A NATIONAL STANDARD: CODE OF PRACTICE FOR TERMITE MANAGEMENT

FINAL DRAFT

ISBN:

FIRST DRAFT

CHAMPIONING INDUSTRY PROFESSIONALISM AND INNOVATION

As the professional pest management industry's peak national body, the Australian Environmental Pest Management Association (AEPMA) is committed to promoting a culture of professionalism and innovation, not only in pest management but also in allied and associated industries such as building and construction. This Code of Practice has been prepared, in large part, to help promote increased professionalism and innovation at all levels, across all industries and to recognise and embrace all stakeholders involved in incorporating termite management systems into new buildings during the course of their construction.

Importantly, to become more professional and innovative, industry stakeholders need to re-examine how they do things and find new and better ways of achieving superior results. And, they need to embrace and commit to continuous improvement in all aspects of: enterprise development and planning; business practice; financial management; project management; workforce management; and, their use of technology.

AEPMA believes technology, particularly information technology, has the potential to be a major driver of change in both pest management and the building and construction industries. Already, we are seeing major growth in, for instance: electronic tendering and documentation; job costing, job tracking , and personnel, vehicle and equipment tasking; data communication; virtual design; project data and database sharing across and between disciplines; construction automation; and energy management. All these innovative technologies are having and will continue to have significant impacts on industry practices.

And, we believe those enterprises and individuals which embrace new technologies into their businesses will become increasingly competitive.

For its part, AEPMA will continue to actively support and promote industry-wide professionalism, ethics-driven innovation, and ever higher standards of performance and behaviour through initiatives such as:

- a 'gold standard' code of ethics;
- professional accreditation through PestCert;
- ever higher standards of training and education for industry practitioners;
- the development of 'National Competency Standards';
- developing, preparing and actively promoting industry 'Codes of Practice'; and
- ever increasing investment in cost-effective communication within the industry and between the industry and its stakeholders.

AEPMA CODES OF PRACTICE

AEPMA is committed to developing, preparing and promoting definitive 'Codes of Practice' describing and providing expert guidance on best practice across an increasing range of key pest management areas.

Codes of Practice which have already been published and which, as 'living documents', are continually being reviewed and updated, include:

A Code of Practice for the Control of Bed Bug Infestations in Australia

A Code of Practice for Pest Management in the Food Industry

Other Codes of Practice under development include:

A National Standard: Code of Practice for Prior to Purchase Specialist Timber Pest Inspections

A National Standard: Code of Practice for Training in the Pest Management Industry

A National Standard: Code of Practice for Termite Management During Construction

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VERSION CURRENCY

A Code of Practice is a ***living document*** and it is therefore important that the latest version is read and relied on. If in doubt, check with AEPMA to ascertain if this Code of Practice is the latest version.

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While every effort has been made to ensure this Code of Practice is complete and accurate, no warranty or fitness for purpose is implied. The information provided is on an '*as is*' basis. Neither the authors nor any persons that contributed to the development of this Code of Practice will accept any contractual, tortious or other liability whatsoever in respect to the contents of this Code or any consequence arising from its use or representations made in relation to it.

ACKNOWLEDGEMENTS

AEPMA gratefully acknowledges the contribution and support of people and organisations who have helped prepare this Code of Practice.

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2. DRAFT INPUT

The committee would like to thank the following organisations for providing comment on the first draft document.

Allstate Pest Control
Amalgamated Pest Control
Austrapest
Envirotechnics Pest Management
Flick Anticimex
RAPID Solutions
Rentokil
Rollins/Allpest WA
Termitrust Pest Management
WR Gay Pest Control

DOCUMENT ADMINISTRATION AND REVIEW

This ***Code of Practice for Termite Management in Existing Buildings*** (elsewhere referred to as 'this Code', and/or 'this Code of Practice') was initiated on behalf of the professional pest management industry by the Australian Environmental Pest Managers Association (AEPMA), the peak professional association for timber and other pest management services in Australia.

To develop and prepare the Code of Practice, AEPMA appointed a working party comprising:

- leading pest management professionals;
- representatives of companies and organisations responsible for the design, development, manufacture, delivery and installation of termite management systems and technologies; and
- other relevant stakeholders.

Under the terms of its appointment, the working party has been made responsible for developing and the ongoing administration and review of this Code of Practice, in accordance with guidelines agreed by AEPMA's national board of directors.

This Code of Practice remains the property of AEPMA which publishes this Code of Practice online. The latest version is available from: http://www.aepma.com.au/Codes-of-Practice.

CONSULTATION WITH REGULATORY BODIES

AEPMA has consulted with both:

- the Australian Competition and Consumer Commission (ACCC); and
- Standards Australia (SA),

to ensure there is no conflict between the Code of Practice and any policy, legislated, or technical requirements.

Please note: This Code of Practice is not intended to contradict any legislated requirements and cannot be read as opposing any such requirements.

ETHICS

The AEPMA ***Code of Ethics*** underpins and provides an ethos for all aspects of professional pest management. In particular, the AEPMA Code of Ethics:

1. underpins best-practice by pest management professionals and pest management industry ('industry') stakeholders;

2. obliges all industry stakeholders to oppose and call out unethical behaviour by others in the industry;

3. requires all industry stakeholders operating at all levels to adopt ethical principles and practices consistent with the industry's codes of practice and Australian standards; and

4. requires all industry stakeholders who adopt this Code of Practice to deal only with industry parties whose standards of performance and behaviour conform to those expected by this Code.

The AEPMA ***Code of Ethics*** can be viewed on the AEPMA website: ***www.aepma.com.au***.

1. PREFACE

This Code of Practice is an initiative of the Australian Environmental Pest Managers' Association Ltd (AEPMA), and is intended to document industry best practice by establishing benchmarks for the pest management industry.

Australian Standard *AS 3660.2-2000 Termite management - In and around existing buildings and structures* sets a minimum standard for termite management in and around existing buildings and structures as part of Australian Standard's 'Termite management' group of standards.

This Code of Practice delivers additional information to both pest managers and clients to assist in achieving a positive outcome from a termite related issue.

2. OBJECTIVES, SCOPE AND PURPOSE

This Code of Practice aims to establish and recommend industry best practice for managing subterranean termites in and around existing buildings and structures.

In supporting this aim, the Code seeks to:

- assist professional pest managers by providing a clear set of operational and business guidelines;
- assist clients and other stakeholders by providing guidelines for best practice termite treatment;
- assist clients in selecting suitably qualified and equipped pest managers;
- inform clients and other stakeholders about what to reasonably expect from a professionally conducted termite management service; and, in so doing,
- better align client and other stakeholder understanding and expectations with the realities of professional termite and other pest management.

Among other things, the Code emphasises:

- features, benefits, and limitations of currently registered systems, techniques, products, and, technologies for managing termites in existing buildings and structures; and,
- best practice (ground rules) governing how such systems, techniques, products, and, technologies should best be commissioned, applied and/or installed.

The scope of this Code of Practice is limited to subterranean termite management in and around existing buildings and structures.

For termite management commissioned and undertaken during building construction, refer to AEPMA's ***Code of Practice for Termite Management During New Constructions***.

People, businesses and organisations who sign up to this Code of Practice commit to following and complying with the Code's best practice requirements and stipulations.

3. KEY STAKEHOLDERS

For this Code of Practice, key stakeholders include:

- professional pest managers commissioned to manage termites in existing buildings and structures;
- companies and organisations which develop, manufacture, and/or distribute termite management systems, products and technologies; and, of course,
- building owners and managers.

4. DISPUTE RESOLUTION

Good communication between pest managers and their clients is essential in avoiding conflict. Conflicts most often occur when clients' expectations are not met.

When a dispute occurs, pest managers should meet with their clients to discuss client concerns and/or issues and try and reach mutually acceptable outcomes.

If parties/stakeholders cannot finalise disputes, the next step, generally and ideally, is mediation. At this stage pest managers should notify their insurance companies.

To help ensure speedy and fair outcomes to any disputes between stakeholders, all parties who agree to comply with (sign) this Code of Practice also agree to be bound to follow the Code's dispute resolution procedure.

Specifically, all parties agree:

- any complaint arising out of works carried out under this Code will be presented in writing in a timely manner; and
- to attempt to reach a consensus over any dispute by sharing their evidence and position using the following escalating pathway.

    1. If the parties cannot finalise the dispute through negotiation within 30 days after receiving the complaint, the matter shall be referred to AEPMA which will recommend a mediation process.

    2. If mediation fails, all parties agree that the matter will be taken to an independent arbitrator either appointed by AEPMA or as agreed by the parties.

The ultimate sanction that can be imposed by AEPMA is to find that the member breached the Association's ***Code of Ethics*** which could lead to expulsion or suspension of membership.

5. LIMITATIONS OF TERMITE MANAGEMENT AND TERMITE MANAGEMENT SYSTEMS

A number of factors can limit the ability of pest managers and/or termite management systems to achieve desired outcomes. Such factors, generally beyond the control of pest managers, may include but are not limited to:

- constraints imposed by building designs;
- construction issues and faults;
- site conditions, especially as affected by soil levels and landscaping;
- limited access to inspect and/or apply treatments to certain areas of buildings;
- the presence of vegetation close to buildings;
- poor or inadequate ventilation of sub-floor areas;
- poor or inadequate drainage beneath and around buildings;
- disturbance to (and, therefore, breaching of) termite management systems after they have been installed;
- deliberate or accidental placement of foreign objects over or around termite management systems (bridging), enabling termites to gain unfettered access to buildings; and
- client failure to follow pest managers' recommendations for on-going system care and maintenance.

6. STAKEHOLDER RESPONSIBILITIES

6.1 PROFESSIONAL PEST MANAGERS AND PEST MANAGEMENT TECHNICIANS

Under this Code, pest managers who provide and undertake termite management must have a thorough understanding of:

- termite biology and behaviour;
- termite identification and geographical distribution of termites in Australia;
- termite inspection and detection techniques;
- preventative and curative treatment techniques;
- building and construction methods;
- environmental conditions known to be conducive to termite foraging and incursions into built and/or other environments; and
- documentation (purpose, contents and formats) required to be completed and/or prepared and presented for termite management.

Pest managers must also have attained required national pest management units of competency for termite management. Further details on these units can be found in the *AEPMA Code of Practice for Training in the Pest Management Industry*.

Pest managers undertaking termite management should also have accumulated a 200 hours of combined study (theory) and practical experience including participation in:

- at least 40 timber pest or termite inspections under direct supervision; and
- at least 20 and, ideally, ideally, up to 40 complete post construction termite treatments (baiting and /or chemical) consisting of a combination of preventative and active treatment sites.

Pest managers must also be licensed to use pesticides by their relevant state or territory governments (see Appendix D).

They must also have had a minimum of two years' experience in pest management , including management of active termites.

Full details of licensing requirements for each state and territory are presented in AEPMA's *Code of Practice for Training in the Pest Management Industry.*

Pest managers who comply with this Code of Practice must also:

- comply with all relevant occupational work health and safety (OH&S) and welfare legislation as well as with other standards and associated (relevant) 'Codes of Practice';
- comply with all national and state regulations that apply to pest management; and
- only handle, use and apply pesticides in accordance with product label directions and industry and government approvals (e.g. APVMA).

6.2 PEST MANAGEMENT BUSINESSES

Under this Code, professional pest management businesses providing and undertaking termite management are required to minimise risk to themselves, clients, other people, and the environment by:

- ensuring their pest management and other staff and contractors are adequately trained;
- ensuring their pest managers have amassed appropriate experience and hold appropriate, certificated qualifications;
- allocating appropriate time, materials and equipment to all termite management jobs to ensure treatments are completed on time and with no compromise to quality; and
- holding current 'professional indemnity' and 'public liability' insurance.

6.3 CLIENTS (BUILDING OWNERS AND MANAGERS)

Under this Code, clients are obliged to acknowledge that a number of factors may limit pest managers' abilities to achieve desired outcomes limiting the ability of a pest manager to achieve desired outcomes.

