

## The Practice of Detecting Termites with Infrared Thermal Imaging Compared to Conventional Techniques

*Mark Rentoul - Prime Building & Pest Consultants Pty Ltd*

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### ABSTRACT

This paper discusses the use and benefits of infrared thermal imaging technology (IRT) during pre-purchase building and pest inspections. It demonstrates how IRT enables a more thorough and accurate internal evaluation of a structure than conventional methods. The case studies are actual examples of the use of IRT to effectively detect termites and their colonies when in the hands of a competent operator. The results show how Prime Building and Pest Consultants' (PBC) TermiteScanIR (IRT) provides its customers with quick, accurate, and cost-effective information regarding the biggest investment they are likely to make.

### BUILDING INSPECTIONS

PBC's core business is pre-purchase inspections for homebuyers. The pest inspections are for subterranean termites, rot, and other pests that damage a home's timber structure. Most Australian homes are inspected prior to purchase and the inspections must conform to the stringent Australian Standard.

Termite infestations create irregular heat patterns that IRT detects. Termites produce energy in the form of carbon dioxide, which is produced as a bi-product of digestion. In fact, termites produce more carbon dioxide per weight than any other living organism. When termites move into a structure to set-up a home they change the energy levels in two ways:

- Heat is released from their digestive system in the form of carbon dioxide; and
- The mud tubes they construct have high moisture content.

These changes in energy levels produce thermal changes that come to the surface of walls, ceilings, floors, and concealed areas of a structure, thus creating irregular heat patterns. The case studies outlined later in this paper show that IRT is the ideal tool to detect these irregularities.

### IRT BENEFITS

IRT allows for easy non-invasive techniques that are accurate and consistent. Conventional inspections require the use of visual techniques, invasive procedures, or crawling around in dirty restrictive floor places or ceilings. IRT has ensured that these conventional techniques, which are required by current regulation, are backed up with the latest technology, thus strengthening the weak links in current conventional inspections.

IRT reduces the time needed to find termite infestations and locates termites where other conventional methods fail or give ambiguous results. IRT's non-invasive methods minimize damage to homes suffered during conventional inspections and therefore save homebuyers and owners money. When an experienced operator uses the correct IRT equipment, there is no doubt that IRT leaves conventional methods of pest detection looking old and outdated. PBC's use of IRT along with the conventional inspection techniques ensures PBC's customers receive the most complete package available on the Australian market.

### INDUSTRY AWARENESS

The results from the case studies show that IRT is the most efficient, accurate, and cost-effective tool to detect termite infestations. However, it is still important for PBC to establish the effectiveness of IRT in the pest industry.

Industry education about the benefits of IRT is necessary because:

- The pest industry is similar to many other industries where the majority do not readily accept change; and
- Operators without any IRT training may use unsuitable cameras and report inaccurate results. This can affect the credibility of IRT in the pest industry.

## CASE STUDY 1 – CONVINCING INDUSTRY PEERS

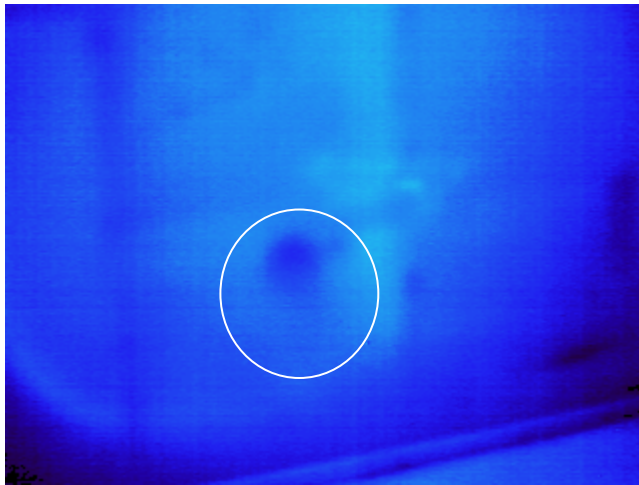
An inspection company on the Sunshine Coast, North of Brisbane contacted PBC concerning a second opinion for an inspection. The company had already carried out a conventional pest inspection complying with the relevant Australian Standards.

