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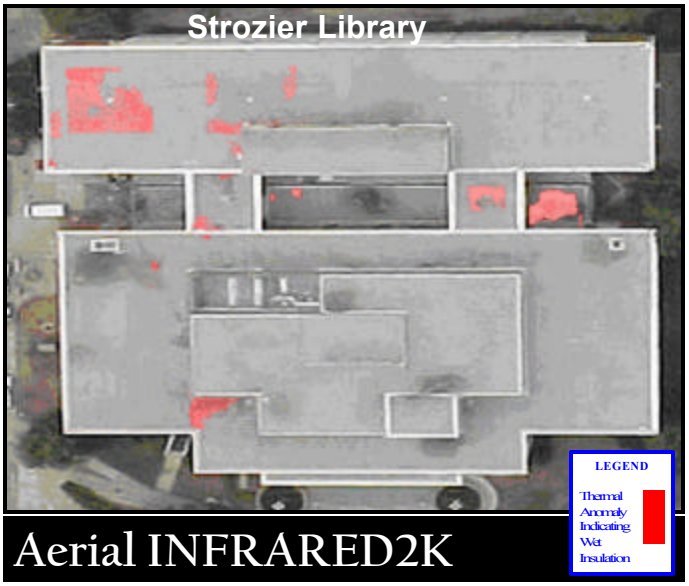
ROOF MANAGEMENT: THE LOW HANGING FRUIT FOR SOME FACILITY MANAGERS

...INFRARED2K, a new generation of X-ray like vision helps extend roof life, conserve energy and improve indoor air quality



U.S. Patent No: 5,818,951

Patented INFRARED2K: photographically accurate documentation of moisture within roofing systems. This is an easily understood communication tool. INFRARED2K is the new generation of IR technology.

Just as the invention of the X-ray has revolutionized surgical procedure, a new generation of infrared technology is altering common roof management practices. This new layer of diagnostic intelligence enables facility managers to clearly see moisture inside the roof unseen by the naked eye.

Infrared is a heat sensing technology. It was first used by the military as a guidance system for missiles, and night vision to locate the enemy. Over forty (40) years ago the Army Corp. of Engineers used infrared to maintain quarters in arctic climates. Today, infrared has emerged as what some call the single most important tool for reducing roof maintenance costs.

Consider These Disturbing Facts from the U.S. Department of Energy (DOE):

*Ninety-five percent (95%) of roofing materials removed are dry and not in need of replacement

*Flat roofs are being replaced every 8 - 10 years although their material life under the manufacturer's warranty is 25 - 30 years.

DOE's statistics state within the first few years most roofs begin to deteriorate because moisture infiltrates the roofing system. Moisture is typically stored in the roofing system long before leaks appear. This is how the downward spiral of destruction begins.

What these nationwide statistics exhibit is that roofs are being prematurely replaced because of frustration in failing to locate and solve the source of moisture infiltration. Indeed, it would be unrealistic to ignore that there are many "roofing professionals" which have a vested interest in promoting premature roof replacement instead of repair.

A full size aerial color photograph of a building's roofing area with moisture problems delineated in red is the state-of-the-art. Although the service started with hand-held infrared cameras that were used to walk over the roof. The service has evolved into capturing the required information from the air.

"Walk-overs are still used but the ability to translate the data into a readable, accurate report remains a challenge," says Stan McDougall, Aerial Operations Director for Infrared Concepts Corp. "The patented method we use involves flying and vertically photographing the site by day to identify false indications

of moisture, and then flying again by night to vertically capture the infrared thermogram."

"When infrared was first used for roof moisture identification, it was useful in defining large accumulations of moisture. "We are now able to delineate areas as small as a few square feet. By combining the daytime and night time images together in a color photograph, infrared has finally come of age with a report everyone can clearly understand," McDougall said. In addition, the obvious false indications of moisture are removed from the report.

Walk-over infrared inspections became available over a decade ago. The image above represents one of 100's of photos which must be captured at less then a 60 degree angle to provide full roof documation. This documentation is subjective and often misinterpreted.