It is imperative that clients carefully follow written recommendations prepared for them by their pest managers. Failure to act on recommendations may limit pest managers' ability and capacity to achieve successful treatment outcomes and, therefore may transfer at least some responsibility and liability back to clients who fail to heed pest managers' professional advice.

IMPORTANT NOTE. Termite management is often complex and should only be carried out by trained, experienced professionals (pest managers who have undergone training under the National Competency Training for Certificate III in Urban Pest Management including Units 8 and 10 for Timber Pest Management.

7. COMMUNICATION WITH CLIENTS

Good (effective) communication between pest managers and their clients is essential to achieving positive treatment outcomes and avoiding conflicts.

This Code accepts that conflicts and misunderstandings can arise when clients' expectations are not met, even if those expectations are unreasonable. The Code, therefore, maintains that, before proceeding to initiate any treatment, pest managers have a responsibility to ensure that clients are effectively briefed and helped to understand what expectations and desired outcomes are realistic and reasonable in the light of and in relation to their own individual circumstances.

The Code stipulates that best practice requires pest managers to provide their clients with:

- an approved format inspection report, clearly showing what, if any, evidence of termites and termite damage has been found and the implications of such findings; and

- an approved format treatment proposal, clearly stating what work or treatments are being recommended, why they are being recommended, the costs associated with such recommendations, and the implications, for clients, their property and the environment should such proposals be agreed to and commissioned.

Under this Code, when treatments have been completed, pest managers are required to provide each client with an approved format 'Certificate of Treatment' and also install, in an approved and appropriate place, a durable 'notice of treatment'.

Pest managers who carry out termite management programs must also provide clients with clear guidelines and directions for maintaining the integrity and effectiveness of all treatments, along with clear warnings about limitations to treatment effectiveness brought about by or due to any client failure to follow such directions or other clearly described limitations to treatment effectiveness.

8. FOR CLIENTS … CHOOSING A PEST MANAGER

Under this Code, clients are strongly recommended to choose pest managers who are members of AEPMA and, who therefore, are committed to abide by AEPMA's Code of Ethics.

Specifically, clients are advised to:

- check that prospective pest managers hold current and valid licences to provide and undertake pest management services (see: Appendix C);
- satisfy themselves that prospective pest managers have amassed significant pest management experience (How long has a pest manager been working and involved in the industry and for how long has the pest manager been carrying out termite management?);
- check prospective pest managers' reputations (ask for checkable references and also consider asking family, neighbours and friends for their recommendations);
- satisfy themselves that they are selecting a pest manager on more than quoted pricing and as much on qualifications, experience, and reputation;
- satisfy themselves that the selection process is not be based on pricing alone.
- check and satisfy themselves that prospective pest managers are fully and adequately insured (covered for both professional indemnity and public liability); and
- check pest manger websites for extra information (testimonials, AEPMA membership etc.).

9. HEALTH AND SAFETY REQUIREMENTS

All pest managers are required, under law, to comply with relevant, current, national and state work health and safety laws when mixing and applying insecticidal products or carrying out any other termite management services.

All termite management chemicals must have Agricultural Pesticides and Veterinary Medicines Authority (APVMA)-approved labels attached. By law, instructions and directions on these labels must be followed, to the letter.

Included on such labels are directions for product use (dosage and mixing rates, application methods, and application equipment and timing, etc.) as well as instructions for the wearing of the appropriate personal protective equipment, and correct storage, transport and disposal procedures.

Failure to observe label directions is an offense.

10. TERMITE BIOLOGY AND BEHAVIOUR

Professional pest managers who undertake or advise on termite management must have an in depth knowledge and understanding of termite biology and behaviour because such knowledge and understanding enables them to make properly informed judgements, decisions and recommendations and, therefore, carry out only the most appropriate treatments and management strategies.

A background paper on termite biology and behaviour is presented in Appendix A.

11. INSPECTION AND DETECTION

Under this Code, written timber pest inspection reports are mandatory components of termite management in and around existing buildings.

Timber pest inspections should always be completed and reported on out prior to any termite treatments being undertaken. Inspections, can, however, be quoted on separately or as part of a total package.

Inspections and associated reports:

1. identify the presence or absence of termites and/or other timber pests or diseases (eg fungal or bacterial rot);

2. identify whether timber damage is due to termite attack or due to other pests or diseases;

3. if damage is termite related, identify the genus and species (if possible) involved;

4. assess the extent of and areas of activity, possible entry points and nests;

5. determine the most suitable course(s) of action, including treatment(s);

6. assess possible and likely limitations to recommended treatment(s);

7. identify risk factors that may influence treatment limitations

8. recommend further trade involvement (eg building remediation, carpentry) before or after treatment(s);

9. recommend on the need for and frequency of future inspections and/or follow-up treatments; and

10. provide clear guidelines for on-going maintenance of treated properties and treated areas.

11.1. STANDARD VISUAL TIMBER PEST INSPECTIONS

Standard visual timber pest inspections cover and include both initial and/or regular inspection of home, buildings and structures within the boundaries of an average sized building block (up to 1,000 square metres) or, with rural properties, all buildings and structures and the surrounding grounds within a 30 metre radius of targeted buildings and structures.

Inspections should be conducted at least annually and, often, more frequently, depending on:

- termite species involved or suspected;

- building construction type(s);
- the presence or absence of 'conducive conditions' (physical and/or environmental conditions which may favour termite activity and attack);
- geographical region; and/or
- history of termite related issues within or around the particular property.

Special note: standard visual termite inspections should not be confused with **'invasive'** inspections, which require potentially termite-affected timbers and materials to be physically removed or opened up.

Tools and equipment

A recommended tool and equipment kit for the conduct standard or visual inspections includes but is not limited to:

- a moisture meter;
- powerful torch;
- long handled probe or screwdriver;
- ladder (minimum 2.1m opening up to 3.6 m);
- sharp knife (for splinter test); and
- digital camera.

Optional but non-essential items include:

- a compass (to determine orientation of building so location of information can be accurately reported);
- a magnifying glass or hand lens (x 10 magnification);
- binoculars; and
- tweezers and specimen jar.

The results of standard visual termite inspections must be detailed in a written report including and covering, as a minimum:

- the detection or non-detection of termites;
- identification or otherwise of 'conducive conditions';
- all and any damage identified during inspection;

- a clear outline and description of all areas of buildings which restricted or limited access to inspection;
- a clear identification and description of all relevant 'risk factors' (factors which may favour termite incursions or attack and/or factors which may preclude or limit future inspections); and
- a clear presentation and proposal of available and recommended treatment options.

11.2. PARTIAL AND SPECIAL PURPOSE ('WARRANTY') INSPECTIONS

Partial and special purpose termite inspections are generally undertaken in situations where further inspection is required of previous termite management measures which have been started or implemented, or when a localised or partial only inspections have been requested. A **partial or special purpose termite inspection** may be a stand-alone inspection of a termite management system only and not include an inspection of the whole property covering all structures and fittings.

Such situations include but are not limited to where a proprietary termite management system requires regular inspections to maintain or renew the warranty applicable to that specific system or product such as:

- graded particle termite 'barriers';
- reticulated termiticide 'barriers';
- stainless steel sheeting 'barriers';
- chemically impregnated membranes or sealants; and
- termite monitoring/baiting systems.

Partial and special purpose inspections are often combined with 'standard inspections' and are generally undertaken or called for:

- where a partial treatment has been previously carried out;
- where the first stage of a multi-stage termite treatment requires checking before the next stage can begin;
- to inspect trees, stumps, poles, fences, etc. where termite control or localised treatment measures had been undertaken previously;
- when a previous invasive inspection of a particular area has highlighted a particular concern; and/or

- an area which was locked or otherwise made inaccessible during a previous inspection.

Under this Code, the frequency of partial and special purpose inspections depends, in large part on:

- the warranty terms and conditions of particular, individual proprietary termite management systems;
- the extent and severity of termite activity and/or attack;
- the type and nature of treatments undertaken or applied; and/or
- the professional judgement and discretion of termite (pest) managers.

Partial or special purpose termite inspections maybe be conducted as 'visual only' inspections or may be performed using invasive techniques.

11.3. INVASIVE INSPECTIONS

Invasive inspections generally involve compromising or damaging surfaces to permit partial, full physical or visual access to concealed areas, for example, to enable inspectors to access and look inside wall cavities, concealed subfloor areas, etc.

This may entail drilling holes in walls or ceilings (internal or external), and/or dislodging or removing sections of internal wall lining, roofing or external cladding to permit inspection of previously concealed or partly concealed areas.

Under this Code, where a recommended invasive inspection may damage or impair properties, fixtures and/or fittings, pest managers must consult and gain agreement from clients or property owners or managers. In the event of any uncertainty as to what is involved and the expected consequences, pest managers must gain written permission to carry out all specified invasive inspection work before any such works are undertaken.

11.4. SITE ASSESSMENTS

A 'site assessment' is a limited assessment of buildings and building sites to determine the suitability or otherwise of possible termite control measures and options for the purpose of developing written treatment proposals or quotes.

12. TERMITE MANAGEMENT PROPOSALS

Under this Code, pest managers must provide each of their clients with written proposals before they commence any termite management work.

Each proposal must include

- a copy of the most current timber pest inspection report for the property being quoted on;
- full details of the treatment methods and products being proposed to be employed and deployed;
- alternative treatment or management options and reasons why the options proposed have been recommended;
- reasonable expectations and anticipated outcomes of the proposed treatment(s) and management options;
- clearly identifiable costs of proposed management/treatment options; and
- a list of any actual and/or potential limitations that (or may) affect the effectiveness of all elements of the proposed the termite management treatment, including construction design, building practices, site conditions, client requirements or any other treatment limiting factors which may arise.

Proposals must also contain sufficient clear detail to ensure clients fully understand and appreciate:

- the nature and implications of each of the various techniques, components and products involved in the proposed treatments (including cutting concrete, drilling holes, removing gardens, replacing or removing soil, trenching, etc.);
- the implications and likely impacts of the works proposed, both for them and the environment and for them in terms of on-going commitments and responsibilities.

This Code requires that there are no misunderstandings among or between the parties involved in each termite management program. Under this Code, to ensure full understanding, pest managers must assure themselves that clients understand and appreciate all parts of each proposal. They must also require that their clients **sign** their acceptance of all proposed treatments and management programs prior to any work commencing.

13. ERADICATION OF TERMITE INFESTATIONS (CURATIVE TREATMENT)

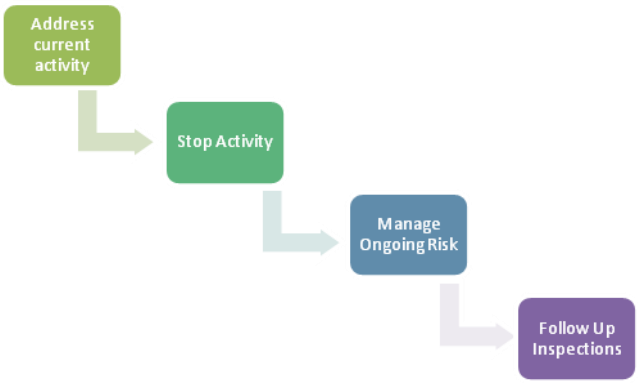
The main aim of 'curative' treatments is to arrest active termite infestations and prevent further damage.

Under this Code, while every attempt to eradicate termite colonies from which infestations may originate should be pursued, the main priority should always be to eradicate all live activity from buildings and surrounds being treated.

Importantly, both pest managers and their clients must understand that cessation of termite activity does not guarantee structures will be protected from attack by other colonies in the area.

Curative treatments are not designed as stand-alone treatments, and should not be used as such. Therefore a preventative termite management system should be installed in conjunction with successful eradication of termite activity from within the structure.

13.1 TERMITE TREATMENT PROCESS OVERVIEW



13.2 DUSTING

Dusts toxic to termites can be used to eliminate termite colonies, even when nests have not been located.

Very fine (ultra-small particle) dusts made up of or containing termite toxicants are gently blown into termite-excavated wood or other suitable termite 'workings' (eg, galleries encased by termite 'mud').

Termites that are dusted directly (those on whom dust particles land), and those that become affected by the dust while using dust covered tunnels, 'groom' each other, thus spreading toxicant among and between colony members and, over time (dusts do not kill termites immediately), eliminating or at least suppressing colonies.