The licensed inspector found visual evidence of previous termite activity and high moisture readings with the use of a non-intrusive moisture meter within the dwelling. As usual, the inspector performed an invasive inspection of the wall cavities using an optic bore scope resulting in the exposure of some termite mud; however no active termites were present. The original inspection company had satisfied themselves that all measures had been taken to establish that the dwelling was free of live termites.

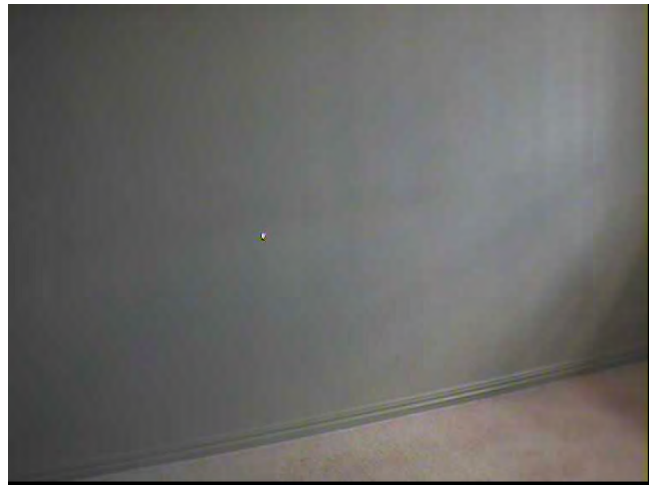
PBC were contracted to report on specific damage caused by termites. All parties involved were present at the time of this inspection, including the owner, buyer, tenant, real estate agent, and original inspection company.

PBC began thermal imaging the walls and within a few minutes located an abnormality, approximately five-feet up the wall in the lounge room. It was a round cold spot approximately one-inch in diameter. The other inspector was directed to the exact location of the thermal anomaly. He drilled a half-inch hole through the plasterboard to fit a bore scope. On removing the drill from the wall, there were live termites on the end of the drill bit.

This was to the amazement of all involved as the other inspection company had already looked inside this wall cavity with a bore scope and nothing was visible. What happened next was even more amazing. A small heat pattern (approximately two-inches in diameter) viewed on the external monitor was moving from the bottom of the wall upwards to the freshly drilled hole. The heat pattern was traced up the wall until it disappeared at close proximity to the hole. Then out of the hole came soldier termites, to defend the intrusion.



*Figure 1. Termites found with IR moisture signature*



*Figure 1b. Visual image with no evidence of termites*

In this case, thermal imaging proved to be more effective than other traditional methods, i.e. visual inspection, moisture meter, and invasive bore scope. IRT gave PBC the advantage of being able to quickly scan the area giving a complete overview of the dwelling. It was able to pinpoint the anomaly that was not visible and in a place where other spot investigative tools would have been used.

After this inspection, the other inspection company still wasn't convinced of the benefits of IRT. Two years later, the same inspection company purchased a high-quality camera and the firm now supports the benefit of IRT.

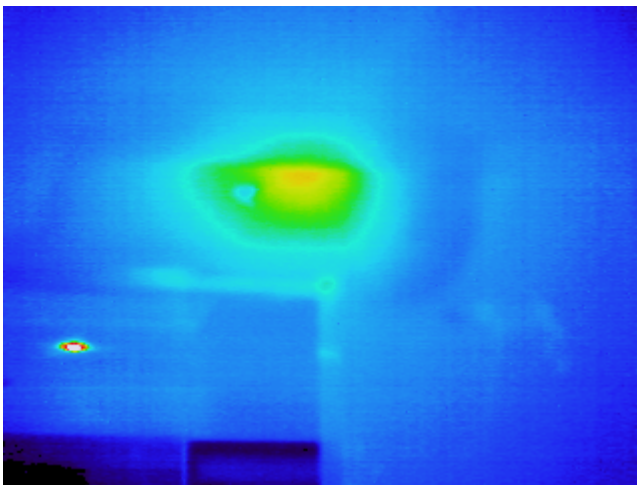
## **CASE STUDY 2 – IRT CAMERAS – IS THERE A DIFFERENCE?**

A pest inspection company conducted a traditional pest inspection and an IRT inspection for a buyer of a dwelling in subtropical Brisbane. The inspection company found active termites in the sub floor. Numerous termite mud leads went up into the dwelling and disappeared into the wall framing that was visible in the sub floor. No visual evidence of active termites was available inside the dwelling and in particular around the walls in question.

