

***Infrared thermography can help reduce turnaround time, cut costs, reduce waste and improve efficiency in the management of facility assets.***

# THERMOGRAPHY IS HOT

By Darice S. Jamison, PMP, M.S.A.M.E.

In order to protect our citizens, nation, freedom and way of life, the U.S. military also must preserve and protect its huge inventory of buildings. Additionally, the military must construct new buildings, when necessary, and decide how best to repair and prepare for reuse the buildings that are no longer needed. And it must do all of this with a limited budget.

Infrared thermography—already used by the military in many ways—can help the military reduce turnaround time, cut costs, reduce waste and improve efficiency in the management of its facility assets.

## Old Concept, New Application

When children get sick, they may run a fever. When a car has a mechanical problem, the engine may overheat. In short, a rise in temperature is often a good indicator that something is wrong, making infrared thermography a valuable diagnostic technology with many diverse applications.

Infrared thermography is the use of an infrared camera to “see” and “measure” thermal energy emitted from an object. Thermal energy is light that is not visible because its wavelength is too long to be detected by the human eye. It’s the part of the electromagnetic spectrum that we perceive as heat.

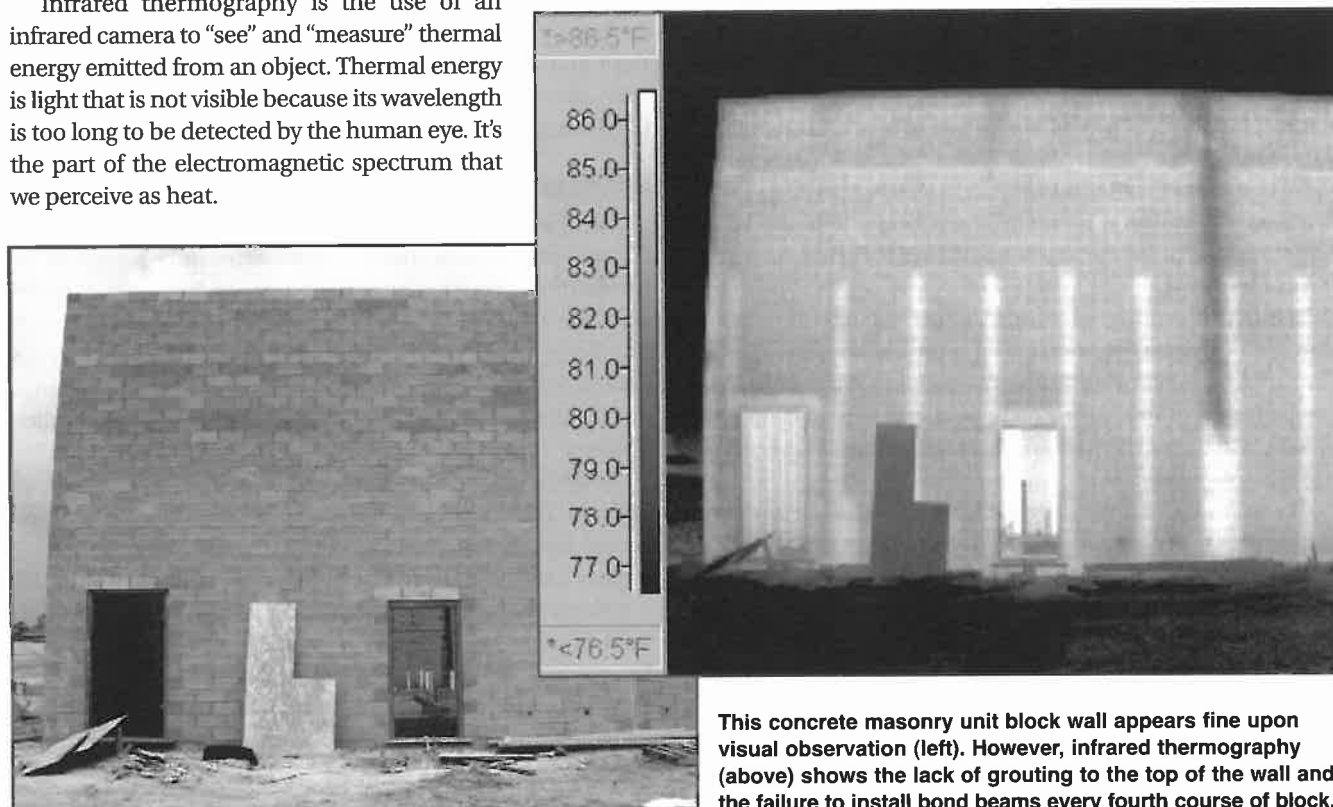
Unlike visible light, in the infrared world, everything with a temperature above absolute zero emits heat. Even very cold objects like ice cubes emit infrared. The higher the object’s temperature, the greater the infrared radiation emitted.

Infrared thermography cameras produce images of invisible infrared or “heat” radiation and provide precise non-contact temperature measurements. The cost of a camera can start at around \$9,000 and go well beyond \$50,000.

