مجلس أبوظبي
للجودة والمطابقة
Abu Dhabi Quality &
Conformity Council

Abu Dhabi Guideline

دليل أبوظبي الإرشادي

ADG

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Second Edition

الاصدار الثاني

Abu Dhabi Guideline for Public Health Pest Control Services – Termite Management

دليل أبوظبي الإرشادي لمكافحة آفات الصحة العامة – مكافحة النمل الأبيض

S.#	Table of Contents	Pages

1. Amendment Page

To ensure that each copy of this technical document (Abu Dhabi Guideline) contains a complete record of amendments, the Amendment Page is updated and issued with each set of revised/new pages of the document. This ADG is a live document which can be amended when necessary. QCC operates Abu Dhabi Guideline for Termite Management – Public Health Pest Control Services Group which prepared this document and can review stakeholder comments in order to review and amend this document, and issue an updated version when necessary.

Edition Number	Year of Approval	Number of pages	Sections Changes	Notes
First Edition	2021	89	-	New Document
Second edition	2024	85	All	Change to ADPHC

2. About the Abu Dhabi Quality and Conformity Council

Abu Dhabi Quality and Conformity Council (QCC) is an Abu Dhabi government entity established in accordance with Local Law No. **(3) of 2009** to raise the quality of Abu Dhabi's exports and products traded locally. QCC consists of a council of regulators and industry with a mandate to ensure provision of quality infrastructure in line with global standards.

- QCC's functions are divided into six key areas:
  - Developing standards and specifications
  - Capacity building of metrology systems
  - Strengthening testing infrastructure
  - Launching conformity schemes
  - Protecting consumer interests
  - Ensuring fair trade
- QCC's key stakeholders include regulatory authorities, consumers, retailers and wholesalers, industry, conformity assessment bodies (CABs) and importers.

QCC supports regulators and government organizations through offering quality and conformity facilities, expertise and resources that allow them to implement products safety and compliance requirements and regulations. Additionally, QCC works towards promoting a culture of quality and protecting the interests of consumers. In doing this, QCC seeks to promote the Emirate's competitiveness to become one of the world's most attractive regions for investments and human capital, and to support the competitiveness of national industries in world markets.

3. Acknowledgement

QCC would like to thank the members of the Working Group listed below.

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15	**Mutaz Atef Khaleel**	MODON
16	**Mona Rashed AlAlili**	Abu Dhabi Quality and Conformity Council

4. Foreword

Technical Guide (TG) for termite management has been prepared by local public health pest control professionals and experts of ADPHC's to be used as national guide and reference for termite management that standardizes the most common and approved control methods used for controlling termite population in Abu Dhabi. These selected methods have been practiced by ADPHC's pest control professionals and the information provided of these methods were approved and all aspects were comprehensively studied. This TG summarizes technically and scientifically approved procedures that consider the interest of the key stakeholders.

The TG contains entire details related to the key procedures, methods, tools, equipment, data management, and quality standards. All methods were critically reviewed and compared with international references. General information and literature review have also been included to provide deeper technical and scientific insights that will help end users from all levels to thoroughly comprehend its contents. This TG is considered as national guide for best practices for controlling termite pests in Abu Dhabi and it can be used as reference for termite management services operations, training programs and examination systems.

This TG is always subject to change and update. Any newly developed or approved methods can be added or excluded upon ADPHC decision.

This TG was built based in the following legal references:

1- UAE Federal law no. 10 for the year 2020 regarding pesticides
2- UAE Federal law no. 13 for the year 2020 regarding public health
3- UAE Cabinet decree no. 27 for the year 2012 regarding public health pesticides circulation
4- Standard municipal guide for permitting requirements public health pest control companies. Issued by MOCCAE 2020

This TG is a dependent document that requires the application ADPHC Technical Guidelines for Responsible Use of Pesticides. Therefore, all standards, regulations and rules of ADPHC TG for Responsible Use of Pesticides are applicable in this TG or for termite management

5. Working Group

The Professional Working Group was organized by Abu Dhabi Quality and Conformity Council and established in April 2021, which was requested by Abu Dhabi Public Health Center (ADPHC) to prepare Abu Dhabi Guideline for Termite Management – Public Health Pest Control Services in cooperation with the related stakeholders including representatives from government and private sectors.

6. Purpose

This TG is considered as national guide for best practices for controlling termite pests in Abu Dhabi and it can be used as reference for termite management services operations, training programs and examination systems

This TG has been built based on the profound experiences of ADPHC's public health pest control experts. The TG is intended to be used by professionals who work in the field of public health pest control and it represents the acceptable and approved procedures for controlling termite pests. Thus, public health pest control professionals in Abu Dhabi shall follow the TG and implement it among their operations. Consumers (clients) can also use the TG as reference to have better knowledge about ADPHC's quality standards for controlling termite pests.

7. Scope

This methodology is applicable for all service providers who are working in the field of anti-termite or termite control activity in the Abu Dhabi. All service providers for termite control shall strictly commit to comply with all given methods and procedures of this TG. This TG and its content are applicable for all anti termite services. All anti- termite service providers in Abu Dhabi shall follow all instructions, methods, rules, and quality standards mentioned in this TG whenever they provide anti-termite services.

8. Terms and definitions

For the purposes of this guideline, the following terms and definitions shall be used unless the context indicates otherwise:

TERM	DEFINITION
Scheduled services	Planned services provided in a regular basis for certain areas
Unscheduled services	The services provided in irregular basis upon client request or field observations
Baseline survey	The initial survey that is carried out to newly served areas in order to investigate the pest population status and infestation level.
Conventional insecticides	Any synthetic active ingredients other than biological and antimicrobial pesticides.
Preconstruction treatment	The anti-termite treatment that is carried out at the building foundation during the construction phase as preventive measure against termite infestation.
Postconstruction treatment	The anti-termite treatment that is carried out for fully constructed buildings and it could curative or preventive measure
Regulatory organization	The designated governmental organization who is responsible for managing and regulating the public health pest control sector within their local or federal jurisdiction

9. Termite overview

Termite is an insect who lives in the dark and feed on wood and it belongs to the order ***Isoptera,*** and there most common termites are subterranean termite, dry wood termite, and damp wood termite all species feed on the cellulose found in the wood and make tunnels or galleries that eventually damage any wooden subjects. A single termite insect could be seen as not dangerous; however, termite is a social insect and lives in colonies and can be seriously damaging and dangerous. Devastatingly every year termite pest cause billions of losses due to structural damage and millions of dollars spent every year on termiticides used for treatments. Since it's been considered as structural pest regulatory organization has included termite to its scope of public health pest control services.

