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THE MUNCH BUNCH:
Keeping a step ahead of termites

WORDS Dick Clarke

↑
A little scary in close-up, the only threat termites such as this *Mastotermes darwiniensis* pose to humans is by attacking and eating our homes. Image: CSIRO, CC BY 3.0, via Wikimedia Commons

Timber-eating termites can pose a threat to buildings in most parts of Australia. Veteran building designer Dick Clarke spins us a yarn about the tricky creatures and how to avoid termite woe in your home.

Termites are a much feared but poorly understood enemy of our houses – yet they are a friend in the bush, clearing a huge volume of dead timber. They have a very important job to do in our broader ecosystem; we just don't want them doing it in our houses. So how do we stop them?

An enemy understood is an enemy defeated, famously stated the Chinese general and philosopher Sun Tzu in *The Art of War*. Not all termite species pose a risk to our buildings, but for those that do, there are only two types of houses in Australia: those they have already attacked, and those they would like to attack. (In spite of popular mythology and even official publications, the Victorian high country and Tasmania are not termite-free: I have seen nests and activity in both locations.)

The war analogy can seem appropriate if you have just found the little fellas happily turning your house frame into cellulose chowder. I know it did when I found that exact thing happening to my own home thirty years ago. I quietly freaked out and thought my family home was going to crumble around me, along with my finances and fortune. Yet, ironically, when I found them in our Envirotecture office just last week, my reaction was measured and calculated to eliminate the problem without panic.

Luckily, back in the 1980s I had a friend who happened to work for Australia's leading termite management company, founded some years earlier by Robert Verkerk – legendary amongst knowledgeable humans, feared amongst termites.

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So much damage inflicted by such tiny creatures! On the right are *Nasutitermes* termites. Right image: CSIRO, CC BY 3.0, via Wikimedia Commons

He wrote 'the book' on termite management in Australia, fittingly titled *Building Out Termites: an Australian manual for environmentally responsible control*. This short volume has become the standard text in the industry.

It turns out that not only are the methods detailed in Verkerk's book environmentally responsible, they are actually more reliable and effective than the old 'toxic chemicals at 20 paces' approach. Therefore it will come as no surprise that everything I have to say about termites is coloured by the experience of working with Mr Verkerk's protégés, and devouring his excellent text as enthusiastically as a termite in old pine flooring. And thirty years' experience in the world of the built environment.

KNOW THY ENEMY

Termite species are easily identified by their soldiers and by the nest location. There are about 360 species in Australia; here are three of the most common.

- *Coptotermes* mostly nest underground or in the base of old trees. Soldiers have pincer nippers and will bite your finger fiercely – if you shut your eyes and concentrate you can almost imagine you can feel it.
- *Nasutitermes* commonly nest in trees. Soldiers have a single rhinoceros-like horn and will valiantly head-butt your finger until they fall over – try as you might you really can't feel that one either.
- *Mastotermes darwiniensis* … lock the doors and hide the children and small dogs. These are the tropical bad boys of the termite world, with a voracious appetite and sufficient strength to tear through anything softer than steel or stone. The soldiers have a set of jaws likely to recur in your nightmares for years, like something out of Alien. [Calm down Dick, none of Australia's termite species can actually cause direct injury to people or pets! – *Ed.*]

Termites are photo-phobic and need high levels of humidity to survive. Thus, they do not roam in the open like ants, except in late spring when potential queens take to the air in their millions hoping for a mate. As soon as these land their wings fall off, and if they don't get lucky they die a short time later. Happily for us the vast majority don't get lucky.

Nests are a social and engineering masterpiece, with temperature regulated at between 25 and 35 degrees Celsius depending on species, with constant humidity control. Termites have distinct social roles from the queen down, and there is a symbiotic feeding relationship between all the workers and the soldiers.

Working termites must build tunnels, called 'leads', to their timber-mining site, in which they labour night and day to feed their egg-laying queen. Soldiers roam the tunnels ready to vigorously defend the colony. This protection technique is also their downfall, so far as we are concerned. They must build their lead out and around any impenetrable barrier, and so physical barriers laid across any joint in a structure force them out into the open where we can spot them and take action before they do much damage.