It is important to apply a light covering of dust over as many termites as possible whilst minimising the amount of stress and disturbance to the termites. To help achieve this outcome, treatment holes should be sealed with tape after each application.

The deployment of 'aggregation containers' can also help maximise the number of termites exposed to dust toxicants.

Also, to help promote colony decline, pest managers should dust termites each time significant activity is found. This means, pest managers should regularly check for and monitor termite activity after each dusting treatment and re-apply dust if termite activity is evident.

Importantly, the absence of activity at and around treatment sites does not necessarily mean success. A thorough re-inspection is required to confirm elimination of termite activity in the structure.

The efficacy of termite dusting treatments depends on several factors including:

- termite species involved;
- the presence of undisturbed and uncontaminated feeding sites identified with live termite activity (termites are easily disturbed and reluctant to venture into areas which seem at all 'suspicious');
- time of year (dusts are more effective during the warmer months of the year when the termites are more active);
- termite numbers (in general, the larger the percentage of colony population treated, the higher chance of colony elimination);
- operator skill (termite dusting is delicate work and requires skills that only come with good training and experience; and
- moistness of termite 'workings' (termite galleries and tunnels must be as dry as possible to permit dusts to travel and be distributed as far as possible).

13.3 BAITING ABOVE GROUND

Above ground baiting involves placing cellulose-rich termite food which has been treated or mixed with palatable, slow acting insect growth regulators (IGRs) into easily accessible containers which, in turn, are positioned (above the ground - inside or outside actual building structures) directly over active termite feeding sites.

The aim is for termites to find and then feed on the baits and transfer the IGR toxicants to other nest members and, eventually, either eliminate or suppress termite numbers in their colonies.

Because termites are relatively fussy eaters with very acute senses of taste and smell, it is important that baits are made to be as palatable as possible (to termites) by ensuring they are:

- made and kept moist bait is moist; and
- all bait mixing equipment and hands are clean and free of odours (wearing disposable gloves is recommended).

It is also important that pest managers/bait station installers minimise the amount of disturbance when installing the bait.

Pest managers should factor in the need to monitor termite activity regularly after bait stations have been installed and be prepared to replenish baits when and as required.

As with dusting, an absence of activity or feeding at baiting sites does not necessarily mean success. And, this means thorough re-inspections of all structures are required to confirm elimination of termite activity in the structures.

The efficacy of above ground baiting treatments depends on several factors, including:

- pest managers' abilities to identify and locate undisturbed and uncontaminated feeding sites showing live termite activity;
- time of the year (baiting is faster acting during the warmer months of the year when the termites are more active);
- accurate species identification (currently available baiting products are more effective on some species than others, for instance baiting is generally ineffective for *Mastotermes darwiniensis*);
- bait acceptance (termite bait must be consumed in sufficient quantity to result in colony elimination, and, the quantity of bait consumed depends on many factors including colony size); and
- bait avoidance (termites may avoid feeding on baits when feeding areas have been excessively disturbed during installation, sites or baits have been contaminated, or, for no apparent reason at all.

13.4 FOAMING

Specially designed foaming agents containing a slow acting, specifically registered termiticides which can be injected under pressure directly into active termite workings.

For foaming to be effective, pest managers must, first, be able to identify suitable, undisturbed and uncontaminated feeding sites demonstrating ample live termite activity.

Termites that come into direct contact with the toxicant-charged foam, and those that pick up foam/liquid residues using the foamed tunnels, 'groom' each other and spread termiticide among other colony members to either eliminate or suppress the colony.

Termiticidal foams expand under pressure to reach places that other treatments cannot. However it is important to mix the correct expansion ratio. Wet foams (less than 10 parts 'solid' material to one part water) will not travel and penetrate as far as a dry foam (15 to 30 parts solid to water ratio). Wet foams also increase the risks of staining walls and wetting floors.

Foaming is particularly suited for injection into termite workings in trees and landscape timbers.

As with other treatment methods, it is incumbent on pest managers to regularly and frequently monitor termite activity after treatment and re-apply foam if termite activity becomes evident. And, as with other treatments, an absence of apparent termite activity at and around treatment sites does not necessarily mean success.

13.5 LIQUID APPLICATIONS

Liquid termiticides registered for direct treatment of termite infestations can be useful if, where and when central termite nests have been located. However, central nests are rarely discovered within buildings.

Importantly, direct liquid application to above ground termite activity (not central nests) within buildings must not be performed unless product labels specifically allow such use.

Direct liquid application to economically important termite nests in trees, stumps or posts and where a mound is discovered in close proximity to 'at risk' structures, is often useful in lessening overall termite pressures on properties.

14. PROTECTION AGAINST TERMITE INFESTATIONS (PREVENTATIVE TREATMENTS)

Preventative treatments, most often applied as liquid termiticides, are normally required as follow-ups to successful curative treatments and help protect properties which have thusfar avoided live termite infestations.

Termiticides in liquid form are often applied to (over or injected into) soil surrounding built structures to help prevent or ward off concealed termite entry, leading to infestations and attack.

14.1 CHARACTERISTICS AND ATTRIBUTES

Different liquid termiticides and termiticide formulations bring with them different characteristics and attributes that help define their suitability for particular situations.

- **Repellency**

  Liquid termiticides are generally classified as being either repellent or non-repellent, based on how termites are observed to behave when they make contact with termiticide-treated soil. Termites may survive long enough to pass the toxin to other termites in the colony through their normal grooming activity.

  Non-repellent products generally allow termites to enter and forage within treated soils long enough to attain lethal doses of toxicant but not long enough to allow them to make concealed entry into built structures.

  Repellent products rely on termites being able to readily sense the presence of termiticides and, therefore, avoid entering termiticide- treated soil. Repellent products are particularly suitable when a 'continuous' (no gaps) treated zone under and around built structures can be guaranteed. Importantly, while 'continuous treated zones' (no untreated gaps within the zones) are generally quite 'doable' before structures are built, too often, the construction process itself can damage and render such zones ineffective. When considering that the risk of gaps in treated zones increases once structure have been built, non-repellent termiticides are generally recommended for post-construction situations.

- **Toxicity**

  All registered termiticides have been independently assessed as providing sufficient termiticidal toxicity to be effective when used and applied according to label directions.

Importantly, all such products have also been independently assessed as having acceptable levels of safety for people and the environment when applied as per label directions.

- **Longevity**

The length of time over which termiticidal products, applied according to label directions, should protect structures from termite infestation and attack is called the 'period of protection'. 'Period of protection' is, by law, stipulated on every product label.

However, stated 'periods of protection' may become invalidated by physical and/or environmental factors (see Chapter 5. *Limitations of termite management and termite management systems*.

- **Requirement to inform**

Under this Code, all licensed pest managers are required to know and understand these facts and, also, required to inform and explain how each of these termiticide characteristics and attributes impact on and interact with their clients particular situations and needs.

It is also incumbent on pest manager signatories to this Code that they carefully explain to their clients the importance of and need for at least an annual timber pest (termite) inspections, carried out in accordance with this Code.

- **Product labels and material safety data sheets (MSDS/SDS)**

By law, product labels provide crucial information about almost every aspect of safely and successfully installing termite management treatments.

Product labels, approved by the APVMA, are legal documents that must be read, understood and adhered to.

'Safety data sheets' (SDS) contain important, detailed information about chemical products including their physical and chemical properties, toxicity, ecotoxicity, handling and storage requirements, spillage procedures, requirements for 'personal protective equipment' (PPE), and first aid procedures.

Every pest manager using or applying an APVMA-registered chemical must carry and be able to provide relevant SDS on request.

14.2 IMPACT AND IMPLICATIONS OF SOIL TYPE

Soil type and quality have a major impact on achieving successful soil treatment outcomes. Pest managers should identify and determine the type and nature of any soil they intend to treat before providing clients with termite management proposals.

Where soils are deemed unsuitable for effective soil termiticide treatment, pest managers may have to consider (and cost) replacing such soils with more suitable materials. Heavy clay soils, for instance, generally make it difficult if not impossible for certain chemicals to become evenly distributed across and within the soil profile and, therefore, must be replaced where possible or practical.

Very sandy soils contain minimal organic matter and often allow termiticides to be leached away by heavy rains. It is often advisable to add heavier loams to treatment trenches in sandy soils to help prevent unwarranted leaching.

Often around houses, proposed treatment areas contain layers of rock derivatives such as decomposed granite, blue metal rock, and crusher dust. Where practical, all such rock derivatives should be removed and replaced with suitable soil before treatments are applied.

Where undesirable soils or materials lie under concrete, pest managers should explain the limitations imposed by such soils and materials and recommend cutting the concrete to allow soil replacement. If and/or when clients refuse to accept such recommendations, pest managers should add an appropriately worded 'limitation to achieving a successful outcome' to affected termite management proposals.

Under circumstances where soil amelioration is neither possible, practical nor acceptable, pest managers should consider termite baiting and monitoring as an alternative.

14.3 APPLICATION CONSIDERATIONS

Liquid termiticides can be applied to establish either 'horizontal' or 'vertical' 'treated zones'.

Horizontal treated zones are created when termiticides are applied to soil surfaces surrounding buildings along a band designed to deter or prevent termites from gaining vertical concealed entry to buildings. It is recommended that pest managers refer to each product's installation manual and product label for more information.

The more commonly adopted vertical treated zone approach requires liquid termiticides to be more deeply incorporated into soils in order to deter or prevent termites from gaining concealed entry to a building, horizontally.

The most effective method of creating even and continuous vertical treated zones is to dig continuous trenches around target buildings and then treating excavated soils with termiticide are they are back filled.

Soil injection equipment (rodding) must only be used where trenching and treating back-fill is not possible. Refer to product labels and/or installation manuals for more information.

14.4 TREATED ZONES UNDER EXTERNAL CONCRETE COVERING

When installing horizontal or vertical treated zones under concrete (paths, patios, etc.), suitable equipment should be used to inject termiticide through pre-drilled holes. Uneven distribution of termiticide can occur when applying by this method, which is why most labels state that the application volume must be increased.

Where soil to be treated lies underneath concrete, pest managers should explain the limitations imposed by either injection or failure to treat at all and recommend cutting the concrete and digging and back filling trenches with treated soil. If clients refuse to accept such recommendations, pest managers should add an appropriately worded 'limitation to achieving a successful outcome' to affected termite management proposals.

Loose laid pavers must be removed to facilitate trench and treat type applications.

15. CONSTRUCTION CONSIDERATIONS

Termites gain concealed entry to built structures via gaps, cracks, joints and joins created during construction.

These potential entry points are found in different locations depending on types of construction. Competent pest managers who understand the principals of construction will not only know where termites are more likely to be found but also where to concentrate treatment activities to eliminate or prevent future termite activity.

15.1 SUSPENDED FLOOR CONSTRUCTION

Where floors are suspended above the ground by posts, poles, stumps, foundation walls or piers, access to sub-floor areas is vital to the success and effectiveness of any termite management program.

Sub-floors with less than 400mm clearance from the lowest structural floor member are considered inaccessible.

If possible, and acceptable to clients, holes should be cut through floors to allow sufficient access to at least inspect and install a horizontal treated zone to the soil surface. If this is not possible, a 'limitation to achieving a successful outcome' should be added to all so-affected termite management proposals.

Sub-floor areas with more than 400mm clearance must have vertical treated zones installed around each point where buildings touch the ground. If supporting members are timber piers or poles, each pier or pole must be drilled and internally checked for termite activity.

Pest managers should consider whether sub-floor ventilation is adequate to avoid and/or prevent inappropriate moisture build up which may attract termites. Where sub-floor ventilation is inadequate, pest managers should recommend structural amendments to improve air flow. If clients refuse to accept such recommendations, pest managers should add an appropriately worded 'limitation to achieving a successful outcome' to affected termite management proposals.

15.2 SLAB-ON-GROUND CONSTRUCTION

Slab-on-ground construction involves pouring a concrete slab poured directly on top of the soil surface with no sub-floor area.