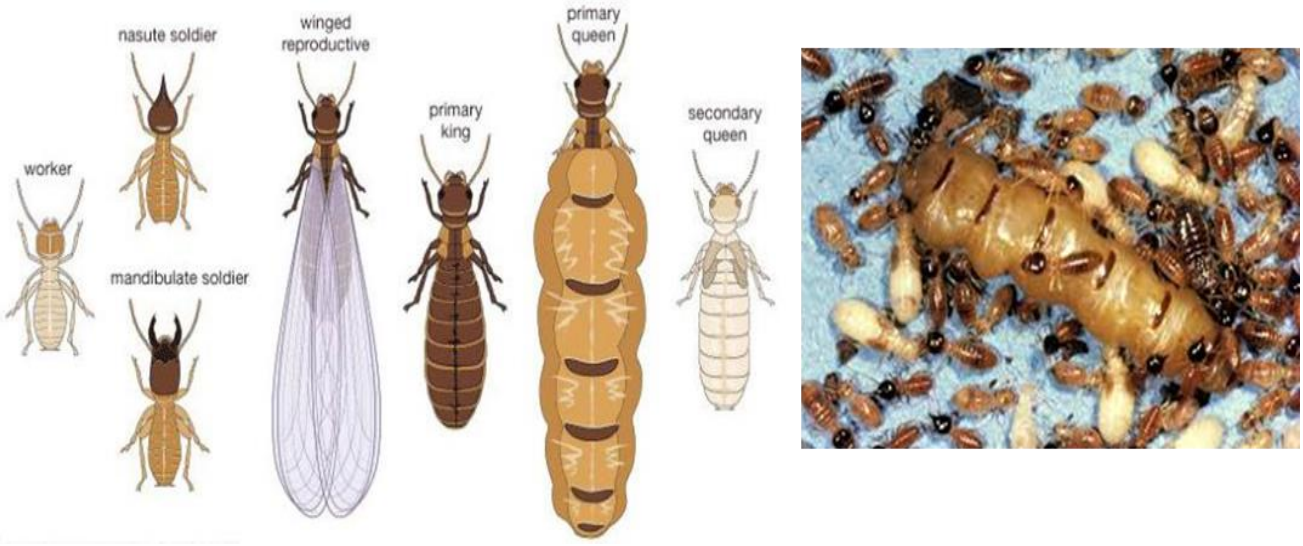
In this methodology the best practice for termite control are illustrated in order to provide all termite control service providers with general perspective about the approved practices for controlling termite in UAE

Termites are social insects living in groups underground where they build nests for their colonies).

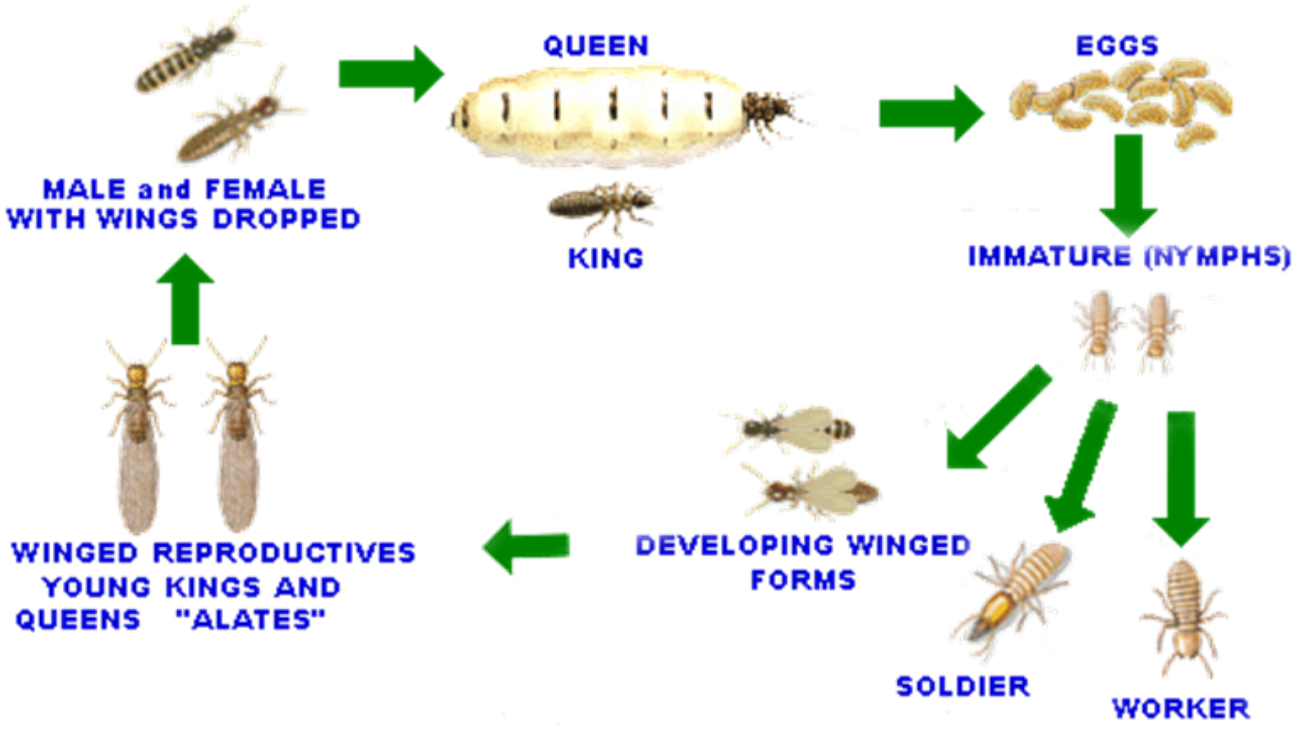
There are various species of termites, subterranean, dry woods, and damp wood species are primarily responsible for the damage to human-made structures. Termites are commonly known as white ants, but they are not related at all to the ants.

Termite workers

In each colony, the members are divided according to task: workers, soldiers, secondary reproductive (swarmer or alates), and primary reproductive (queen and king).