This requires two steps: barriers, and regular inspections – at least every twelve months, though twice-annual inspections give greater security.

THE GREAT WALL

Fundamentally, the principle for protecting your home is to keep the little fellas out. Sounds easy, and if you stick to some proven building components, and inspect them at least annually, it is.

The safest and most effective techniques rely on permanent physical barriers – these never leach away or deteriorate over time. Chemical barriers have a use-by date, no matter how or where they are applied, from as little as ten years. Your building's use-by date should be somewhere north of one hundred years, so clearly anything that wears out or leaches away – even in part – long before that is leaving your house terribly exposed.

The best permanent physical barriers include stainless steel (sheet or fine mesh), crushed granite, or a special vapour barrier poly sheet with termiticide molecules bonded with the plastic molecules. This product repels on contact, meaning the termites cannot even contact the material, much less eat through an outer layer to reach the active termiticide within. These sheets retain their potency for the life of the building, yet are completely safe to handle and never leach out into the surrounding soils.

How and where these barriers are installed varies with design details and location (Australian Standard 3660.1 *Termite Management – New Building Work* is the key document), and not all are suitable for the ravenous tropical termite *darwiniensis*. Systems suitable for installation north of the Tropic of Capricorn carry explicit identification as such.

CONSTRUCTION DETAILS

Concrete slabs should always be designed not to crack, but in reality most will develop minor cracks over time, without failing. Sometimes the cracks can be wide enough for termites to sneak up through. So there are two strategies for protection: design the slab slightly stronger than the bare minimum to reduce the likelihood of cracking and reduce the severity if and when it does crack; and have a permanent barrier under the whole slab that is flexible enough to stretch over a slight crack. The integrated termiticide-poly sheet materials described above are perfect for this, as they also substitute for the ubiquitous orange or black vapour barrier sheet required by the building code.

Any pipe penetrations (and movement joints such as are found in very large slabs) must also have a physical termite barrier installed in them. Typically these will be sleeves or collars that fit tightly over the different pipe diameters, and are embedded within the concrete itself.

Insulation to slab edges is becoming more common, and one of the obstacles to its practical implementation has been overcome thanks to poly sheet products with integrated termiticide, which can be installed right up the edge of the slab outside the insulation board. Because these are repel-on-contact, they provide an effective barrier that does not need to be opened up for inspection. See the construction diagram below for an example of this approach.

Raised timber floors usually have reliable physical barriers, commonly known as 'ant caps', on piers and around perimeter walls. Like any physical barrier they must be inspected; to ensure that inspection is feasible, there must be 400 millimetres of clearance between the lowest subfloor timber and the ground. It is also important to keep the humidity levels down in enclosed subfloors, thus the need for multiple vents in perimeter walls. In cooler climate zones this makes underfloor insulation even more important in order to minimise heat loss.

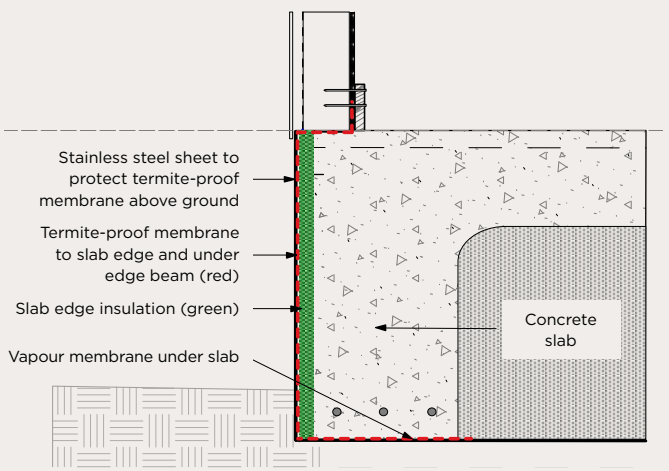
In cavity wall construction such as double brick or brick veneer, a stainless steel barrier across the cavity will prevent termites from ascending to the roof framing undetected. The material's edge must be exposed in a mortar joint on the external skin, and not covered by paving, soil or any other later work. It is this 'edge' that is best inspected twice-annually, and if it is exposed the inspection is simple. Crushed granite can be used in the cavity instead, which creates an impassable barrier because the grains are too heavy for all but *darwiniensis* to shift out of the way, yet the spaces between them are too small for termites to squeeze through.