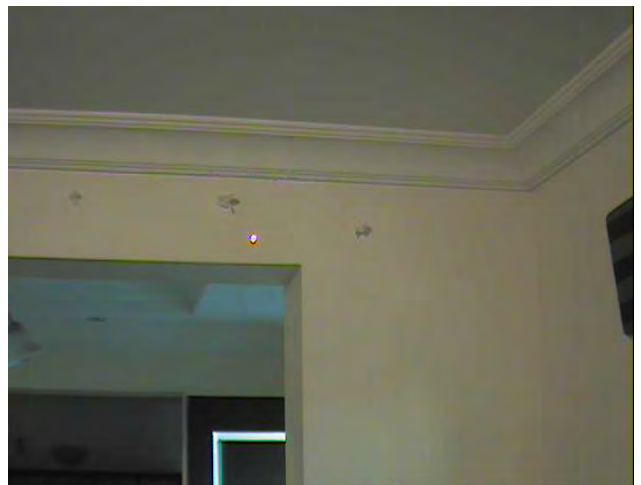
The company thermal imaged the dwelling with a 160 x 120 resolution camera and found nothing. It was apparent the termites were in the wall. They could not prove this without invasive or destructive investigation. The owner engaged PBC to conduct a thermal scan of the dwelling.

PBC used a 320 x 240 resolution camera, which enabled the firm to immediately find the termite anomaly and capture real time images showing the exact location of the termites. Confirmation of the termite anomalies was supported using Termatrac, a Microwave movement detection device and AED 2000, an acoustic listening device. Chemical treatment was placed in the right areas to achieve more effective eradication.

Higher-resolution cameras proved to be more effective in finding small anomalies and saving homeowners the expense of pulling walls apart. Therefore, not only is IRT needed to achieve the results, but also the correctly specified infrared camera, used by a correctly trained operator, is required to detect smaller anomalies.



*Figure 2. IR heat signature of termites above doorway*

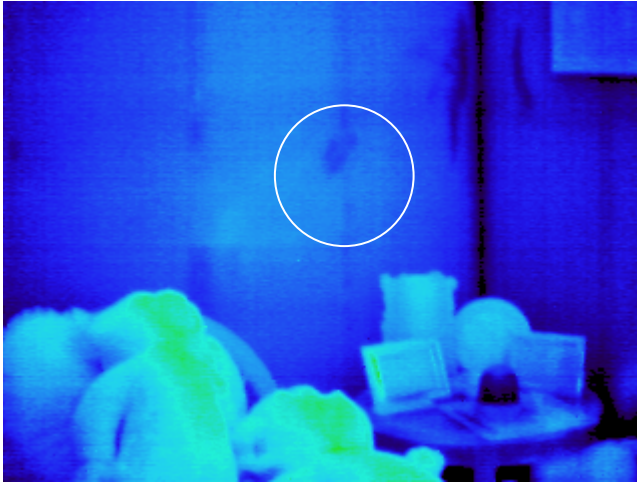


*Figure 2b. Termites located and treatment applied*

## **CASE STUDY 3 – POWER OF TECHNOLOGY**

A real estate company asked PBC to do a termite inspection for prospective buyers. Once at the property, PBC noticed that another inspection had already been completed. Drill holes under a windowsill marked where the previous inspection had penetrated the wall to check for damage. IRT confirmed their suspicions and found what appeared to be water damage under the window.

During a normal visual inspection, no furniture or belongings are to be moved without the consent of the owner. Consent is not always received. This makes it difficult for inspectors to check all areas of a dwelling. Storage areas, behind wardrobes, and kitchens are black spots for conventional inspections. IRT reduces this problem.