Termite castes



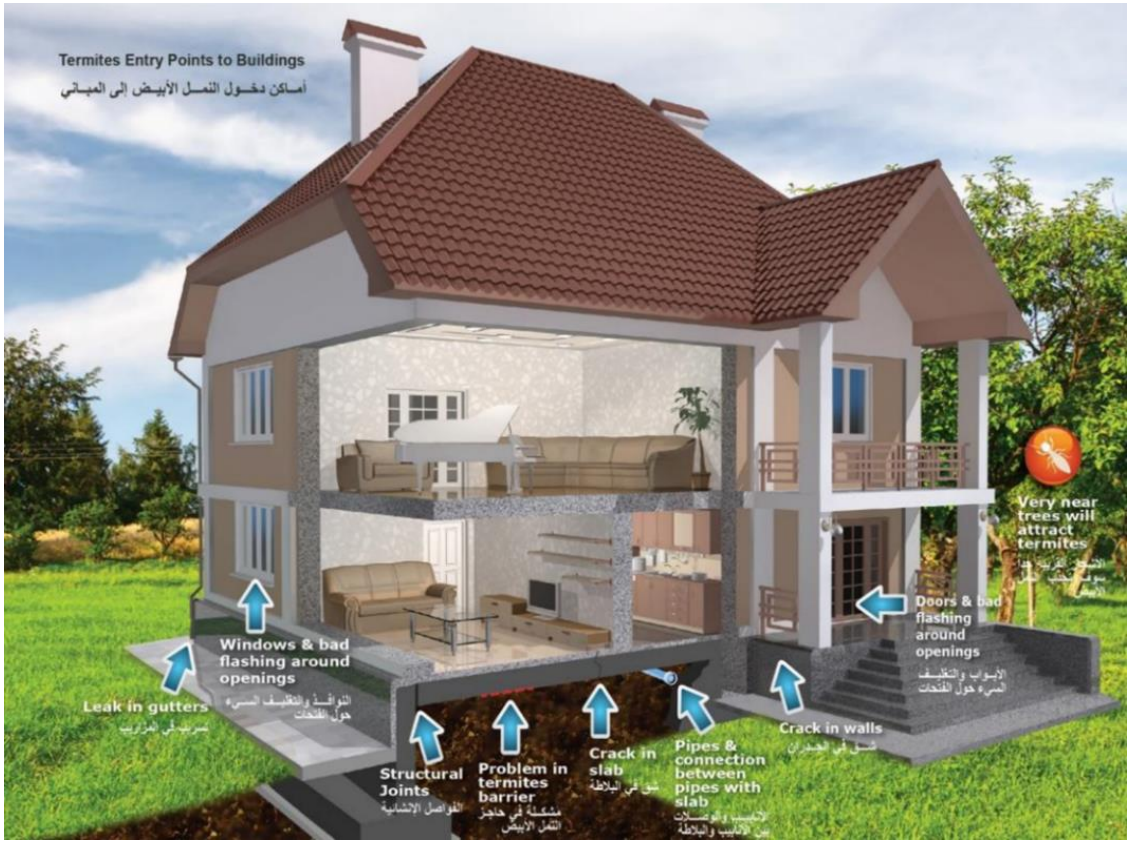
Termite life cycle

Live termite castes

9.1. THE IMPORTANCE OF TERMITE

- Termites make tunnels in soil which might cause problems to the structure.
- Termites target the cellulose, which is the main component in wood, this makes termites harmful to properties.
- Termites have a very keen sense on detecting wood even meters away.
- They search for food underground and above ground.
- Termites enter to building through cracks in concrete slabs, openings in walls, voids of materials (such as hollow blocks), openings of drainage & water pipes, electrical conduits.
- They can enter in cracks as small as 1-2mm.
- Termite can cause serious damage for human dwelling by feeding on wooden structures such as wooden doors, windows, furniture, hardwood floor and other wood works.

Entry pathways of termite


Termites Entry Points to Buildings
أماكن دخول النمل الأبيض إلى المباني
Very near trees will attract termites
Doors & bad flashing around openings
Windows & bad flashing around openings
Leak in gutters
Crack in walls
Structural Joints
Problem in termites barrier
Crack in slab
Pipes & connection between pipes with slab

Subterranean termite tunnels

Subterranean termite tunnels

Subterranean termite damage on door frame

Subterranean termite damage on hardwood floor

Subterranean termite damage on wooden structures

Subterranean termite damage on door frame

Dry wood termite galleries

Dry wood damage on kitchen wooden drawers

9.1. THE IDENTIFICATION OF KEY TERMITES' SPECIES

A Comparison between the workers size of damp wood, dry wood, and subterranean termite

A Comparison between the workers size of damp wood, dry wood, and subterranean termite

Common Name	General Discerption	Behavior & Habitats	Infestation Signs	Termite Photos	Infestations Photos
Subterranean Termite	• Color: Differ in Color by Caste. Workers Are Cream-Colored and Pale, Soldiers Light Color, But Their Heads Are Brown, Supplementary Reproductive Opaque Shade, But Primary Reproductive Are Brown or Black. • Size: Depends on Its Caste. Workers Measure One-Eighth to Three-Eighths of An Inch in Length. Soldiers Are as Long as Workers, But Have Larger. Both Supplementary and Primary Reproductive Measure About 1 Inch In	• Adapted To Various Climates • Subterranean Termites Need Continuous Contact with The Soil and Live Below Ground Level • Infest Various Wooden Surfaces • Create Shelter Tubes (Mud Tubes) To Protect Them from Drying Out as They Travel	• Discarded Wings • Presence Of Shelter Tubes (Mud Tubes) • Small Piles of Feces That Resemble Sawdust	 	 
Dry wood Termite	• Color: Vary in Color Depending on Their Maturity and Role Within the Colony. Worker Termites Are Cream Colored and Can Look White Against Wood. Soldier Termites Range from Cream to Brown and Swarmer's Can Be Brown or Black in Color. • Size: Dry wood Termites Range in Size Depending on Their Age, From 1/4 Inch To 3/8 Inch Long.	• Prefer Warm Climates • Infest Wooden Structures with Low Humidity Level • Do Not Need Soil Contact • Do Not Create Shelter Tubes (Mud Tubes), And Live Completely Within the Wood Which They Feed	• Discarded Wings • Accumulated Hexagonal, Wood-Like Pellets Droppings Called (Frass) • Tunnels Within Infested Wooden Structures	 	 
Damp wood Termite	• Color: Generally, Brown in Color, But Can Range from Dark to Light, And Can Even Be Reddish, Especially Towards Their Abdomens. Nymphs Are Cream-Colored. • Size: Queens Measure Between One-Half to Five-Eighths of An Inch in Length. Nymphs Can Also Grow to Be Five-Eighths of An Inch Long, While Soldiers Can Grow Up to Three-Fourths of An Inch in Length.	• Prefer Humid Conditions • Typically Infest Damp and Decaying Timber • It Can Infest Structures Where High Moisture Levels Exist Such as Plumbing Leaks, Ventilation Deficiencies, Drainage Problems, etc.... • Do Not Create Shelter Tubes (Mud Tubes), And Live Completely Within the Wood Which They Feed	• Discarded Wings • Ejected Wood Pellets • Fecal Pellets Outside Wood Galleries Which Are Elongated and Round on The Ends • The "Velvety Appearance" Of Wood Galleries	 	 

10. Roles and responsibilities

The key stakeholder in termite control are :

1- Service providers: who are permitted by Regulatory organization to provide termite control services
2- Clients: who receive termite control services in their facilities or premises
3- ADPHC (Regulatory organization) act as the regulatory party who monitor and set regulations for termite control services

Termite control roles and responsibilities	
Stakeholder	**Roles and responsibilities**
Service providers	1- To provide termite control service as per the standards, instructions and methodologies mentioned in the TG 2- Provide qualified staff who are capable to carry out the service in safe and effective manner. 3- Provide sufficient knowledge for client on how to properly implement cultural and physical practices that will reduce or prevent termite infestation. 4- Follow UAE instructions and regulations relevant to public health pest control 5- Record all data related to service orders, contracts, chemical consumption, infestation level and geographical distribution of treated objects on maps or layouts. This data must be reported in official service reports for each treatment. 6- All pest control data shall be available and accessible for clients and regulatory organization 7- Use only MOCCAE registered and approved termiticides. 8- Always seek to get the highest level of customer satisfaction and providing the services with highest quality levels. 9- Comply with local and federal laws and regulations. 10- Service providers shall provide the contact details of control team to the client, contact details shall include name, position, mobile phone, email address for all control team members.
Clients	1- Clients shall contract only registered and approved companies permitted from regulatory organization for practicing termite control. 2- It is recommended for clients to have a look and be familiar with TG 3- Clients shall provide any data required by regulatory organization for termite control. 4- Client has to support the control teams by facilitating their jobs in the workplace through providing easy access and follow the service providers recommendations that are relevant to pest control operations.
ADPHC (Regulatory organizations)	Shall provide guidance, regulations, and control for public health pest control industry.