Among the many and varied methods of slab-on-ground construction are:

- **Slab-on-strip footings**

  Concrete footing foundations, positioned below where load-bearing walls will be built, are poured before actual slabs are poured.

These footing foundations spread the weight of built structures over a larger area for greater stability.

Potential concealed termite entry points may occur where footings meet slabs (especially if foundations have not been properly cleaned off before pouring the slabs), and also around service pipes which penetrate through slabs.

- **Monolithic slabs**

Monolithic slabs are similar to slab-on-strip footings except that the slabs and supports for load bearing walls (thickening beams) are poured at the same time.

If slabs have been constructed in accordance with Australian Standards - AS 2870-2011 - Residential slabs and footings or AS 3600-2009 - Concrete structures, to lessen the chance of cracking, the only concealed termite entry points are likely to be around service pipes penetrating through the slabs.

- **Infill slabs**

With infill slabs, external walls are partially constructed to act as form work and the slabs are poured inside.

In terms of termite risk, this design is more problematical in that slabs often shrink around the outside, leaving a gap for termites to get through. In many cases, these gaps can be hidden by internal walls, carpets etc, thus providing termites with concealed access directly to the inside of the building.

Also, infill slabs are often filled with soil and other material to build the height of the floor above the natural ground level. This is sometimes not compacted properly leaving voids under the slabs which are difficult to successfully treat.

To provide preventative protection, infill slabs generally require internal drilling and injecting as well as supplementary external perimeter treatments.

- **Waffle pod slabs**

Waffle pod slabs are a relatively new design involving polystyrene boxes (pods) laid out (with gaps between each pod) on level ground and the slabs poured over the top and in between the pods.

Waffle pods are particularly challenging for pest managers as termites seem to enjoy attacking and residing within the polystyrene pods, where they are effectively protected from treatment by even the best pest managers. Waffle pod slabs are even more challenging because they are prone to cracking, particularly around step downs and pipe penetrations.

Termite baiting systems may be the best approach to providing adequate protection for this type of construction.

15.3 JOINS AND CRACKS IN SLABS

Concrete slabs-on-ground can, themselves, form at least part of termite barriers. Importantly, however, slabs need to have been constructed in accordance with the National Construction Code (NCC) and Australian Standards, to lessen the chance of cracks forming and allowing concealed termite entry.

Barriers to concealed termite entry are, however, often compromised where:

- two slabs are joined;
- there are 'step downs' to accommodate changes in slab levels);
- extension are added to existing slabs; and
- pipes and other penetrations extend (as they inevitably always do) through slabs.

Where possible, pest managers should make every possible attempt to identify these potential concealed entry points and clearly identify and consider them when writing termite management proposals.

15.4 BUILDING FRAMES

The design and methods by which wall and roofing frames are constructed are both important in helping pest managers decide where to concentrate treatment activities to eliminate or prevent future termite activity.

Designs and types of building frames are as many as they are varied.

- **Brick veneer and timber frame constructions**

  Buildings constructed using timber frames are not only clad externally with a veneer of bricks but can also involve weatherboard, fibro, and sheet metal cladding.

  Most internal walls in buildings designed around timber framing are usually clad with plasterboard or timber.

Once termites gain access to such buildings they often follow timber 'bottom plates' to quickly move undetected around and throughout the built structures, including up into roof areas, in order to locate and exploit their most suitable and desirable food source. That is why internal wall claddings should often be drilled or even removed to allow thorough inspection and treatment. This is an 'invasive' inspection.

- **Full brick (including cavity brick and double brick) constructions**

In the case of 'full brick' buildings, both the external and internal walls are brick and mortar based. However, there will always be a cavity between the brick walls which can allow termites to move undetected throughout the building.

Inspection of and treatments for these types of buildings can be most challenging.

- **Concrete block constructions**

Concrete blocks are, generally, much stronger than brick and, generally, are laid as single skin walls that often serve as both the external and internal surfaces.

However, internal surfaces may sometimes be lined with a sheeting material.

If the voids inside the blocks are carefully filled with concrete at the time of construction, termites will not be able to move internally between blocks. However, if blocks are not filled or poorly filled, termites can have concealed entry to roofing timbers and then other areas of block-based buildings which are inherently difficult to inspect and treat.

- **Termite resistant frames**

Wall and roof framing materials can have a major impact on the potential severity damage caused by termites.

If frames are constructed using termite resistant material, building damage is generally confined to non-structural elements such as window & door frames, architraves and mouldings, timber flooring, timber cabinetry, plasterboard and other cellulose based materials.

Some timbers are naturally termite resistant and others may be treated to prevent termite attack. Such resistance will not, however, necessarily ensure that termite damage will not be structurally significant. For instance, high moisture and humidity levels in termite workings can potentially lead to corrosion in structural metals which, over time, can lead to structural integrity being compromised.

Termite resistant building frame materials include:

- masonry (concrete, brick, etc.);
- preservative-treated timber;
- naturally resistant timber; and
- metal (usually steel).

15.5 REPLENISHMENT ('RETICULATION') TERMITE MANAGEMENT SYSTEMS

Reticulation termite management systems, which may be installed during the early stages of construction or some time after construction has been completed, generally comprise a network of underground pipes designed to distribute liquid termiticide evenly through the soil around and under buildings.

While reticulated systems are generally more time consuming and expensive to install, they allow for the future refurbishing and reactivation of treated zones without the need to excavate a trench, drill through concrete or lift pavers etc.

15.6 BRIDGING AND BREACHING

Protective termiticide-treated zones are breached when one or more objects form 'bridges' between buildings and any ground outside treated zones.

Common examples of how breaching can be caused or can occur include:

- building extensions;
- add-ons such as carports and garden sheds;
- raised garden beds set against buildings;
- concrete paths installed against buildings;
- fences attached to or secured against buildings;
- large trees which have grown sufficiently to touch buildings; and even,
- materials (think firewood) stored or stacked against building walls.

Termiticide treated zones can also be breached when and if they are disturbed or broken to allow a free passage for termite entry. Such disturbances can be caused by the installation of underground cables, repairs to external plumbing, and incursion of tree roots.

It is important that clients are made fully aware of:

- the potential for their termite treatments to be bridged and breached;
- how they can and should best avoid and prevent breaches occurring; and
- the need to urgently contact their pest managers for advice and possible remedial action if their treated zones are in any way disturbed or otherwise compromised.

15.7 PERIODS OF PROTECTION AND WARRANTIES

Products

The minimum length of time over which termite management products should provide protection against concealed termite entry is called the "Period of protection" and is stipulated on each and every product label.

Some products have different periods of protection applicable to different geographical areas and regions to accommodate climate and environmental impacts on product longevity.

All products, however, must be registered with the APVMA and used in accordance with their labels.

By law, termiticide manufacturers must provide warranties that their products are 'fit for purpose' according to product specifications. If products fall outside those specifications, manufacturers must, at least, provide replacement product. Manufacturers are not, however, held responsible for how products are applied.

Treatment services

Pest managers, who are responsible for how inspections are carried out and how products and other treatments are applied, may offer 'service warranties' which extend for a set period of time (usually 12 months).

If any issues occur during service warranty periods, pest managers are obliged to investigate (free of charge for warranty issues).

Fees for any required or recommended rectification work may be quoted depending on the results of any investigation.

Most service warranties are conditional upon regular (at least 12 monthly) timber pest inspections being carried out, after which pest managers may re-issue new service warranties.

The offer of any service warranty is usually dependent on both the full disclosure and client acceptance of treatment limitations, site access, and other site factors noted in writing as impacting or potentially impacting on warranted services.

Some manufacturers and pest managers also offer overarching warranties and guarantees. It is also possible, at a cost, for clients to obtain insurance cover for termite damage. Such additional warranties, guarantees, and coverage should be assessed on an individual basis.

15.8 GROUNDS AND SURROUNDS

Under this Code, termite management is not just about buildings. Timber pest inspections and/or termite treatment should also focus on areas in the immediate vicinity of buildings such as:

Landscaping and gardens

Gardens usually contain mulch, are wetter than surrounding soil, and often contain timber-based landscaping materials in various states of decay. All this makes them relatively attractive to termites.

Gardens and landscaping timbers should be kept away from buildings. Special care should be taken to ensure gardens and garden materials are kept well away from 'weep holes' (vertical joints between bricks close to ground level that are left open to allow any moisture to escape outside the house) and sub-floor air-flow vents in foundation walls, both of which may provide termites with concealed access to buildings.

Trees

Termites often build their nest inside trees. Trees should, therefore, be regularly inspected for signs of termite activity.

Treating termite colonies in trees may be useful in lessening overall termite pressures.

If and when trees are 'test drilled' for inspection and/or treatment, all holes should be treated with anti-fungal agents and sealed with a flexible caulking compound (eg silicon) to help minimise moisture entry which, in turn, may lead to fungal growth and wood decay.

Importantly, termite-susceptible trees should not be planted close to buildings.

Fencing

Timber fencing should be inspected and any termite activity treated accordingly. Points where fences touch building should be thoroughly checked out. Decayed fencing timbers should be replaced.

15.9 BAITING AND MONITORING

Termite monitoring and termite monitoring systems are designed to help detect and monitor the presence of active termites, especially in the vicinity of otherwise vulnerable buildings and structures.

Monitoring systems work by encouraging termites to forage for, find and feed on attractive, cellulose-based baits in a 'safe', undisturbed environment, conducive to termite aggregation.

Monitoring system bait stations are generally placed (fully or partially buried) in the ground, in 'termite conducive' areas or locations. Systems may comprise just a few or a sizeable array of 'stations', some or all of which may also be physically linked either by piping or lines or layers of termite 'food'.

The idea, generally, is to make it as easy as possible for termites to find and then want to feed at or in the stations. Bait stations are then checked at regular intervals to establish the presence and activity levels of neighbouring termites. Based on such findings, professional pest managers can make informed decisions and recommendations about appropriate treatment and treatment programs.

Available monitoring systems range from very basic home-made bait stations filled with cardboard and timber through to more complex systems installed by pest management professionals.

On their own, monitoring systems provide no protection to built structures. Their role, unless loaded with baits containing termite toxicants, is to aid in termite detection the assessment and measurement of termite activity.

(As discussed later, the non-toxic baits in a number of pure monitoring systems can, if required, be switched over to toxicant-loaded baits which allow termites feeding on them to take toxicants back to their nests and start to kill off and eventually eliminate entire colonies.)

Action needs to be taken when monitoring stations are found to contain active termites at a routine inspection. This may consist of station service inspections or depending on when the last full termite inspection was conducted on the structure, a termite inspection (treatment inspections) or other control options.

In terms of converting or using monitoring stations for actual termite control, pest managers have found that dusting of the termite workings with a specialised insecticide has, in the past, been used effectively to provide at least some level of colony control.

Today, however, the most common practice is to add insect growth regulators (IGRs) to cellulose-based baits. The IGRs are taken back to colonies/nests by termites which have been actively feeding on the baits and then fed out to other colony members which, having ingested or absorbed the IGRs, are unable to effectively moult out of their exoskeletons (a vital process for on-going survival) and, therefore, eventually, die out. Colony elimination, using this technique, may take several months to achieve.

Installation

Typically, in-ground termite monitoring installations requires that bait stations be placed:

- according to manufacturers' instructions and specifications;
- as close as practical to target buildings and, ideally, under and along roof/guttering;
- within or as close as possible to areas known or judged to be conducive to termite movement and foraging activity;
- ideally spaced around three metres apart, depending on site conditions.

Sites most likely to favour termite activity include:

- areas as close to current or previous termite activity;
- garden areas rather than open lawn;
- wet areas rather than dry areas;
- areas containing rotting plant material or timber;
- shaded areas rather than open sunny areas; and
- areas under and around trees, as opposed to open, exposed ground.

Other installation siting considerations include:

- the need to avoid areas that contain or may a previously applied chemical treatment zone;
- the potential, when necessary, to place stations within and among concrete and paved areas via holes bored into the concrete and using stations specially designed for these areas.
- the necessity to prepare a site plan, marking the number and location of each station (as required for a comprehensive and Code-approved 'Record of termite management';

- an understanding that inspection intervals will depend on manufacturers' specifications, the time of year (different seasonal conditions affect levels of termite activity), and inherent termite hazards associated with each site or location.