In solid or monolithic wall construction such as rammed earth, mud brick or hempcrete, a physical barrier is still required at the base of the wall if on slab, or below bearer height for a raised timber floor.

Roof construction is not usually considered, because if the floor and walls are protected, by definition so is the roof.

In renovations, all new work should follow these standards. Protecting existing structures that have no barriers is a difficult task, and calls for different tactics such as reticulated systems where termiticide is regularly pumped into blind spaces. Each building will need its own strategies, but in any case more regular inspections will definitely be required.

Even with appropriate barriers and design details in place, you should always carry out a full and detailed inspection of the whole property wherever accessible, at least once a year.



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Construction detail for the installation of a membrane with integrated termiticide over slab edge insulation.

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(Left) Entomologist Harry Malcolm installing a termite-baiting trap in the Envirotecture outdoor meeting room. (Right) Harry places an alpha-cellulose mixture containing an insect growth regulator in a nearby garden bed where an active termite lead was found. It was then covered to prevent accidental disturbance by animals or humans.

I'M UNDER ATTACK – WHAT DO I DO?

If you do find evidence of termites, firstly, don't panic. Call for help, with a bit of information to help find the right people (that is, not the 'toxic chemicals at 20 paces' crowd). A good management company will inspect to ascertain the extent of the infestation and identify the species, as different species need subtly different management techniques.

If possible, they will inspect the surrounding area in an attempt to locate and destroy the nest directly. Then they will devise a scheme that will ultimately destroy the reproductive viability of the nest. Termites reproduce at a rapid rate, so any disruption to that process has an immediate effect, quickly making the nest unviable. The best method involves making a concentrated 'alpha-cellulose' paste that is delicious to termites. In this paste is mixed an insect growth regulator, which is harmless to vertebrates but for termites prevents the formation of exoskeletons, so the next generation is hatched as defenceless, infertile, immobile blobs. Sounds like a sad end, but it's the law of the jungle out there!

CONCLUSION

There is no end to the battle of wits between termites and humans, and we must be constantly vigilant. But taking our lead from Sun Tzu, forcing the termites to take their leads out and around a physical barrier is the most reliable defence we have, and as long as we inspect our barriers at least once a year we can sleep peacefully at night.

Hey, what's that chewing noise…?

WHAT ABOUT THAT GREEN-COLOURED FRAMING TIMBER?

H2 treated pine timber framing, sometimes marketed as T2, is structural pine that has had an envelope or perimeter treatment added to reduce the likelihood of borer and termite attack. It sounds like a really good idea, and the Australian timber industry has been quick to seize the opportunity to value-add. The marketing plays on our fears, and our desire to protect our biggest investment.

But if AS3660.1 *Termite Management – New Building Work* is followed, and if inspections are carried out at least once a year, then termites will not enter the building structure undetected. So why add a second layer of protection? Or perhaps the better question is, why not add a second layer?

Reasons not to use it are threefold. Firstly, the treatment limits end-of-life options. Sadly, the average Australian house is demolished after just 42 years. H2 treated timber cannot be composted or burned for biofuel, meaning it must be either reused or sent to landfill. The labour cost to deconstruct framing for reuse is still much higher than the cost of gross demolition, and so landfill is where it is most likely to end up.

Secondly, some H2 timber manufacturers require liquid termiticide treatment to be applied to the end grain of cut timber. I have yet to see that happen on any site. Thirdly, it smells! H2 off-gases whatever solvent was used to carry the treatment into the timber, even if water-based. Some people have reactions to these solvents, and carpenters may be advised to wear gloves while handling it, something else I have never witnessed.