11. Termite management

Anti-termite or termite management means the application of chemical and non-chemical control methods that are designed to eliminate, prevent, or reduce the damage associated with termite infestation.

1.1. ACTION THRESHOLD

Termites live in hidden places under the soil and their infestation cannot be detected until infestation sings occurred. When infestation signs occurred, the damage will be huge and anti-termite treatment become harder and more difficult to be eliminated. The devastating structural damage associated with termite infestation has oriented anti-termite services to be more preventive than curative. Thus, termite control shall always start at the very beginning of premises construction. Therefore, the action threshold for termite control cannot depend only on the observed infestation it shall also depend on the potential infestation as well. In this TG we have listed the action threshold for termite control in two categories as the following table.

Termite action threshold			
Category	Description	Action threshold	Notes
Preconstruction (Preventive)	The stage prior to proceed in constructing a premise	Any potential or prospective infestation, legal requirements, client requirements	Many municipalities and regulatory authorities enforce homeowners to apply anti-termite treatment at foundation or preconstruction stage as a legal requirement
Postconstruction (Curative)	The treatment for existing buildings or premises, or the wooden objects inside those premises	The presence of any infestation signs in or around the premise	Infestation signs include termite swarmers, tunnels, damaged structures, termite workers, excavation residues or dirt.

1.2. SERVICE FREQUENCY

Anti-termite services are provided in unscheduled manner which termite infestation occurs occasionally in existing buildings and for preconstruction stage the treatment will be done one time as a long-term preventive measure. Therefore, there is no standard service frequency for regular termite treatment, however certain rules are needed to manage service frequency as shown in the following table

General rules for anti-termite service frequency	
1	According to local and federal regulations in UAE, all premises shall apply anti-termite treatment at the preconstruction stage as a long-term preventive measure. Thus, preconstruction anti-termite treatment shall take place at the foundation stage. This treatment supposed to be provided one time to provide a protection against termite infestation for at least 5-10 years. After 5-10 years another preventive postconstruction treatment may be required to maintain termite-free structures.
2	If termite infestation occurred in existing premises, then postconstruction anti-termite treatment shall take place to treat infested parts and provide protection to any potential areas of infestation. In this case anti-termite treatment will be provided one time upon client request, though, regular follow up is required. At least one follow up shall be carried out after 2-3 weeks of the treatment to ensure that termite infestation is totally off.
3	In case of using termite bait station as monitoring devices, regular checkup for those bait station shall be carried out and checkup shall be done every 2-4 weeks

1.3. TERMITICIDES SELECTION

Termiticides basically are insecticides however, the key difference is that termiticides are specialized for targeting termite, which means termiticides have several characteristics than general insecticides including:

1- It is recommended to use Termiticide who are registered and labeled as termiticides or it only contain termite/ ant as the only targeted insect.
2- Have chemical and physical properties that enable it to work effectively for long time inside the soil. Properties such as good adhesion for cement, soil particles, and wood. Humidity and temperature resistance
3- Non-repellent and slow acting with long residual effect. Repellent insecticides or termiticides are not recommended to be used for termite treatment. Because termite treatment depends highly on the residual effect on which termite can move through treated soil or objects to termite workers and then to be transferred to the colony and finally terminate the termite colonies. Repellent insecticides such as pyrethroids will provide chemical barrier that knock down exposed termites but has no effect on termite colony and infestation will not be eradicated since the colony still alive.
4- Transferable. When termite walk through treated area, they will be contaminated with termiticide particles and then they will pick up the termiticides back to colony and contaminate the colony. Thus, termiticides is recommended to be characterized with transferability to allow termite to pick them up to the colony.

Even though some general insecticides are able to kill termite insects, they will not be able to provide effective long-term protection against termite infestation. Thus, general insecticides are not recommended to be used for anti-termite treatments.

Therefore, whenever selecting termiticides is better to make sure that it has all of the above-mentioned properties.

Examples of termiticides labels

1.4. GENERAL RULES FOR TERMITE MANAGEMENT

The following general rules must be followed by service providers whenever termite control services are applied

1- Follow all instructions and methodologies of this TG for all termite control operations
2- Use only termiticides that are valid, registered and approved by MOCCAE
3- Always follow the product label instructions for dilution rate, application rate, and safety instructions
4- Wear full PPE's whenever handle, use, or dealing with termiticides
5- Follow strictly all safety instructions mentioned in the SDS/MSDS
6- Record all data of termite control services
7- Always inspect the area carefully before any treatments
8- Record all data of inspection in formal inspection report
9- Clean out the workplace form any waste, dirt, or dust generated from termite control services operations.
10- Dispose empty termiticide containers as per Regulatory organization's regulations for hazardous waste
11- Any damage to the properties resulted from termite control services is the responsibility of the service provider
12- Always inform your client about the treatment and obtain his official approval before proceeding in any treatment
13- Follow all safety instructions in construction sites
14- In construction sites. Do not spray or apply any treatment before obtain approval and evacuate all other non-involved persons form the site
15- Do not spray termiticides in windy and raining days for outdoor treatments

1.5. TERMITE CONTROL METHODS

Termite control can be classified in two main categories preconstruction and postconstruction. Preconstruction treatments includes all anti-termite treatments that take place at the foundation stage of construction and postconstruction treatments includes all anti-termite treatments aim to control termite infestation in existing premises. The following are the approved termite control methods

1- Pre-construction (subterranean termite)
   - Termiticides (conventional spray)
   - Termite Bait Stations
   - Anti -Termite Blanket
   - Anti-termite Mesh

2- Post-construction (subterranean termite)
   - Mechanical alteration /sanitation
   - Spot treatment
   - Soil treatment
   - Wood treatment
   - Foundation treatment
   - Baits and Monitoring systems
   - Anti-Termite Treatment for Outside Premises

3- Dry wood termite treatments
4- Damp wood termite treatments

Chapter 1 Pre -Construction Subterranean Termite Treatments

1.1. INTRODUCTION

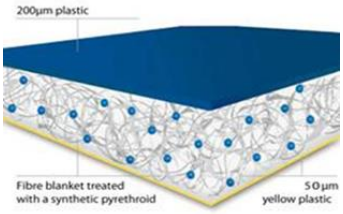
Termite preconstruction treatment involve 4 methods including:

1- Termiticide (Conventional Spraying)
2- Termite Bait Stations
3- Anti -Termite Blanket
4- Anti-termite Mesh

Termiticides or termiticide liquid spray is a mandatory method for preconstruction treatment and preconstruction treatment cannot be done without termiticide spray. Termite bait stations, anti-termite blanket, and anti-termite mesh are optional methods and they can be combined with liquid termiticide spray, and their selection depends on customer requirements.