*Figure 3. IR moisture patterns of termites in wall*

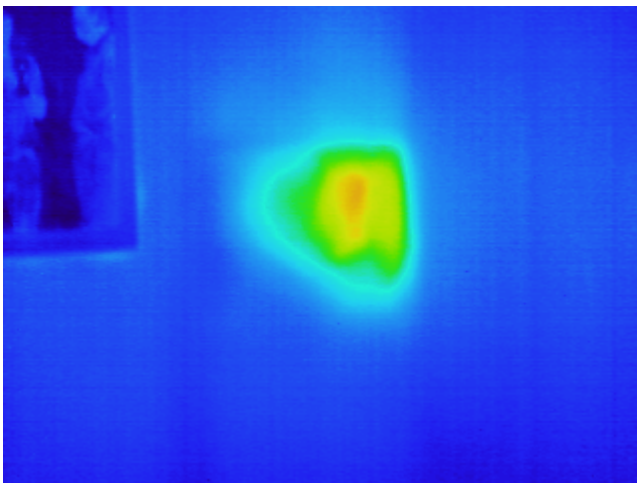


*Figure 3b. Visual image shows stored items*

PBC continued with the inspection. IRT was familiar with checking ceilings, walls, and floors of the dwelling. Other areas were checked, such as high ceilings and behind couches and kitchen cupboards. It was while looking under the stairs that PBC noticed a hot spot. Behind boxes and general stored material, IRT displayed a warm area on the screen. Once the material was moved, termites were found.

The real estate agent was amazed and the buyers annoyed. The buyers questioned why the previous inspection had not detected the termites. They had done all that was required under law but missed the infestation because they could not move the material. Technology in this case has surpassed the legal requirements. IRT surpasses the conventional methods for termite detection by completing thorough inspections that only an experienced and qualified inspection team can accomplish.

This case shows that IRT goes where no other method of termite detection can go. It locates what others fail to find and displays what others fail to see. The real estate company is now one of PBC's best customers.



*Figure 4. Termites found inside wall cavity*



*Figure 4b. Visual image shows no signs of termites*

## **SUMMARY**

IRT helps PBC perform its core business of pre-purchase inspections for homebuyers. Inspections completed using IRT for termites, rot, and other pests that damage a home's timber structure are completed with accuracy, effectiveness, and efficiency compared with conventional methods.

IRT pinpoints the termite infestation, which limits the need for second opinions or confirmations. Termites are their own worst enemy when it comes to IRT. The carbon dioxide they produce during digestion and the mudding used to construct their tunnels creates irregular heat patterns that IRT detects. Once IRT has located the termite infestation, spot analysis can be confirmed with the use of Termatrac and AED 2000, which enables application of more accurate eradication methods.

PBC is helping to establish the credibility of IRT within the industry. The case studies show that IRT locates termites where conventional methods have failed. When an experienced operator uses the correct IRT equipment, termites are located in a fraction of the time compared to conventional methods. It saves homebuyers and owners money and ensures security compared to other inspection techniques. IRT goes where other pest inspection techniques cannot—to see the unseen.

## **REFERENCES**

Australian Standard AS 4349.3 – 1998.

Commonwealth Services and Industrial Research Organisation ( Aust.)

Dr. Berhan Ahmed B.Sc. ( Agri.) Ph.D.

## **ABOUT THE AUTHOR**

Mark Rentoul is a licensed Builder, Building Inspector, Pest Inspector, and Pest Controller in Australia with the Queensland Building Services Authority. He is licensed with the Queensland Health Department as a Pest Management Technician.

He is a Certified Thermographer of Building Science and a Level II Thermographer. He is a Certified Resistographer and has trained in the United States, Asia, and Melbourne University Australia.

He operates Prime Building and Pest Consultants Pty Ltd. and specialises in Infrared Thermal Imaging. He is a founder of IRT in Building and Pest Inspections within Australia. His company employs nine inspectors using Thermal Imaging to investigate structural, electrical, plumbing, termites, roof tops, and energy efficiency within the residential and commercial markets.

Building Sciences Thermographer Certified 24598

Building & Pest Inspector QBSA LIC No: 720 426

