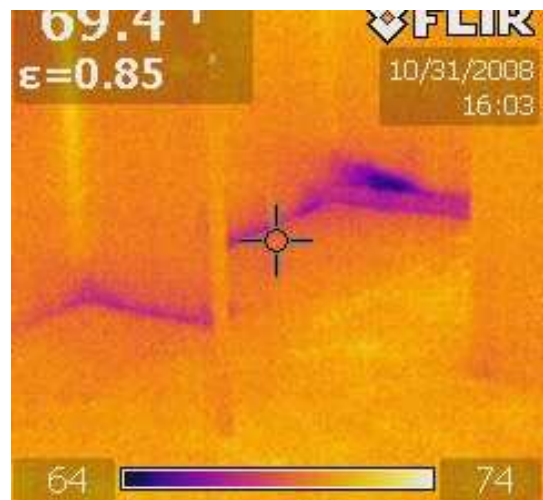
Why Infrared Thermography?

The home inspector’s main role is to provide objective information to the client regarding the condition of the systems and components of the property, as determinable at the time of the inspection. Because IRT assists the inspector *in discovering conditions that might otherwise go unnoticed*, this technology provides valuable information that is useful to both the seller and the buyer of the property.

Photos 2 and 3 below are digital and thermographic pictures of the same closet and hall area in a home. Referencing Photo 2 alone there would appear to be no apparent defect, however the temperature differential displayed in the infrared photo clearly shows evidence of moisture intrusion.



(Photo 2: Walls & Closet)



(Photo 3: Same Walls & Closet)

The buyer and the seller now have very specific location-based information about moisture in the walls of the home, and this can now be included in discussions regarding the property’s condition. *The buyer has a deeper understanding of the property’s current condition and the seller has the opportunity to rectify this condition prior to closing, thereby limiting both property damage and future liability.*

Consider the advantages of infrared thermography for the home buyer, especially in today’s real estate marketplace. Many homes are being sold in “short sales”, in advance of a foreclosure on the property.

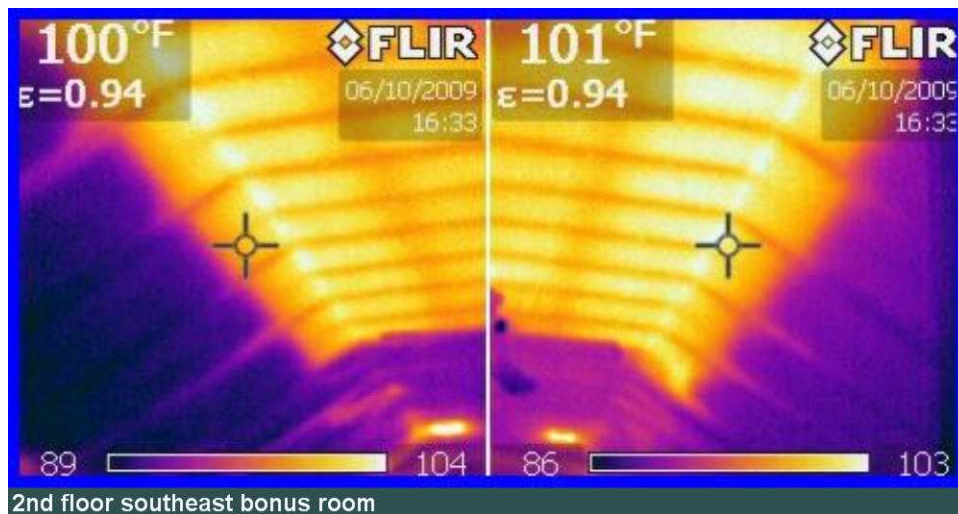
Because these homes are effectively owned by a bank and are vacant, there may be no history of the home that can be communicated to the buyer. Because infrared thermography detects very subtle differences in surface temperatures, it often provides insight into defects that would otherwise go undetected.

Infrared In Action

The following photos further illustrate the many applications of IRT during a home inspection.

Insulation: Improving Efficiency & Comfort

Photo 4 is an infrared image of a bonus room ceiling; a picture of the left and right sides are placed side by side to show the entire breadth of the ceiling. The “glowing” temperature differential displayed (i.e. the yellow areas) indicates missing insulation in these areas; heat is heavily penetrating these areas. This is a prime example of a defect that a home inspector would not be able to detect without the use of IRT.