1.2. TOOLS AND EQUIPMENT FOR PRE-CONSTRUCTION TREATMENTS

This section displays the key tools and equipment required to perform all approved control methods for pre-construction treatment

#	Tools & Equipment	Photo	Purpose
1	High pressure powered sprayer machine		To be installed on pickups and to be used to provide high pressured liquid termiticides spray
2	Termite bait station		Termite treatment and monitoring
3	Anti-termite blanket		Anti-termite protection
4	Measurement cup		For insecticides calibration

5	Gram-based calibration spoon		To be used for adequately calibrating solid insecticides
6	Chemical cartridge respirator		To be worn during liquid insecticides application for respiratory protection
7	Chemical protection gloves.		To be used by pesticides handler for hands protection
8	Safety goggles		Eye protection
9	Dust mask		Respiratory protection
10	Data entry device, Handheld data entry terminal		For systemized or digital data entry
11	Conventional clipboard		For manual data entry

12	Safety shoes		Foot protection
13	Uniform		To be worn during all procedures by technicians to protect their bodies from any contact with pesticides or any hazardous materials during their work.
14	Disposable coveralls		Additional protection against termiticide contamination
15	Safety tapes		To be installed around the construction site to warn people from entering
16	Safety gumboot		Foot protection when spraying pressurized chemical in large quantities

1.3. METHOD 1: TERMITICIDE (CONVENTIONAL SPRAYING)

Termiticide as a method means the application of liquid termiticide at the premise foundations as preventive measure to provide long-term protection for any future termite infestation. It depends on applying termiticide in adequate amount at the proper places to build a chemical barrier against any possible invading termite and act as guarding fence.

General rules for termiticides

- Termiticide is a mandatory method for preconstruction treatment and no preconstruction treatment can be done without termiticide.
- Use only approved and registered termiticides as mentioned in termiticide selection section.
- Use the proper dilution and application rates as mentioned in products label
- Follow the safety instructions in the product MSDS and Label
- Follow all procedures and instruction mentioned in this TG for termiticides

General Procedures Before Treatment

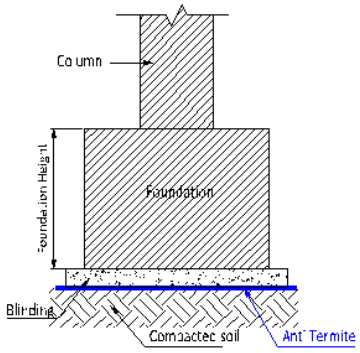
- Approval from client / consultant on all materials, drawings including location graph.
- Install all necessary warning tapes & signs.
- Prepare labor, materials, tools, equipment, transportation, and all other necessary arrangements to carry out the specified jobs.
- Ensure the site is clean and ready to receive treatment.
- Provide all necessary water and power supplies for the works & labor

1.3.1. TREATMENTS UNDER FOUNDATIONS BEFORE CASTING

Treatment under foundations aims to deliver termiticides on the soil that is under the foundation area and before casting in order to form a termiticide layer for underground protection against termite below the foundation.

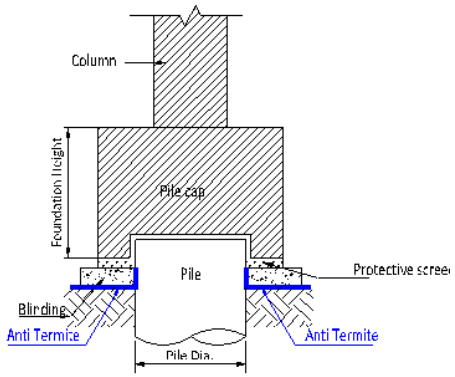
1.3.1.1. Treatment Under Single Foundations or Pile Caps

- Be sure the soil is levelled and compacted.
- Isolate the area with warning tapes / cones / barriers to prevent people from entering during treatment.
- Spray the termiticide as per manufacturer's recommendations.
- Do not allow people to enter the treated area until the soil absorbs the termiticide (Duration of absorption depends on type of soil, in average 2 hours- read termiticide label).
- Blinding must be casted within 24 hours maximum (be sure the sprayed soil is protected from rain, disturbance, etc. until casting the blinding)



Note: Antitermite at this stage to be done before casting the blinding

TYPICAL SECTION
ANTI TERMITE TREATMENT UNDER THE FOUNDATION

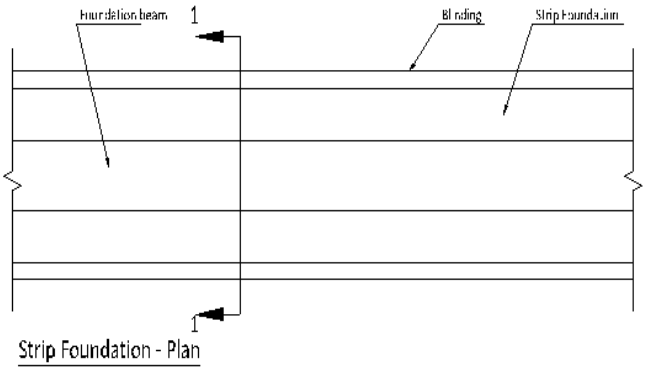


Note: Antitermite at this stage to be done before casting the blinding

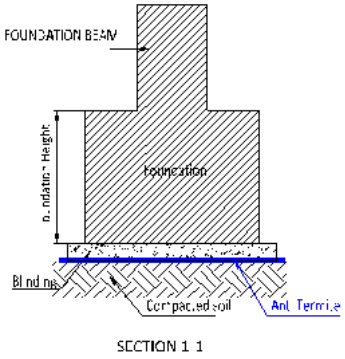
TYPICAL SECTION
ANTI TERMITE TREATMENT UNDER THE PILE CAP

1.3.1.2. Treatment Under the Strip Foundations

- Be sure the soil is levelled and compacted.
- Isolate the area with warning tapes / cones / barriers to prevent people from entering during treatment.
- Spray the termiticide as per manufacturer's recommendations.
- Do not allow people to enter the treated area until the soil absorbs the termiticide (Duration of absorption depends on type of soil, in average 2 hours).
- Blinding must be casted within 24 hours maximum (be sure the sprayed soil is protected from rain, disturbance, etc. until casting the blinding)