## Variety of Uses

Infrared thermography is widely used in the commercial workplace in ways that logically extend to expanded military use.

**Quality control and inspection measures.** Commercial projects often rely on infrared thermography as the quickest and easiest method to discover construction failures, during and after construction.



This concrete masonry unit block wall appears fine upon visual observation (left). However, infrared thermography (above) shows the lack of grouting to the top of the wall and the failure to install bond beams every fourth course of block.

For example, during construction of a 300,000-ft<sup>2</sup> retail strip center in Houston, Texas, infrared thermography helped identify cells of concrete blocks that were not grouted all the way to the top of the wall as designed. It also revealed that the contractor had failed to install bond beams as designed.

Early identification of these problems saved an estimated \$250,000 in post-construction re-work. Had the problem not been discovered, the deficient wall could have suffered catastrophic collapse during a wind-related event, potentially during operating hours with shoppers inside.

**Identify potential health dangers.** Infrared thermography also is used to identify potential health dangers, such as mold build-up in homes and offices. Mold is a problem that affects building structures, and that, in turn, may impact the health of the occupants who have allergies or sensitivities to mold spores. Mold damage identified by infrared cameras can be treated quickly, reducing absenteeism and health care costs, while increasing worker alertness and productivity.

**Locate and correct energy inefficiencies.** Infrared thermography can be used to locate and correct energy inefficiencies, which in turn, reduce life cycle costs. Heat losses, humidity and air leaks—whether in new buildings or those being renovated—are instantly visible on thermal images. Once corrected, the ratings achieved can support the military's sustainable design and development efforts and pave the way to Leadership in Energy and Environmental Design (LEED®) certification.

**Identify leaks and water damage.** A very common application of infrared thermography is the identification of external and internal leaks and water damage. Thermography aids in finding and checking internal pipes and tubes for leaks. Even if water pipes are laid in the floor or under plaster, the heat of the pipes radiates through the surface and the pattern is clearly detected with infrared thermography. Evaluating roofing systems for water leakage is easy because water retains heat longer than dry roofing material and is detected at night after the rest of the roof has cooled down.

Infrared thermography provides very specific information about the extent of water damage and can help decision-makers better determine the way in which they proceed. Tremendous savings are realized when only the damaged areas of the roof are repaired, rather than replacing the entire roof.

For example, a roofing contractor working on a commercial roof damaged by hurricane Rita in 2005 provided an estimate for the replacement of approximately 72,000-ft<sup>2</sup> of roofing. After PT&C Forensic Consulting Services, a Project Time & Cost Co., performed a field investigation using the infrared camera, it found that approximately 1,600-ft<sup>2</sup> of roofing was damaged by wind borne debris. With the exception of the 1,600-ft<sup>2</sup>, no other portion of the roof was wind damaged. Use of infrared thermography enabled the building owner and insurance company to repair less than 3 percent of the building's roof, instead of the entire roof.

Infrared thermography is only a measurement tool and won't magically reduce the scope of the problem it's diagnosing. With thermography, owners can take comfort in knowing that the work they're doing is truly necessary. This minimizes expenditure in terms of both time and money, and allows more of those resources to be reallocated and available for other critical projects.

The military can capitalize on infrared thermography technology by using it in the many construction-related activities surrounding base realignment and closure (BRAC) initiatives. With the extensive number of buildings affected by BRAC, the military can minimize its expenditure on repairs and renovations while maximizing the efficiency and quality of the buildings for non-military use.

## Technology + Training + Experience

The images from infrared thermography are deceptively simple. Perhaps most of an image is a gloomy greenish to grey shade, and there's one bright red area clearly indicating moisture intrusion. Or a structural beam that's supposed to be inside a wall just isn't there, clearly indicating a construction defect.

It seems like anyone who can snap a picture could reasonably see where the damage is, right? Not necessarily. Operating the equipment and locating the damage area is half the task. The other half is the accurate interpretation of the thermographic images—in other words, diagnosing the problem.

If an untrained user were to use the best equipment in the proper way, but did so at the wrong time of the day, the images would be misleading and could cause more harm than good. Beginning and advanced training is available from several organizations, including the Infrared Training Center and Snell Infrared.

## Widespread Benefits

On the commercial side, both owners and insurance companies benefit from the information revealed by infrared thermography. The clear images of normally invisible diagnostic evidence are a valuable resource for planning repairs and rationalizing settlements. This results in lower premiums and higher profits. The savings on the owner side are shared universally among all policy holders.

When considering military construction, the benefits of infrared thermography are even more widespread. Taxpayers benefit by eliminating the expense of unnecessary repairs and reducing life cycle costs in the operations and maintenance of buildings. Building occupants benefit with safer and healthier environments. The environment benefits through greener solutions and reduced waste. And, finally, the military benefits from the reliable information on which it can base sound decisions without delay. **T&C**

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