Bait application

IGR (toxicant) baits are best applied to termite management systems when stations are showing significant termite feeding activity. Toxicant baits may either be applied to existing monitoring stations (as per manufacturers' instructions) or put in place by installing pre-baited monitoring stations, again, according to manufacturers' instructions.

It is recommended that pest managers wear disposable gloves to avoid contaminating baits and bait stations with 'repulsive' odours, such as cigarette smoke.

Toxicant laced bait stations should be inspected every two to four weeks and baits replenished with new bait material in any stations where baits have been consumed until all activity has ceased.

Measuring success

The aim of baiting programs is to eliminate termite colonies know to be attacking built structures or reasonably suspected of having the potential to invade and attack.

In most cases, colonies cannot be located. This means measurements of success, subjective as they may be, can only be made by observing baiting sites.

In general terms, with regular bait station checking, observed bait consumption and the need to replenish bait materials is the first indication of success in that it shows pest managers that toxicant is being actively consumed and, in all likelihood, being transferred back to nests or colonies and fed out to other colony members.

Also, in general terms, the final indication only comes when feeding activity ceases and no live termites can be found.

Specific measurement observations

(Importantly, the following observations may differ depending on the types of system deployed.)

Over time, from when baited bait stations are first deployed, a number of sequential, observable changes and conditions will help indicate if colony elimination is underway or being achieved.

1. Termite feeding must have been recorded in bait stations and bait must actually have been recorded as being consumed. (Actual amounts of bait consumption will vary between products. And, larger amounts of bait will be required for and eaten by larger colonies.)

2. The ratio of soldier caste termites to worker caste termites is recorded as increasing from ratios normally associated with healthy colonies of the same termite species.

3. Pest managers will observe and be able to record visible changes to the colour of termites in the bait stations (worker termites, for instance, which have been affected by IGRs may appear with splotchy discolourations to their abdomens).

4. Pest managers will be able to observe and record significant behavioural changes, especially among worker termites.

5. Sites which have previously shown early effects of bait toxicity but, at the same time, remained active, will be observed to become inactive (as an apparent result of bait consumption).

6. Malformed or pre-alates will be observed within bait stations.

7. There will be an apparent consumption of a terminal amount of bait product.

8. No live termites will be recorded as present in either bait stations or other surrounding structures.

9. No termite activity will be recorded within the termite management baiting system or surrounding structures over at least two consecutive monthly inspections after all above indications have been observed.

Reporting

Final full inspections of all affected buildings and structures must be carried out and reported on to ensure and confirm that full control of termite activity has been achieved.

Together with each final report, pest managers must also provide their clients with a 'certificate of treatment'.

Special and notable considerations

A number of factors can affect the time it takes for baiting programs to achieve termite colony control. Colony suppression and, ultimately, elimination can proceed over many months.

While it is not yet possible to provide accurate definitive time frames over which colony elimination should be expected to occur, experience indicates if feeding is established early in the process it will typically take between six weeks and six months to kill off all the termites. In some cases, however, colony elimination can take considerably longer, especially with multi-nesting species such as *Schedorhinotermes* and *Nasutitermes*.

Factors that influence how long it can take to eliminate termite colonies include:

- whether or not a chemical treated zone (barrier treatment) has been previously applied (termite feeding may be significantly delayed or disrupted by the effects of residual chemical in soil);
- termite species (for reasons not fully understood, some species are slow to feed or, in the case of *Mastotermes darwiniensis*, for instance, may exhibit bait avoidance.
- the size and number of termite colonies in the area;
- prevailing climatic conditions (cold temperatures suppress termite activity);
- distance between built structures (properties) termite nests (which may be up to 100m away);
- termites feeding patterns and behaviours which, in turn, may be influenced by the availability of alternative feeds and feed sources (termite colonies may often feed at several locations, including built structures that baiting is meant to protect);
- presence or absence of disturbances (termites which are disturbed will often delay feeding and may even avoid disturbed areas all together); and
- other nearby activities and events (activities undertaken by neighbours and/or local councils and utilities involving, for instance, tree removal, ground works, service installations, etc.).

Limitations

As with all termite management systems, no baiting or monitoring systems is failsafe or foolproof.

The purpose and objectives of termite baiting and monitoring systems are to:

- monitor and help measure the extent of local termite activity;
- manage and, ideally, eliminate termite colonies; and

- reduce the risk of termites attacking and damaging buildings and structures.

These systems cannot, however, be guaranteed to prevent concealed termite access to building or structures.

In accordance with the spirit and recommendations of this Code of Practice and in line with manufacturers' manuals and recommendations, the success of baiting and monitoring systems depends on pest managers carrying out regular full and detailed checks and twelve monthly whole-of site inspections, and on-going system maintenance.

15.10 PHYSICAL TERMITE MANAGEMENT SYSTEMS

Physical termite management systems (often referred to as physical barriers) are, most often, installed during building construction. Physical systems which have been retrofitted to existing buildings are a relative rarity, although some systems installed during construction may require repairs down the track.

Typical physical termite management systems include: chemically impregnated blankets; stainless steel mesh; and crushed granite.

Physical systems do not stop termites from entering buildings. Rather, they are designed and purpose built to prevent concealed termite access. This is why regular termite inspections are essential to ensuring building and structural protection.

In many cases, and for varying reasons and risk factors, pest managers will recommend that physical systems be supplemented and/or complimented by additional (for instance, liquid chemical or monitoring and baiting) termite management .

For additional information on Physical Management Systems please seek consultation from an AEPMA member or refer to Code of Practice for New Building Termite Management in New Constructions.

15.11 FUTURE INNOVATIONS IN TERMITE MANAGEMENT

Major research and development undertakings by companies and organisations in Australia and around the world are likely to result in an exciting range of new termite management and other pest management products, technologies and application techniques in the future.

Importantly, for the health and safety of consumers, pest managers and the environment, all such products will be required to be thoroughly trialled and tested and, assuming they pass such tests, be submitted for registration by the APVMA and/or satisfy requirements of *AS 3660.3-2014 Termite management - Assessment criteria for termite management systems.*

16. TERMITE MANAGEMENT RECORDING

16.1 RECORDS OF TERMITE MANAGEMENT

Under this Code, pest managers must provide their clients or their agents with comprehensive '*Records of Termite Management'* at each stage of any termite management process.

Copies of all records of termite management should also be kept by pest managers.

Appendix B provides a full and comprehensive list of information required to appear on all records of termite management.

16.2 DURABLE NOTICES

As well as records of termite management, pest managers must also ensure they prepare a 'durable notice' ascertaining that timber pest inspections and termite management treatments have been carried out. Such durable notices must be permanently fixed to buildings in both secure and prominent locations, such as electricity meter boxes.

Appendix B also provides a full list of information required to appear on each 'durable notice'.

Durable notices should be clearly written, on and using materials that will not deteriorate or fade over time, so they can be easily accessed and read by future building owners and/or occupiers.

17. RISK MANAGEMENT

MINIMISING TERMITE RISK

Regular maintenance and inspections are both essential elements in the cost-effective minimisation of the risk of concealed entry into buildings by termites.

To protect their building from termites, building owners and managers should:

- ensure their buildings are inspected at least annually by suitably qualified and licensed pest managers (more frequent inspections may be required in high risk areas);
- take care not to compromise (by bridging or breaching) existing or recently installed termite management systems;
- fix water leaks in and around buildings, paying special attention to drainage points for airconditioning and hot water systems, ensuring such drainages are piped well away from any built structures;
- remove loose timber material, especially timber lying on the ground;
- ensure there is adequate ventilation in available to all sub-floor areas and that ventilation vents are kept clear;
- ensure gardens, paths, pavers etc, are kept well below the height of finished internal flooring; and
- generally follow recommendations from professional pest managers.

GLOSSARY

AEPMA	The Australian Environmental Pest Managers' Association Limited. AEPMA is the national peak body for professional pest managers including specialists in timber pest detection, assessment and management in Australia.
APVMA	The Australian Pesticides and Veterinary Medicines Authority is the Australian Government regulator of agricultural and veterinary (agvet) chemical products, including insecticides and other pesticides. For an agvet chemical product to be legally manufactured, imported, supplied, sold or used in Australia, it must be registered by the APVMA, unless exempt by the Agvet Code.
best practice	A best practice is a method or technique that has been generally accepted as superior to any alternatives because it produces results that are superior to those achieved by other means or because it has become a standard way of doing things: for instance, a standard way of complying with legal or ethical requirements. Best practices may be used to maintain quality as an alternative to mandatory legislated standards and can be based on self-assessment or benchmarking. Best practice is a feature of accredited management standards such as ISO 9000 and ISO 14001.
building (built) environment	The environment above, underneath, and around a building including air, water, soil, vegetation, surrounding structures, materials, vegetation, and other life forms, and the impacts all these have on each other.
building owners and managers	People or entities that either own or have primary responsibility for managing buildings on behalf of owners and that also, therefore, commission, contract out, and pay for building-related services, including professional pest management.
built structure	A building or other structure built by a person or people.
cellulose	A structural organic compound on which termites feed. Cellulose is normally found in plant based products in the form of timber, paper and cardboard.

chitin synthesis inhibitors (CSIs)	CSIs are formulated or naturally occurring chemicals which disrupt the normal formation of outer cuticle (exoskeleton) in arthropods, including insects.
client(s)	A client is a person for whom or entity for which termite management services are undertaken by professional pest managers. Clients may either own buildings or properties or manage them on behalf of owners.
Code of Practice (pest management industry) (CoP)	Document commissioned by AEPMA for and on behalf of the Australian professional pest management industry setting out prescriptive requirements for best practice and guidelines for how best practice should be achieved and delivered.
compliance (with Code of Practice)	A signed agreement to abide by all the Code's requirements and stipulations and a recorded proof of actually observing and adhering to the Code's requirements and stipulations.
concealed access	Where termites are able to gain access to a building without revealing their presence.
concealed access (unobserved/unobservable access	Terms used to describe the situation where termites gain or can gain entry into a building without such entry being able to be easily or readily seen by trained and experienced pest inspectors and/or pest managers.
conducive conditions	Specific conditions known to be favoured and sought out by and attractive to termites. Termites are most likely to be found during inspections in areas and situations where environmental conditions are 'conducive' to their foraging behaviour.
DAWR	Department of Agriculture and Water Resources
economically important termites/termite species	Species of subterranean termites that have the potential to cause significant damage to a structure or building. A list is available in Item 8.4 of the Code
floor coverings	Materials used to cover the floor structures. Floor coverings may include carpet, linoleum, ceramic or other tiles, and floating timber flooring.
inaccessible voids	Floor, subfloor, roof or wall spaces to or through which a timber pest inspector may not be able or reasonably expected to gain access to carry out an inspection.

insect growth regulator (IGR)	A (generally synthetic) organic pesticide that mimics certain insect hormones and, in so doing, prevents exposed insects from completing their normal development cycles. This prevention of normal development causes the insect to die before it becomes an adult. Two forms of IGRs most commonly utilised by the pest management industry are Chitin Synthesis Inhibitors (CSIs) and Juvenile Hormone Analogues (JHAs)
inspection zone	A band generally at least 75 mm high or wide, constructed or applied around a building perimeter or subfloor member over which termites must travel to reach susceptible timbers and building interiors. Almost universally, termites which bridge inspection zones leave readily visible traces, such as mudding.
inspections/regular inspections	Under this Code of Practice, inspections for evidence of termite attack and/or to determine the risk of concealed termite entry are required to be carried out by adequately and certifiably trained, qualified and experienced timber pest inspectors. Timber pest inspectors may also be (and often are) licensed, suitably qualified, professional pest managers.
installation	The process of laying out, fitting, securing, finishing off, checking and, if required, testing termite management systems.
insurance cover/appropriate insurance cover	Professional pest managers and timber pest inspectors are required under this Code to acquire sufficient insurance cover to protect both themselves and their clients in the event of misadventure, mishap, or underperformance. All AEPMA members are required to carry adequate professional indemnity and public liability insurance.
IPM	Integrated pest management is a multidisciplinary approach to pest management with the main aim being to maximise the control of insect infestations by the use of multiple methods. IPM is based on the proper identification of the pest, knowledge of the pest's ecology, non-chemical means of control and the judicious use of insecticides.
Juvenile hormone analogue (JHA)	Juvenile hormone analogue (JHA) is a synthetic insect growth regulator ((IGR) which disrupts normal growth and development of the immature stages of insects.
life span	The period over which a system or technology continues to function appropriately and adequately.