Strip Foundation - Plan



SECTION 1 1

Note: Anti termite at this stage to be done before casting the blinding

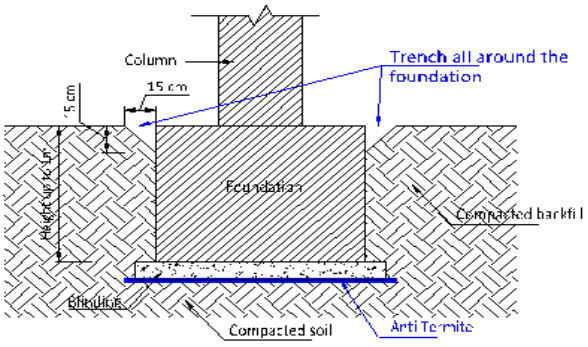
TYPICAL SECTION
ANTI TERMITE TREATMENT UNDER STRIP FOUNDATIONS

1.3.2. TREATMENT AT THE SIDES OF FOUNDATION

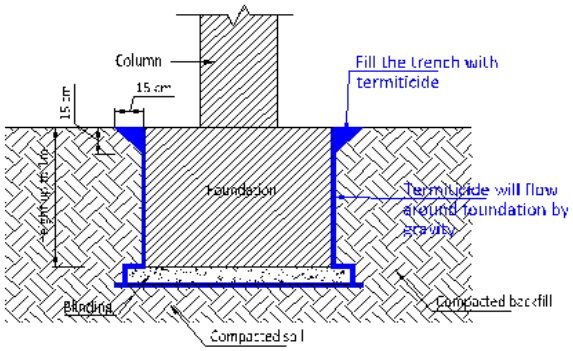
This treatment aims to deliver termiticides and treat the foundation sides and the adjacent soil next to it.

1.3.2.1. *Treatment At sides of foundations or pile caps (Height up to 1m)*

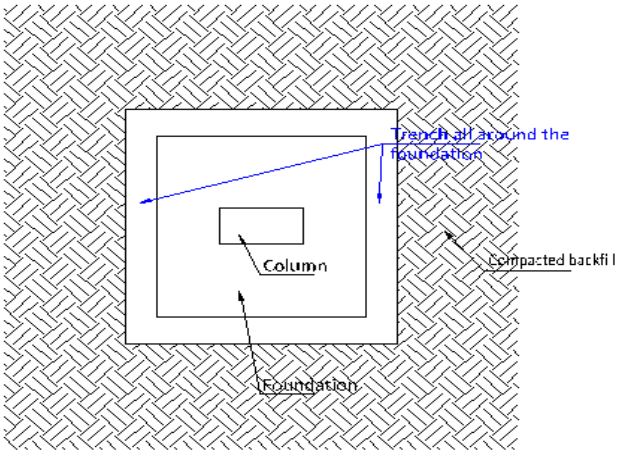
- Be sure the backfill around foundation or pile cap up to the top is complete and soil is compacted.
- Isolate the area with warning tapes / cones / barriers to prevent people from entering during treatment.
- Create a triangular trench all around the foundation with height = 15cm and width = 15cm as per the figure.
- Fill the trench with termiticide and wait for 2 hours to let the liquid flow by gravity to cover the sides of foundation.
- Do not allow people to enter the treated area until the soil absorbs the termiticide.
- The trench must be backfilled within 24 hours maximum (be sure the soil is protected from rain, disturbance, etc. until backfilling)
- Spray the top of foundation.
- Protect the column necks in same way.



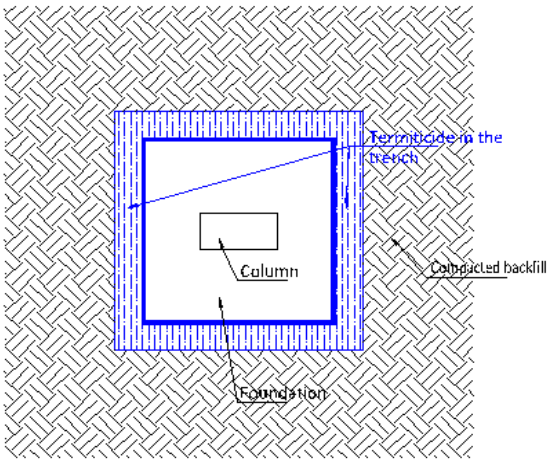
TYPICAL SECTION IN FOUNDATION (TRIANGULAR TRENCH AROUND THE FOUNDATION TO RECEIVE TERMITICIDE)



TYPICAL SECTION IN FOUNDATION (ANTI TERMITE TREATMENT AT SIDES OF FOUNDATION)



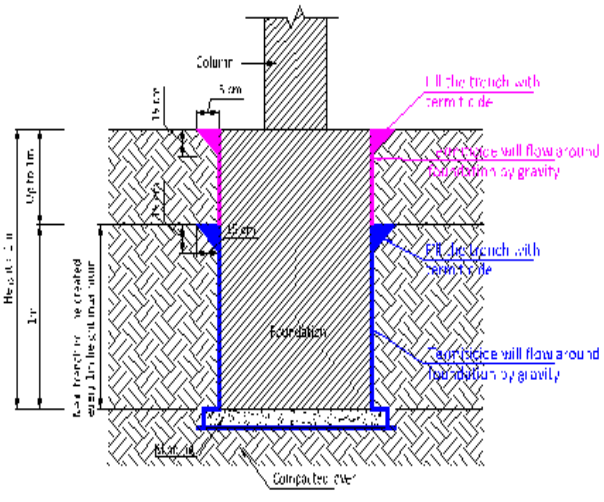
PLAN FOR ABOVE SECTION



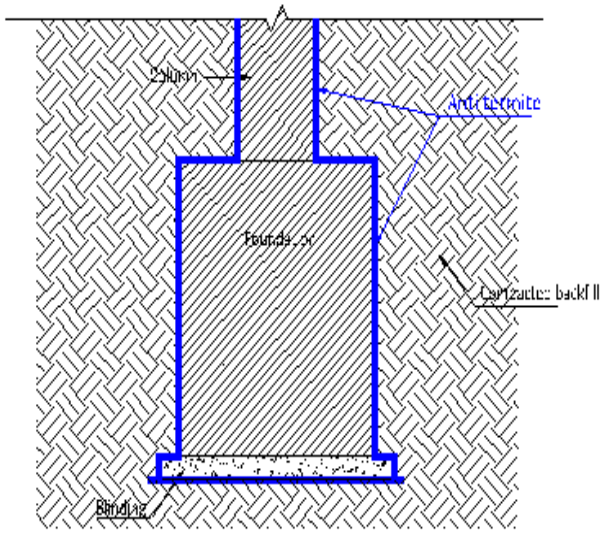
PLAN FOR ABOVE SECTION

1.3.2.2. *Treatment At sides of foundations or pile caps (Height more than 1m)*

- Backfill & compact until reaching height of 1m (from bottom of foundation).
- Isolate the area with warning tapes / cones / barriers to prevent people from entering during treatment.
- Create a triangular trench all around the foundation with height = 15cm and width = 15cm.
- Fill the trench with termiticide and wait for 2 hours to let the liquid flow by gravity to cover the sides of foundation.
- Do not allow people to enter the treated area until the soil absorbs the termiticide.
- The trench must be backfilled within 24 hours maximum (be sure the soil is protected from rain, disturbance, etc. until backfilling)
- Repeat the previous steps every 1m until reaching the top of soil layer contacting with the foundation.
- Spray the top of foundation.
- Protect the column necks in same way.