Florida State University Finds Moisture in 40% of the Buildings Inspected

"We already knew where many of our roofing problems were, but determining the location and extent of moisture was a problem. Having a color photograph to use as ammunition makes the difference between whining and winning additional funds," says Buddy Watkins, Associate Director of Facilities at FSU.

The FSU study encompassed 50 buildings or approximately one million square feet; a full 40 percent of the buildings inspected were found to have moisture problems. Fifteen (15) buildings were found to have areas appropriate for surgical restoration. Only five buildings needed sectional tear off. "It took these color photographs to secure the funds to make the required repairs, " says Watkins.

"Based on our preliminary analysis of the infrared report we're expecting the savings to mean an additional three to five years of extended roof life on most campus buildings," says Watkins.

Florida Community College

"Roof Management Has Become The Low Hanging Fruit in Our Facility Management Program."

Peter Blaise, PE, Associate Vice President of Facilities Management and Construction for this five-campus community college in Jacksonville, FL. says he used INFRARED2K on every campus. "The use of infrared and other roof assessment tools has made roof management the low hanging fruit in our facility management program meaning that the task has become easy to accomplish," says Blaise.

"Infrared is the foundation intelligence for our roof management program," says Blaise. "We've learned that surgical and sectional roof replacement is indeed the best strategy to manage our entire roof inventory. Frequently, roofs have been treated as a unit that is either in good condition or ready to be replaced. Infrared has enabled us to treat roofs section by section based upon condition."

When asked why Blaise chose to inspect all five campuses, his response was resounding: "There are no roofs too new to inspect and none too old unless the building is scheduled for demolition."

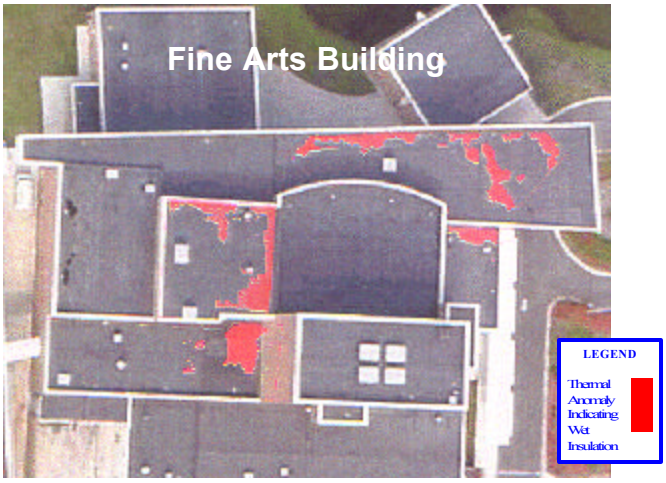
Premature roof failure caused by poor installation of satellite equipment

Blaise says roof replacement costs are roughly $10 a square foot, making replacement of a 100,000 square foot roof cost $1 Million dollars. If a roof life of 15 years is assigned, the annual per square foot roof cost is $66.00 or $66,000+ yearly per 100,000 square feet. Blaise asserts that if roof life can be extended on only five of our buildings, for five

years, he has enabled the reallocation of over $300,000 to other priorities.

Blaise says infrared is being used in a legal dispute concerning chronic leaking problems over the college's new Fine Arts building. "Infrared gave us the unbiased diagnostic tool needed to help resolve this issue."

Jack Brede, Facility Project Manager for FCC was skeptical of INFRARED2K in the beginning because of prior experience with earlier infrared technology. "After analyzing the reports and having them validated by a roof consultant, we believed what we saw. We all began to see how we could resolve roof problems before the leaks ever occurred… we are no longer in a reactionary mode," says Brede.