(Photo 4: Missing Insulation)

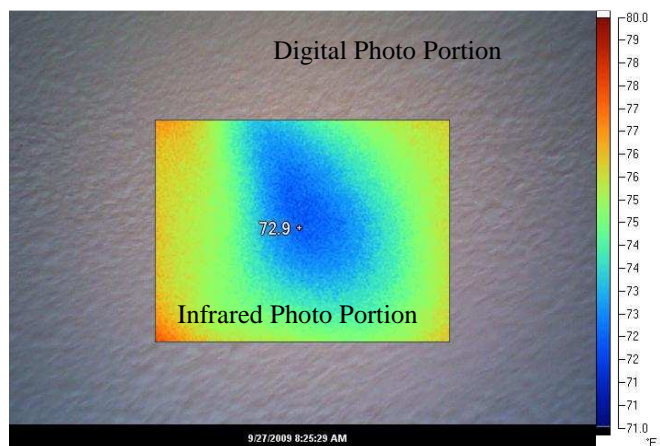
A lack of insulation can increase energy costs and adversely affect the comfort of a home.

Moisture: Preventing Wide Spread Damage

Look at Photo 5 closely. The area shown is the ceiling of a home, and it is a fusion photo combining both a digital and infrared snapshot of the area.

The dark blue (“cool”) area stands out starkly against the yellowish/reddish surrounding areas. This stark differential is therefore considered an anomaly, and therefore indicates a potential leak.

Early leak detection is imperative and if identified soon enough, can typically be easily corrected. It is the unidentified leak that spreads and worsens over time that can lead to costly damages – both to the structure and potentially to personal belongings.



(Photo 5: Ceiling Leak)

Electrical: Saving Lives

Many of infrared’s applications might seem to focus on identifying water intrusion, but it is equally effective at identifying potential electrical defects. With house fires presenting such a significant risk in

homes these days, identifying electrical issues is imperative not only for making a smart investment decision, but more importantly for protecting you and your family.

Photo 6 shows a side-by-side comparison of infrared and digital pictures of a cable splice. The bright glowing yellow (almost white) coloring is indication that the wiring is overheating. This is the type of concern that should immediately be addressed to protect both the current and future occupants.



(Photo 6)

Summary Of Primary Benefits For Sellers, Buyers & REALTORS®

- “Surprises” are avoided post-transaction, giving buyers more confidence to move forward with the purchase and avoiding any post-closing legal disputes between parties.
- Needed repairs can be completed quicker and at a lower cost because the specific location and nature of the defect is better known.
- Areas that may initially appear as a serious defect to the naked eye can often be disconfirmed using infrared as well. This eliminates issues and negotiations that can stall transactions.
- Safety hazards that can harm current or future occupants can be more readily identified.
- Seller’s can have greater peace of mind knowing they are in compliance with seller disclosure laws.

“Infrared tool to detect water was great and very helpful.”

- Home Buying Client

Infrared thermography is a leading edge tool that provides many advantages for the client. Not only does the camera provide a tool to identify anomalies, it also captures that anomaly as a photographic image that can be viewed by others. Because of this capability, the camera provides conclusive documentation while improving the thoroughness of the overall inspection.

This information is easily embedded into the written inspection report and, if desired, may be shared with all parties to the transaction. The end result is faster communication, greater overall clarity, deeper understanding of the property’s condition and smoother negotiations.

Limitations Of Infrared

While certainly more advanced than the naked eye, infrared is not perfect and has its limitations. Most importantly, the use of IRT does not expand the industry accepted standards pertaining to the scope of a home inspection. Namely, inspectors still cannot “see behind walls” or “predict future conditions,” and use of IRT is not a guarantee or warranty. Remember, IRT simply gives a pictorial temperature reading – it is not a quantitative analysis. Even with these limitations, IRT is a valuable diagnostic tool that enhances the inspector’s ability to find certain defects that might otherwise go undetected.

Conclusion

Like every profession, the home inspection industry continues to evolve as new technologies emerge. Understanding these technologies and combining them with the skills and knowledge of a highly trained home inspector gives clients a degree of insight previously unattainable.

At Inspect-It 1st, our Mission entails delivering the best report, with the highest quality service, using the latest innovations in knowledge and/or tools. We believe our expansion into IRT is consistent with this Mission, and delivers a superior product to our clients and REALTORS®.

Links To Further Information

The following list identifies a few websites that provide excellent information about the different types of infrared equipment and more on the advantages of infrared thermography.

Infrared Certification

www.infrared-certified.com

Infrared Thermography Equipment Websites:

www.flir.com

www.fluke.com