limitations	Like any technology, the functionality of termite management systems can be limited (affected and even compromised or destroyed) by events or actions surrounding their installation or which take place after their installation. Under this Code of Practice, such limitations must be understood by and communicated to all stakeholders before, during or after system installation.
manufacturers' guidelines	Installation, monitoring and maintenance guidelines and instructions provided by termite management system manufacturers.
mud tunnels (mudding, mud leads, shelter tubes)	Subterranean termites generally construct 'mud' tunnels/'mud leads' that allow them to travel over obstacles and surfaces while remaining protected from the outside environment. These are typically constructed from a 'mud like' material of soil, faeces and re-worked building materials.
National Competency Standards	National industry-specific standards prescribing minimum knowledge and skill levels for individuals wishing to prove competency in specified roles or tasks within specific industries, trades or professions (http://training.gov.au).
new building	A building constructed 'from the ground up' prior to being occupied.
obstructed/unobstructed	The degree to which one or more potential termite access points can be easily seen and observed by timber pest inspectors or others. If the view of a particular area or building component is obstructed, termites may gain concealed access through that area.
occupants	Persons present within a property. This may include vendors, tenants and, where properties are used to provide services, business personnel, customers and clients.
pest management industry ('industry')	All facets, including people and businesses, of professional pest management including: professional pest managers (individuals, and professional pest management companies and partnerships); manufacturers, retailers and distributors of pest management materials and technologies; and specialist consultants, researchers, and advisors.

pest manager	A person licensed to undertake pest management services under relevant State Legislation, and who qualified to undertake a termite treatment. Note that this name varies across the country with the different State legislative 'Acts'.
PestCert	The Australian accreditation body for pest managers (see www.aepma.com.au for more information).
pesticide	Chemical or biological substance or mixture of substances used directly or indirectly for controlling, preventing, destroying, repelling or inhibiting pests.
plant pest	Plant pests are a disease causing organisms or invertebrates which attack or threaten agricultural production, forestry or native and amenity plants.
PPE	Personal protective equipment
product label	Product specific document, normally attached or affixed to its relevant product container, that defines how products should be handled and used in accordance with approval by the APVMA.
professional pest managers/pest management professionals	Professional pest managers are trained, experienced and qualified to carry out a range of pest management services for home, building and property owners (private and public) on a fee-for-service basis. Professional pest managers who are members of AEPMA maintain professional liability insurance cover and are bound by AEPMA's Code of Ethics.
property manager	A person or entity who manages a tenanted property. It is often a property manager who arranges access for timber pest inspectors to inspect tenanted properties. Property managers only rarely actually sell properties.
recommended service and inspection schedule	System manufacturers' recommendations as to how often prescribed services to and inspections of systems need to be carried out (for up to 50 years) for system integrity and functionality to be maintained and manufacturers' warranties to be upheld.
registered/currently registered	Pesticidal products that are approved and registered by the Agricultural Pesticides and Veterinary Medicines Authority (APVMA) for use according to label directions.

regulatory bodies/regulators	Government (federal, state and local) agencies and their employees/officers responsible for developing, communicating and enforcing rules, regulations, and both mandatory and non-mandatory standards, processes and procedures.
SDS/MSDS	Safety data sheet/Material safety data sheet.
stakeholders	For the purpose of this Code of Practice, a stakeholder is any person or entity with an interest, vested or otherwise, or involvement in the design, installation, and functionality of termite management systems.
strip shield	A sheet of material – most commonly a corrosion-resistant metal - impervious to termite entry, which is placed between building members to prevent concealed termite access , and therefore, force termites out to the edges of the sheet to render termite entry or entry attempts visible. A common form of strip shield is the long established ant cap.
structural elements	Components of a building which support vertical and horizontal function, integrity and non-structural elements.
structural frames	Strong framework made, generally, from timber or steel, which directly or indirectly, supports all other building components, including flooring, internal and external cladding, and roofing, as well as various fittings and conduits.
structural significance	A term used to indicate that damage affects the performance of affected members.
subterranean termites	Termites which normally attack structures from the ground. While some termites can establish colonies within buildings, the majority come from remote colonies built under or nearly under the ground or in trees and tree stumps.
system maintenance	On-going inspection and checking to ensure continued system integrity and that termites have not breached the system and gained entry into the building. Also, regular checking to ensure reticulation type systems are continually topped up with termiticide.
termite damage	Degradation that can be directly attributed to termite attack.

termite management	The management of: 1. all aspects of termites, termite behaviour, termite environments, termite colony function and development; and 2. all aspects of buildings and materials which can be potentially attacked by termites; in order to minimise the risk of attack and damage caused by termites.
termite management system	A system of treatment that prevents or deters termites gaining concealed entry into a building. The term, 'termite barrier', was previously used to describe certain elements of termite management systems but, is now regarded and accepted as being deceptive and outdated as they do not stop termite entry into structures.
termite management systems	Technologies installed to prevent the unobservable entry of termites into buildings.
termite management systems for new buildings (buildings under construction)	One or a combination of technologies designed and approved to be installed during the building process to prevent concealed entry of termites into a building.
termite risk	The risk of termite incursion and attack as affected by types and species of termites present, likely proximity of termites to a building, a building's environment (including temperature and humidity), presence or absence of hidden or observable/visible termite access opportunities, and the amount and type (attractiveness) of termite food and water available.
termites	Highly specialised insects that live in colonies and feed on (gain their energy from), in the main, plant fibre (cellulose). Termites also require adequate water to survive and thrive. For the purpose of this CoP, the term, 'termites' refers specifically to subterranean termites.
termiticide	A pesticide or pesticide treated article or substance used for controlling, preventing, destroying, repelling or inhibiting termites.
timber	Timber is wood which has been derived from trees, then dried and processed for use in construction.

timber formwork	Temporary framing used during building construction to support concrete while it sets and cures. Timber pests can sometimes gain access to built structures via timber formwork during construction or post-construction if the formwork is not removed once its job is done.
timber in service (in service timber(s))	Timber or timber product used in or as building elements or structural elements of a building or a structure.
timber pest	Economically significant termites, borers and decay-causing fungi which may attack and degrade seasoned timber in service
timber pest inspector (specialist timber pest inspector)	An appropriately qualified person who carries out specialist timber pest inspections. Under this Code of Practice, specialist timber pest inspectors must be certifiably trained and experienced in timber pest inspection conduct and reporting.
trades (personnel)	Employed and subcontracted tradespeople including: bricklayers, stonemasons, electricians, plumbers and gasfitters, tilers, painters, plasterers, and builders' labourers.
units of competency	Individual, industry-specific elements of the National Competency Standards. A unit of competency defines the minimum knowledge and skill levels required by an individual to be competent at performing a specific task or role. See http://www.training.gov.au
vendor	A person or entity that sells a property.
wall linings	Cladding or coverings which conceal wall structures.

warranty/warranty provisions	In contract law, a warranty has various meanings but generally means a guarantee or promise which provides assurance by one party to another party that specific facts or conditions are true or will happen. This factual guarantee may be enforced which allows for a legal remedy if that promise is not true or followed. Although a warranty is, in its simplest form, an element of a contract, some warranties run with a product so that a manufacturer makes the warranty to a consumer with which the manufacturer has no direct contractual relationship. A warranty may be express or implied, depending on whether the warranty is explicitly provided (typically written) and the jurisdiction. Warranties may also state that a particular fact is true at one point in time or that the fact will continue into the future.
whole-of-building	All parts of a building, including both structural and non-structural elements, including contents, furnishings, cladding, fixtures and fittings.
Working party(ies)	Group(s) of individuals from, attached to or affiliated with the Australian professional pest management industry, who have volunteered to develop, design and write pest management industry Codes of Practice.

REFERENCES

Abe T, Bignell D and Higashi M (2000). Termites: Evolution, Sociality, Symbiosis, Ecology.

AEPMA (2014). A Code of Practice for Prior to Purchase Specialist Timber Pest Inspections. 2nd edition. www.aepma.com.au/Codes-of-Practice

AEPMA (2016). A Code of Practice for Termite Management during New Constructions.

Gerozisis J, Hadlington P & Staunton I (2008). Urban pest management in Australia. 5th Edition. University of New South Wales Press, Sydney, 326 pp.

Peters BC, King J and Wylie FR. (1996) Pests of Timber in Queensland. Queensland Forestry Research Institute, Department of Primary Industries, Brisbane, 175 pp.

Hadlington P and Staunton I (2008). Australian Termites. 3rd edition.

Standards Australia *AS 1604 - Specification of preservative timber* series. Australian Standard, distributed by SAI Global Limited. www.saiglobal.com

Standards Australia (2014) AS 3660.1: 2014 Termite Management - Part 1: New Building Work. Australian Standard, distributed by SAI Global Limited. www.saiglobal.com

Standards Australia (2014) AS 3660.2: 2000 Termite management - Part 2: Termite management in and around existing buildings and structures. Australian Standard, distributed by SAI Global Limited. www.saiglobal.com

Standards Australia (2014) AS 3660.3: 2014 Termite management - Part 3: Assessment criteria for termite management systems. Australian Standard, distributed by SAI Global Limited. www.saiglobal.com

Standards Australia (2010) AS 4349.3: 2010 Inspection of Buildings - Timber Pest Inspections. Australian Standard, distributed by SAI Global Limited. www.saiglobal.com

APPENDIX A: TERMITES AND TERMITE BIOLOGY

INTRODUCTION

Termites have lived on Earth for at least 120 million years.

Approximately 70 percent of the Earth's land surface contains at least one of the 2,600 species in 281 genera discovered thus far.

Termites consume cellulose, in one form or another, and play a crucial role in nutrient cycling, helping improve soil structure through the decomposition of wood and plant debris.

Termites only become 'pests' when they attack structural or other timber in the 'built environment' or damage crops and other materials important to humans.

Australia is home to five families of termites. Those five families are made up of around 30 genera and, among these, approximately 350 species.

Only 30 Australian termite species are known to attack timber important to humans. The remainder are either soil debris or grass feeders.

Importantly, however, the 30 'pest' species account for an annual bill of about $1 billion in damage and treatment costs.

TERMITE COLONIES

Unlike most other insects, termites live together in communal nests and divide tasks among themselves for the benefit of the community as a whole. This is why they are often described as 'social insects'.

Castes

In each colony, there are three main tasks which different colony members perform:

- working (gathering, processing and distributing food, colony structural development and maintenance, and care for the needs, nurturing, hygiene and development of other caste members);
- defending (protecting colonies from outside attackers and influences; and
- reproduction (producing new termites).

Each task falls to a different termite 'caste': workers, soldiers and reproductives. And, each caste has a specialised body shape and behaviour pattern to enable caste members to perform their required tasks.

- **Workers**

Workers (all wingless, sterile and blind) construct and repair nest and galleries, tend the eggs and young, forage for food and feed the rest of the colony.

In more recently evolved termite species, workers remain as workers for their entire lives. In some of the more primitive termite species, however, workers are called helpers or pseudergates (helpers with wing buds). Primitive species workers can either remain workers or, (given the right hormones) can be 'switched over' to become soldiers (defenders) or even a reproductives, if required.

Worker termites are responsible for the majority of damage to properties.

- **Soldiers**

Soldiers are easily distinguished from other castes by their heads, which are generally larger, thicker and coloured. They too are wingless, sterile and blind.

Because their mandibles are so specialised for defensive duties, soldiers must be fed by the workers or helpers.

The primary function of the soldier is to defend the colony against predators such as ants however they have been known to explore new areas for food and recruit workers to newly discovered resources.