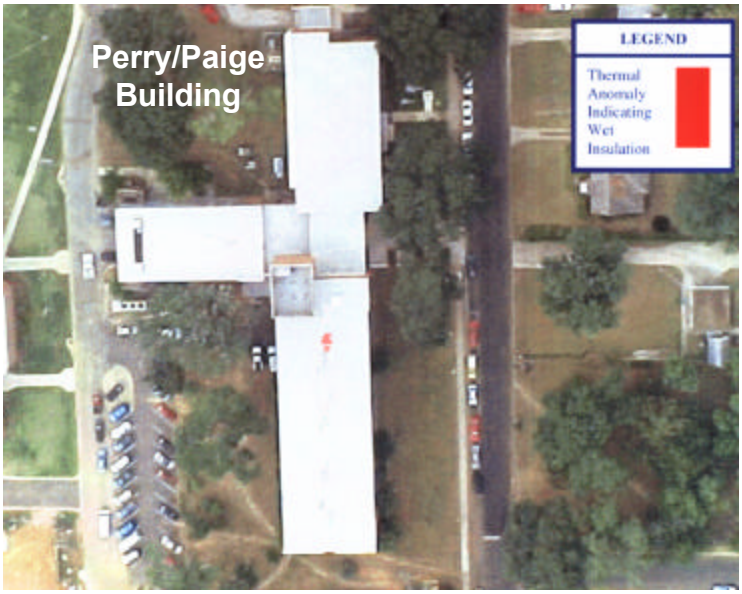


An inspection during the applicator warranty period exposes installation and material defects.

A & M University Holds Contractors Accountable

Another INFRARED2K believer is Physical Plant Director for Florida A & M University in Tallahassee, Kendall Jones. He found the INFRARED2K study of his campus particularly useful in forcing a contractor at his cost to remove an area of moisture from a new roof.

"It is most important to inspect a roof before warranty expiration," says Jones." During this period the contractor and/or materials supplier can be held accountable. Without this insight you are judging the quality of a roof by it cover, much like judging a book by its cover," says Jones.



Inspection of a new roof exposes a small problem which can be corrected at minimal expense by the installing contractor.

Florida Board of Regents Mandates Non-Destructive Roof Inspections

It was the Florida Board of Regents who first saw the wisdom of using non-destructive testing to manage campus facilities and have actually mandated an infrared scan technique at all state universities.

Ken Ogletree, Director of Facilities, explains the mandate. "Non-destructive testing such as infrared is mandated by the Florida Board of Regents in two instances: “Inspect all new roofing to ensure compliance with specifications. All new roofs are to be received and maintained in dry condition. Inspect before re-roofing to identify wet insulation and ensure its removal. Inspect after roof installation to ensure wet insulation is removed and the roof received is dry. Inspect every year or two years during warranty period.”

Ogletree asserts that now infrared inspection technology has come of age, in unison with the inspection costs falling below 2½ cents per square foot on a volume purchase, the Board of Regents recommends inspections of the entire campus every year.

"This is simply the best way to allocate and prioritize the roof management effort," says Ogeltree. "The process begins with identifying the source of the leak, repairing the problem and then following up to ensure no reoccurrence."

Extend Roof Life

"If, for example, a total re-roof of 500,000 square feet costs approximately $5 Million Dollars, anything that can be done to extend roof life means more money for other facility needs," says Ogeltree. "We believe this information is crucial before our universities make a decision to re-roof."

SAVINGS DIRECTLY RELATED TO REMOVING MOISTURE IN FLAT AND LOW SLOPE ROOFING

	SQUARE FEET OF ROOFING	
1 YEAR	**100,000**	**500,000**
DELAYED ROOF REPLACEMENT	$ 60,000	$ 300,000
ENERGY WASTE	$ 8,705	$ 43,525
ONE YEAR SAVINGS	**$ 68,705**	**$ 343,525**
5 YEARS	**100,000**	**500,000**
DELAYED ROOF REPLACEMENT	$ 300,000	$ 1,500,000
ENERGY WASTE	$ 43,525	$ 217,625
5 YEARS ACCUMULATED	**$ 343,525**	**$ 1,717,625**
10 YEARS	**100,000**	**500,000**
DELAYED ROOF REPLACEMENT	$ 600,000	$ 3,000,000
ENERGY WASTE	$ 87,050	$ 435,250
10 YEARS ACCUMULATED	**$ 687,050**	**$ 3,435,250**

NOTE: This chart is based on information provided by the US Department of Energy and analyzed by the Florida Board of Regents. DOE estimates a nationwide average of $ 9.00 per square foot for a full tear off and replacement and an average roof life of 15 years. This equates to 60 cents per square foot as the economic benefit of delaying roof replacement each year. DOE estimates that the impact of moisture has reduced the average R-value of insulation by 43% .