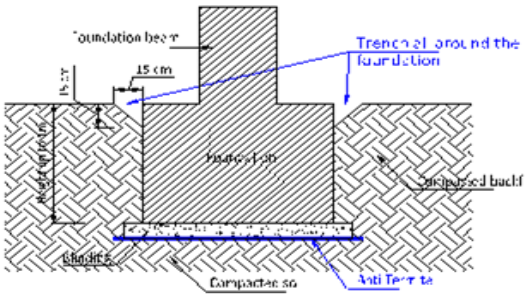
TYPICAL SECTION IN FOUNDATION WITH HEIGHT > 1M
(ANTI TERMITE TREATMENT AT SIDES OF FOUNDATION)



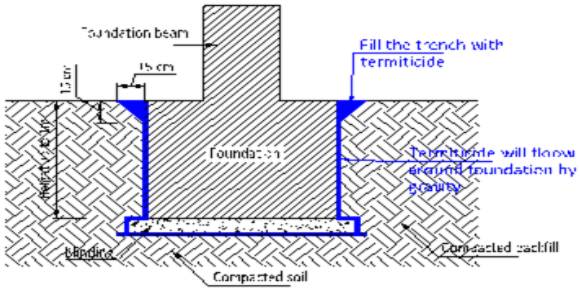
TYPICAL SECTION IN FOUNDATION & COLUMN NECK
(ANTI TERNITE TREATMENT TO COVER ALL SIDES)

1.3.2.3. *Treatment At sides of strip foundations (Height up to 1m)*

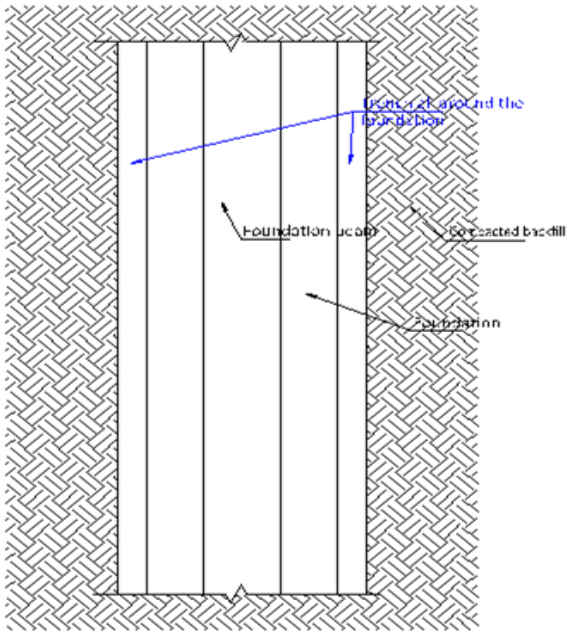
- Be sure the backfill around foundation up to the top is complete and soil is compacted.
- Isolate the area with warning tapes / cones / barriers to prevent people from entering during treatment.
- Create a triangular trench all around the foundation with height = 15cm and width = 15cm as per the figure.
- Fill the trench with termiticide and wait for 2 hours to let the liquid flow by gravity to cover the sides of foundation.
- Do not allow people to enter the treated area until the soil absorbs the termiticide.
- The trench must be backfilled within 24 hours maximum (be sure the soil is protected from rain, disturbance, etc. until backfilling)
- Spray the top of foundation.
- Protect the foundation beam & wall or column necks above foundation in same way.



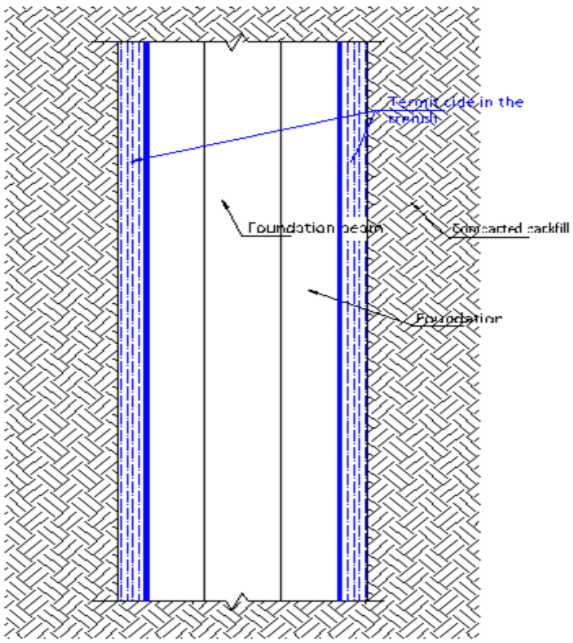
TYPICAL SECTION IN STRIP FOUNDATION
(TRIANGULAR TRENCH AROUND THE FOUNDATION TO RECEIVE TERMITICIDE)



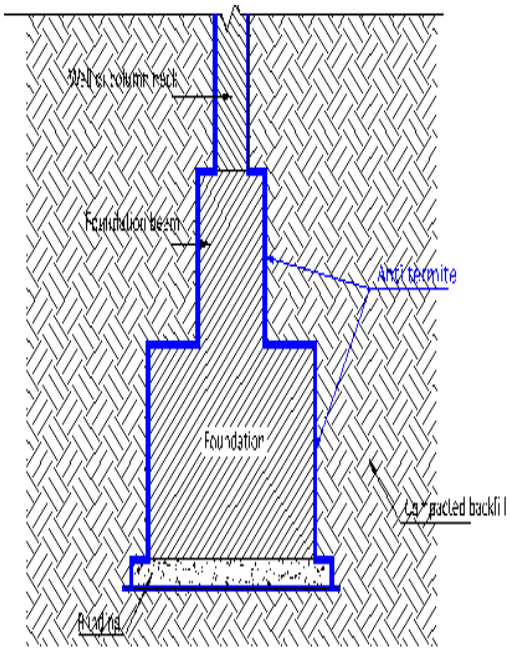
TYPICAL SECTION IN STRIP FOUNDATION
(ANTI TERMITE TREATMENT AT SIDES OF FOUNDATION)



PLAN FOR ABOVE SECTION
(STRIP FOUNDATION)



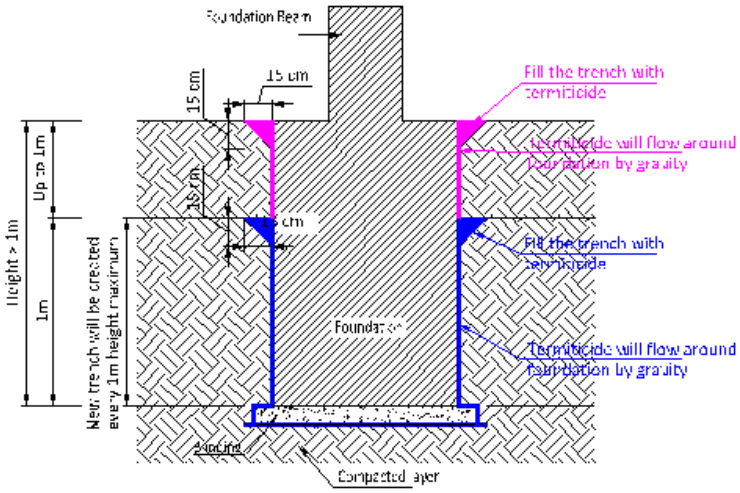
PLAN FOR ABOVE SECTION
(STRIP FOUNDATION)