Termite soldiers rely on chemical as well as physical weapons. Some soldiers bite or hit their attacker whilst others spray or inject a poison. Some have strongly built heads, which may be used as plugs to seal the nest from predators. The soldier caste is the most distinctive and is often used to identify particular species.

- **Reproductives**

Members of the reproductive or alate caste are the potential kings and queens of new colonies.

Reproductives have eyes, reproductive capabilities and wings for flight. They usually leave the colony (swarm) through the summer months, often via specially constructed and well protected exits (called flight cuts).

Alates tend to mainly swarm in high humidity conditions. They are attracted to lights at night and are commonly found in spider webs which are a useful spot for pest managers to inspect.

After swarming alates break off their wings and search for a suitable mate to begin building a new colony (only a small percentage live long enough to get to this stage).

The original mating pair is the new king and queen. The king remains a similar size after mating, however the queen (after the colony reaches a certain size) becomes an immobile egg laying machine (physogastric) which in some more recently evolved species, is capable of laying up to an incredible 80,000 eggs a day.

Nests

Termites are social insects that live in colonies and many species build and live in centralised nests.

Nests are critical to colony survival as they form effective climate chambers which maintain temperature and humidity within critical limits.

Termites maintain nest temperatures around 30°C to 34°C and relative humidity around 80%.

Nests also provide a defence against predators such as ants and birds.

Nests can be an important store of food and some termite species grow their own food in the form of fungus farms within the nest to supplement their external foraging feeding and to sustain colonies in harsh environments.

Nests come in many forms, dependent, mainly, on species involved. That is why nest form and structure can aid in species identification.

Depending on species, nests can be either ground mounds, attached to trees, posts or poles, underground or inside trees. Some species are multi nesters and there may be several underground nests at any one time, a feature which can make control more difficult.

Some termites build their nests within structures, such as houses, and maintain them by building mud galleries (tubes) which connect them to the soil. These galleries are frequently hidden in walls or cavities or in rare cases sustained by water leaks within the built structure.

Underground nests, nest inside trees, tree stumps and nests hidden in buildings can sometimes be difficult to locate.

From their nests, termites forage for food underground through the soil, potentially up to 100 metres in any or all directions, another feature which can make nest detection extremely difficult.

Nests are the homes of the reproductive queen and king who are tended to and fed by the worker cast and protected by the soldier cast.

Reproductive alate flights generally take place fairly close to nests and can be very useful in locating nests.

If there are multiple nests within feeding range of a building controlling termites may take substantial time and effort.

Occasionally, nests may be found to have been built within building walls. More often than not, however, termite workings (mudding material) found in walls is merely part of termites' food gathering infrastructure.

Not only can there be multiple nests within attacking range (often 50 to 100m or more) of a structure such as a house, but there may be multiple species within the area that may attack the structure.

The nests of some species may be readily visible … for instance tree nests of *Nasutitermes walkeri* or mound nests of *Nasutitermes exitiosus* … while others, such as the underground nests or internal tree nests of *Coptotermes* species, may be completely invisible. Subterranean termite nests (underground or hidden) make it very difficult for pest managers to locate and require greater reliance on remote treatment management techniques (such as baiting).

IDENTIFICATION AND DISTRIBUTION

Termites which attack timber can be roughly divided into three groups: **subterranean**, **dampwood** and **drywood**. These descriptors are used to indicate where each group is normally found and also help describe their habits and behaviours.

While this Code of Practice deals with the management of subterranean termites, pest managers and their clients should be aware of the importance of the other two groups and their potential impact.

Subterranean termites

Subterranean termites are mostly ground-dwelling and require soil contact for a source of water. (Importantly, subterranean termites can survive in buildings above ground if they have access to an internal source of moisture).

Subterranean termites by far cause the most damage to timber in service in Australia.

There are nearly 20 species of subterranean termites - most commonly from within *Coptotermes, Schedorhinotermes, Nasutitermes* and *Mastotermes* genera and, to a lesser extent from within *Heterotermes* and *Microcerotermes* genera - which commonly attack timber in service throughout Australia with the

- ### Coptotermes

  Coptotermes is the most economically important genus.

  Members of the *Coptotermes* genus are easily distinguished from other termites when members of a soldier caste are poked or lightly squeezed to release a white milky liquid, secreted from a specially modified pore (fontanelle) in the front of the head (a defence mechanism).

  Positively identifying individual species within the *Coptotermes* genus is extremely difficult.

One particular species, *Coptotermes acinaciformis*, stands out from the rest, however, because of the large amount of damage it causes throughout Australia

Coptotermes acinaciformis is responsible for more economic loss than all the other Australian species combined. There are numerous reasons why *C. acinaciformis* is regarded as the most economically destructive Australian termite, including:

- the fact that they can be found over such a wide spread area, across nearly all mainland Australia;
- the species is 'very comfortable' living in the centre of large populated cities and towns;
- massive colony sizes of well over 1,000,000 termites that need lots of food; and
- aggressiveness and willingness to 'bully' other species out of a territory.

Other *Coptotermes* species that pest managers may encounter include:

- *C. frenchi* - a major pest of timber in service throughout Victoria, Queensland, and NSW;
- *C. lacteus* - builds large above ground mounds in coastal and associated hinterland areas from southern Queensland, through NSW and Victoria and has been associated with damage to timber in service (however, the large mounds of *C. lacteus* are easily spotted and dealt with, usually before damage occurs);
- *C. acinaciformis raffrayi* - found only in the south west corner of WA (closely related to *C. acinaciformis* by biology and behaviour, with some debate as to whether this species is in fact *C. acinaciformis*); and
- *C. michaelseni* - another WA native found along coastal areas up to approximately Geraldton where it builds low dome shaped mounds and is known to attack timber in service.

• Schedorhinotermes

Schedorhinotermes does not cause as much economic damage Australia wide as *Coptotermes*. However, in certain places, for instance, in Queensland, they have equalled and sometimes have been implicated in more attacks on houses than *Coptotermes.*

Schedorhinotermes is easily identified from other termites in that the soldiers come in two sizes. 'Major' soldiers are approximately 6mm long, with bulbous shaped heads whereas 'minor' soldiers are only around 4mm long with a narrower head and more slender mandibles.

Identification between species can be difficult. However, the geography of where they are found can be a useful guide.

The most common *Schedorhinotermes* species that pest managers may encounter are:

- *S. intermedius* – found in coastal areas from south east Queensland down to the NSW-Victorian border;
- *S. actuosus* – found across most of northern Australia from mid WA through to northern NSW;
- *S. breinli* – found across the Northern Territory and around to central Queensland; and
- *S. seclusus* - mainly found in coastal Queensland and down to the NSW mid-north coast.

Mastotermes

Mastotermes is the most ancient living genus in the world and contains only one species, *Mastotermes darwiniensis*.

Mastotermes termites have voracious appetites and cause havoc for building clients, farmers (mango, sugar cane, citrus, grape), electricity suppliers (poles and underground cables), tree growers, and councils (trees and palms in parks etc) across northern Australia from about the Tropic of Capricorn north.

Sometimes, however, it appears their range may be extended. Relatively recently, a pest manager discovered *M. darwiniensis* in a number of houses, trees and landscaping timbers in close proximity to each other on Queensland's Gold Coast. Experts suspect the infestation originated in a load of timber sleepers from the Rockhampton area some years previously. While it was surprising that the population survived and actually spread in such a (relatively) cold climate, the termites' survival could well be yet one more sign that we really are seeing significant climate change.

The large size of the termites and associated galleries in damaged timbers plus where they are found makes identification of *M. darwiniensis* relatively easy.

Nasutitermes

Nasutitermes is the most evolutionarily advanced termite genus and can be easily identified by the pointed snouts (nasus) at the front of soldiers' heads. Identification between species, however, can be difficult, with the proviso that geographical location and mound type and shape can be useful pointers.

The most common *Nasutitermes* species that pest managers may encounter include:

- *N. exitiosus* - a major pest in the southern half of Australia where it builds distinctive dome shaped mounds up to a metre high (*N. exitiosus* tends to prefer hardwood (eucalypt) timbers over pine species and has a particular liking for timber bridges, fences and poles);

- *N. walkeri* - found from tropical north Queensland down the coastal belt to just south of Sydney where it builds distinctive arboreal nests on the trunks or branch forks of trees (nests often house kingfisher birds) and tends to feed on decayed or weathered hardwood timbers, therefore posing relatively little threat to house timbers; and

- *N. graveolus* – very similar to *N. walkeri* except that it can be found in tropical coastal areas from Ingham in north Queensland through to the NT/WA border.

Heterotermes

While *Heterotermes* are generally considered less of a threat to timber in service than other genera, in parts of northern Australia they have been known to cause considerable damage to houses. *Heterotermes* are often confused with *Coptotermes* because the soldiers look similar. However, on close examination, the head of the *Heterotermes* soldier is longer and more rectangular, compared to the tear drop shape of the *Coptotermes.*

The main species associated with timber damage is *H. ferox* which is found from the southern half of Queensland down throughout much of NSW, Victoria, South Australia, and the south west corner of Western Australia..

Microcerotermes

Generally, *Microcerotermes* pose only a minor threat to timber in service across Australia. When they do transgress, they generally only feed on already decayed or weather damaged timber such as posts, poles and fences.

The most common *Microcerotermes* species have distinctive cylindrical arboreal nests with stalactites dripping from underneath. Other species build low dome shaped mounds at ground level. *Microcerotermes* soldiers have rectangular heads resembling *Heterotermes* except for the presence of fine serrations on the inner margin of the mandibles (a feature upon which it was named).

The most common *Microcerotermes* species include *M. turneri* (north Queensland to central coast of NSW), *M. serratus* (across most of mainland Australia) and *M. distinctus* (southern half of Australia)

Dampwood termites

Dampwood termites generally feed on rotting timbers on the forest floor and seldom become a nuisance to humans.

However if a structure has decay issues associated with timber being exposed to the elements (fencing, decking timbers and even internal timbers via a leaking roof etc), dampwood termites can further damage such timbers and may even venture into the surrounding sound timber.

Dampwood termites that pest managers may encounter include:

- *Porotermes adamsoni* - a dampwood termite associated with damaging timbers in houses and found in the coastal belt and associated ranges from southern Queensland around to South Australia (including ACT) and also in Tasmania;
- *Neotermes insularis* – a major pest of standing gum trees with the largest soldier of any Australian termite (up to 15mm in length), found along the coast from the Northern Territory right around to the Victoria/South Australia border; and
- *Glyptotermes spp*. – a major pest of power poles and implicated in poles falling over, Glyptotermes lives in standing trees and can survive after poles have been cut from them and put into service. However, most damage is done by associated decay throughout the termite tunnels rather than the termite itself. *Glyptotermes* termites are found in coastal and highland areas from tropical north Queensland down to the Great Australian Bight in South Australia.

Drywood termites

Drywood termites are able to live in small isolated pockets in the dead wood of living trees and timber in service such as flooring, structural members and furniture. Unlike other termites, they get their water from the timber they consume and therefore do not require contact with the soil. Because of this fact, their galleries are clean and free of soil. However there is one thing present that will give away that drywood termites caused the damage: the presence of dry, sesame seed-like frass (faeces) throughout the gallery system and on horizontal surfaces in close proximity to the infestation. Often this is the first thing noticed by building clients and pest managers upon inspection.

Several Australian state and territories consider the presence of some species of drywood termites a serious biosecurity risk and as a result have introduced legislation to classify and combat these pests. Under prescribed legislation several species of Drywood termites are classified as either a notifiable or prohibited plant pest and heavy fines exist for the non-reporting of these pests' infestations. *Appendix D* summarises the reporting requirements for the species of Drywood termites listed as a notifiable or prohibited plant pest.

Drywood termites can be categorised as either native (endemic to Australia) or exotic (introduced to Australia). Most native drywood termites live their lives in dead branches or stumps without ever causing a nuisance. However colonising flights can take hold in power poles and other timber in service. They can also be accidentally introduced into a home via infested furniture and other timbers. There are a number of relatively important drywood termites that may be encountered by pest managers.