Energy Dollars Saved on Every Campus

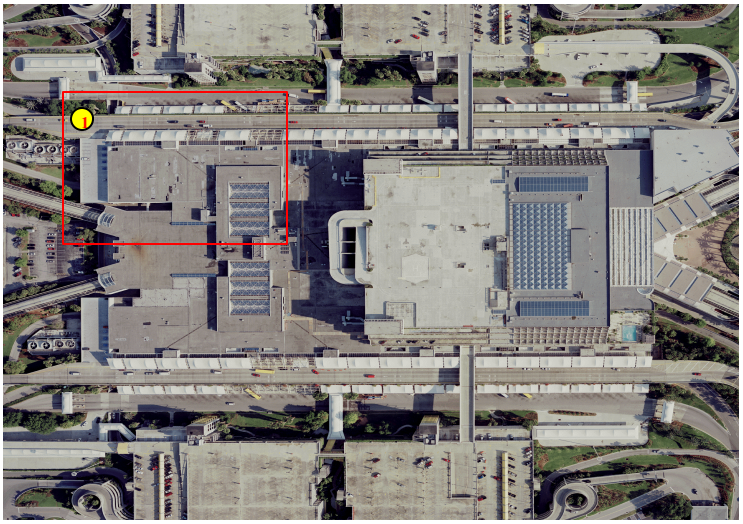
Florida Board of Regents Engineer, Tom Shewan, analyzed the energy savings associated with keeping roofs dry. Shewan determined that although R-19 insulation is required, the average roof R-value has degenerated to R-11. This is costing the state literally hundreds of thousands of dollars every year. This is based on the US Department of Energy's claim that R values nationwide have been reduced by over 43% due to moisture.

Shewan determined that over the anticipated 15 year roof life for every 500,000 square feet of roof area energy waste would amount to $652,878.75 based on Florida Power's GSTD-1 rate schedule.

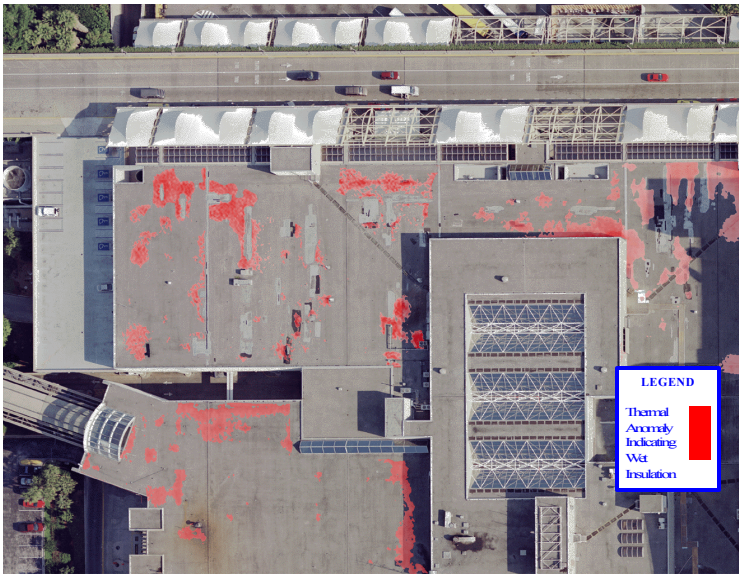
Air Quality Issues Also Addressed

If asset protection and energy conservation weren't enough, infrared can also assist in the nagging issue of poor air quality. The source of air quality problems are very difficult to identify, but infrared can certainly track down wet insulation in the roof with X-ray like accuracy.

LARGE BUILDINGS are analyzed in sections of up to 50K sq. feet and individual INFRARED2K Reports Prepared for each Section.



Main Terminal: Greater Orlando International Airport



INFRARED2K Report: Section 1 Main Terminal

From military secret to the secret to extending roof life, reducing energy waste and identifying potential sources of poor air quality, it appears infrared has finally come of age. More information about this patented process may be found at web site www.INFRARED2K.COM Phone: 407-629-8485.