- *Cryptotermes primus* (Hill). Considered a minor to moderate pest of structural timber, house stumps and utility poles. It has also been found in dead trees, branches, logs, root crowns, sapwood and heartwood in the coastal strip from the tip of Cape York down to about Sydney.

- *Cryptotermes queenslandis* (Hill). Regarded as a minor pest and has been found in dead branches, stumps from coastal areas from south-east to north-east Queensland.

- *Cryptotermes domesticus* (Haviland). Considered a minor pest, and has been collected from various structural timbers, furnishings, ornaments, packaging, dead trees and logs from various locations across northern Australia including several islands off north-eastern Queensland and the Torres Strait.

- *Cryptotermes cynocephalus* (Indo-Malaysian drywood termite). A relatively minor pest, recorded feeding on structural timber, furniture, dead trees and fallen logs in coastal north-east Queensland.

- *Cryptotermes tropicalis* (Gay & Watson). Another relatively minor pest of structural timber and house stumps, dead and decaying trees and logs and is limited to rainforest areas of coastal NE Queensland.

- *Cryptotermes brevis* (West Indian drywood termite). This is an introduced drywood termite, noted (like its native 'cousins') for its clean, frass filled galleries as their native cousins. *C. brevis*, however, is much more voracious in terms of damage to timber in service and, in fact, has been labelled the world's most destructive termite. Its presence is usually not noticed until the timber it is infesting collapses. *C. brevis* was introduced to Australia in the 1960s and has been found in structural timber and furniture in Brisbane, Maryborough, Bundaberg, Rockhampton, Gold Coast, Sydney and Canberra.

- *Cryptotermes dudleyi* (Banks). A major pest of structural timber, in particular that of boats. Despite several quarantine interceptions at ports of entry, there is no evidence to suggest that this species is established in Australia.

Feeding behaviour

All termites consume cellulose in one form or another.

Subterranean termites find their cellulose-rich food by leaving their nests 'foraging' through series of underground galleries or covered tracks which they build towards their chosen 'larders' away from their nests.

Through their gallery system, termites from a single colony may exploit food sources over as much as one hectare, with individual galleries of *Mastotermes* extending up to 200m in length.

How subterranean termites locate food on their foraging expeditions remains a topic of much debate within the pest management industry.

Most experts believe foraging is completely random and, that actually finding food is, to an extent, a matter of luck.

Others, however, claim there has to be a master plan based on where some termites have been found.

The truth, probably, lies somewhere in between.

Termite foraging is a collective process in which termites search in organised patterns. Termites are known to communicate the location of food s by laying pheromone trails for other nest mates to follow. And, there is some research to suggest that termites can not only estimate the size of the chunk of timber they have discovered but can actually determine its nutritional value.

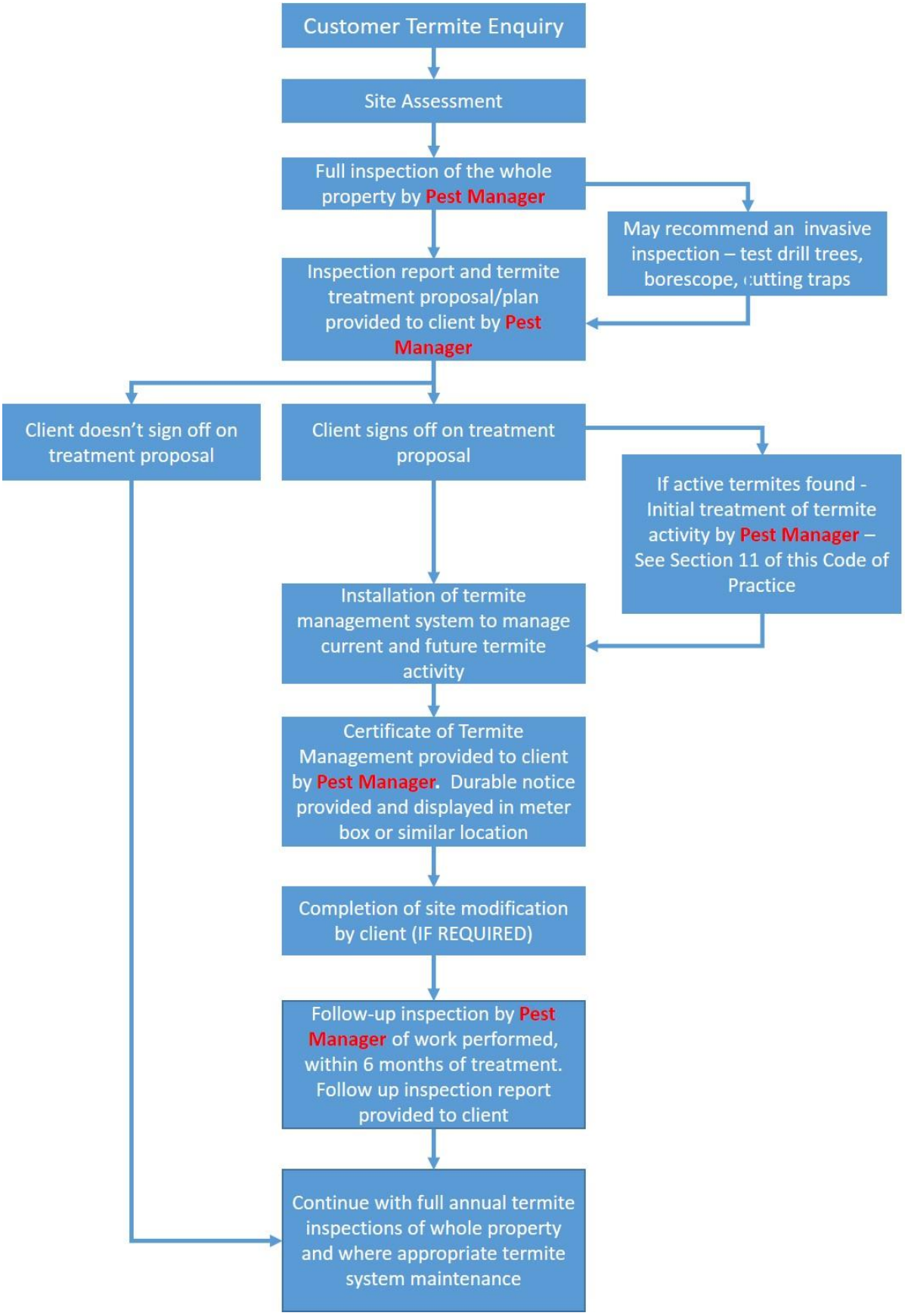
While some termites can, albeit somewhat inefficiently, break down cellulose on their own, in most cases, digestion is the result of a symbiotic relationship between termites and microbes in their digestive systems (much the same as ruminant and some other herbivorous animals employ gut microflora to help them digest pasture). In the case of termites, microbes in their guts break down the various complex cellulose molecules into simple sugars, which the termites can then absorb and utilise to provide energy.

So important are these microbes that young termites are actively 'inoculated' early in their lives by being fed a concentrated mix of microflora excreted (from the anuses) of mature workers or soldiers. This same method of proctodeal feeding is employed to restore microbial health after termites moult, to replace microbes lost when, as part of the moulting process, the entire gut lining is shed with the old skin.

To help conserve precious protein (dietary nitrogen), in which most termite food is generally extremely poor, most termites dispose of excess, dead and diseased members of the colony by cannibalism.

Termites are known to damage materials that have no nutritional value during their search for food. These include polystyrene, rubber, plastic, leather, mortar and some metals. A particularly annoying trait is the attack on underground power cables, with termites chewing through the outer rubber and plastic sheathing, thus exposing the conducting wires to moisture resulting in short circuits and ultimately power failure.

APPENDIX B: DECISION MAKING TREE



APPENDIX C: 'CERTIFICATES OF TERMITE MANAGEMENT' AND 'DURABLE NOTICES'

Details required for a 'certificate of termite management'

Company name & details

Technician name/s and license details

Methods of control options employed

Date of treatment

Products used (trade name and active constituents)

Rate of application

Volume

Amount of concentrate

Site plan identifying areas treated

Limitations

Recommended future inspection frequency

Maintenance requirements

Details required for a 'durable notice'

A durable notice must be permanently fixed to the building in a prominent location, such as in a meter box or the like, indicating:

- termite management system used;
- date of installation of the system;
- where a chemical is used, its life expectancy as listed on the appropriate authority's registered label;
- installer's or manufacturer's recommendations for the scope and frequency of future inspections of termite activity;
- details of the installation company, including contact details.

The notice should be legible, on a material that will not deteriorate easily and so that it can be understood by property clients and pest managers.

APPENDIX D: PEST CONTROL LICENSING AUTHORITIES BY STATE OR TERRITORY

New South Wales:	NSW Environment Protection Authority
Victoria:	Victorian Department of Health
ACT:	Environment and Planning Directorate - Environment
Queensland:	Queensland Department of Health
South Australia:	South Australian Department of Health
Western Australia:	WA Department of Health
Northern Territory:	NT Department of Health
Tasmania:	Tasmanian Department of Primary Industries, Parks, Water & Environment

APPENDIX E: REPORTING REQUIREMENTS FOR NOTIFIABLE(PROHIBITED) DRYWOOD TERMITE PESTS IN AUSTRALIAN STATES AND TERRITORIES (CORRECT AT 10TH NOVEMBER 2015)

State	Drywood termite Species	Status of Pest	Reporting Timeframe	Maximum Penalties within legislation	State/Territory Authority	Contact details
New South Wales	West Indian Drywood Termite *Cryptotermes brevis*	Declared a Notifiable Pest in Part 2 of the Schedule under Section 12 of the Plant Diseases Act 1924	Within 24 hours	$11,000	Department of Primary Industries - Biosecurity NSW	http://www.dpi.nsw.gov.au/biosecurity/plant Exotic Plant Pest Hotline: 1800 084 881 Email: biosecurity@dpi.nsw.gov.au
Queensland	West Indian Drywood Termite *Cryptotermes brevis*	Listed as a biosecurity matter (Category 1 Restricted Matter) under *Section 22 and Schedule 2 of the* Biosecurity Act 2014	Within 24 hours	$88,350 or six months imprisonment	Department of Agriculture and Fisheries	https://www.daf.qld.gov.au/forestry/pests-and-diseases/termites Phone: 13 25 23 (within Queensland) or 07) 3404 6999 Email: callweb@daf.qld.gov.au Fax: (07) 3404 6900

Western Australia	West Indian Drywood Termite *Cryptotermes brevis* Indo-Malaysian Drywood Termite *Cryptotermes cynocephalus* Exotic Drywood Termite *Cryptotermes dudleyi* Native Drywood Termite *Cryptotermes domesticus* Native Drywood Termite *Cryptotermes primus*	Prohibited Pest (C1 Category Exclusion) under Section 12 Biosecurity and Agriculture Management Act 2007 Listed as Prohibited Pest for whole of state in West Australian Organism List (WAOL)	Within 24 hours	$20,000	Pest and Disease Information Service (PaDIS) - Department of Agriculture and Food	https://www.agric.wa.gov.au/biosecurity-quarantine/biosecurity Phone: 1800 084881 Email: info@agric.wa.gov.au

Northern Territory	West Indian Drywood Termite *Cryptotermes brevis* Exotic Drywood Termite *Cryptotermes dudleyi* Native Drywood Termite *Cryptotermes domesticus* Native Drywood Termite *Cryptotermes primus*	Declared a notifiable pest under Section 6(4) Plant Health Act (PHA). Notifiable Pest as listed in Northern Territory Plant Health Manual - Version 3.0	Within 24 hours	$76,500 (Non reporting - Section 15 of PHA)	Department of Primary Industry and Fisheries (DPIF) - NT Quarantine	Website: NT Quarantine Darwin Office Phone: (08) 8999 2118 Fax: (08) 8999 2053 Katherine Office Phone: (08) 8973 9704 Fax: (08) 8973 9777 Alice Springs Office Phone: (08) 8951 8166 Fax: (08) 8951 8112 Email: quarantine@nt.gov.au
Victoria	No reporting requirements					
South Australia	No reporting requirements					
Australian Capital Territory	No reporting requirements					
Tasmania	No reporting requirements					

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