TYPICAL SECTION IN STRIP FOUNDATION WITH WALL OR COLUMN NECK
(ANTI TERMITE TREATMENT TO COVER ALL SIDES)

1.3.2.4. *Treatment At sides of strip foundations (Height more than 1m)*

- Backfill & compact until reaching height of 1m (from bottom of foundation).
- Isolate the area with warning tapes / cones / barriers to prevent people from entering during treatment.
- Create a triangular trench all around the foundation with height = 15cm and width = 15cm.
- Fill the trench with termiticide and wait for 2 hours to let the liquid flow by gravity to cover the sides of foundation.
- Do not allow people to enter the treated area until the soil absorbs the termiticide.
- The trench must be backfilled within 24 hours maximum (be sure the soil is protected from rain, disturbance, etc. until backfilling)
- Repeat the previous steps every 1m until reaching the top of soil layer contacting with the foundation.
- Spray the top of foundation.
- Protect the foundation beam & wall or column necks above foundation in same way.



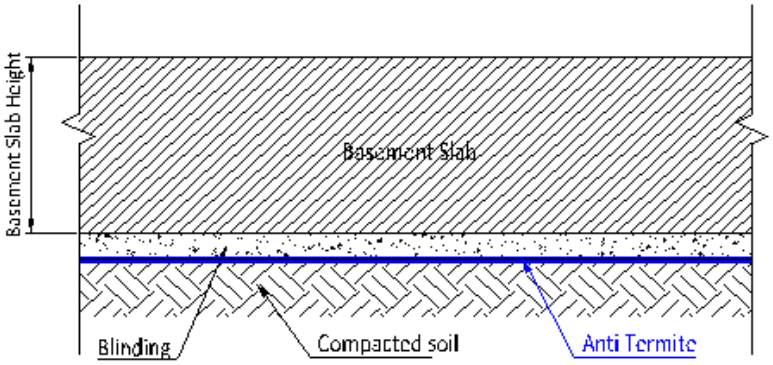
TYPICAL SECTION IN FOUNDATION WITH HEIGHT > 1M
(ANTI TERMITE TREATMENT AT SIDES OF FOUNDATION)

1.3.3. TREATMENT OF BASEMENT

This treatment aims to deliver termiticides to the soil layer under the basement slabs and raft foundation in order to provide protection for building underground.

1.3.3.1. Treatment of Basement Slab or Raft Foundation

- If blinding under the basement slab is going to be casted one time, then the whole slab will be considered one area. However, if it is not going to be casted one time (divided to multiple areas) then coordinate with contractor to know the casting schedule of blinding.
- For each area:
- Be sure the soil is levelled and compacted.
- Isolate the area with warning tapes / cones / barriers to prevent people from entering during treatment.
- Spray the termiticide as per manufacturer's recommendations.
- Do not allow people to enter the treated area until the soil absorbs the termiticide (Duration of absorption depends on type of soil, in average 2 hours).
- Blinding must be casted within 24 hours maximum (be sure the sprayed soil is protected from rain, disturbance, etc. until casting the blinding)

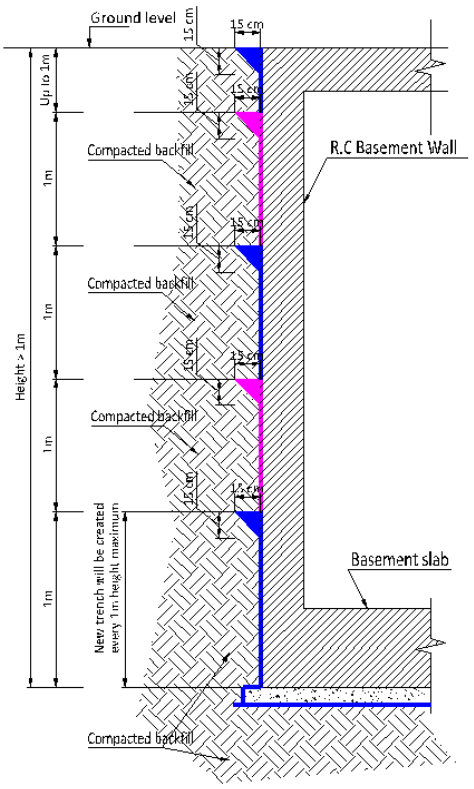


Note: Antitermite to be done before casting the blinding, allow 2 hours before casting.

TYPICAL SECTION
ANTI TERMITE TREATMENT UNDER BASEMENT SLAB

1.3.3.2. *Treatment of Basement Walls*

- Backfill & compact until reaching height of 1m (from bottom of wall & slab).
- Isolate the area with warning tapes / cones / barriers to prevent people from entering during treatment.
- Create a triangular trench all around the wall with height = 15cm and width = 15cm as per figure.
- Fill the trench with termiticide and wait for 2 hours to let the liquid flow by gravity to cover the sides of wall.
- Do not allow people to enter the treated area until the soil absorbs the termiticide.
- The trench must be backfilled within 24 hours maximum (be sure the soil is protected from rain, disturbance, etc... until backfilling)
- Repeat the previous steps every 1m until reaching the top of soil layer contacting with the wall.



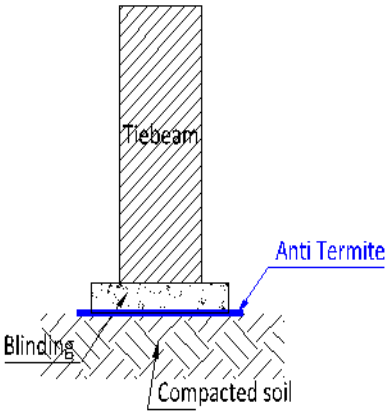
TYPICAL SECTION IN BASEMENT SLAB & WALL (TRIANGULAR TRENCHES ALONG THE WALL AT LAYERS OF 1M HEIGHT)

1.3.4. TREATMENT OF TIE BEAM AND SLABS

This treatment aims to treat the soil under and around the tie beam and slabs

1.3.4.1. Treatment Under Tie Beams

- Be sure the soil is levelled and compacted.
- Isolate the area with warning tapes / cones / barriers to prevent people from entering during treatment.
- Spray the termiticide as per manufacturer's recommendations.
- Do not allow people to enter the treated area until the soil absorbs the termiticide (Duration of absorption depends on type of soil, in average 2 hours).
- Blinding must be casted within 24 hours maximum (be sure the sprayed soil is protected from rain, disturbance, etc... until casting the blinding)

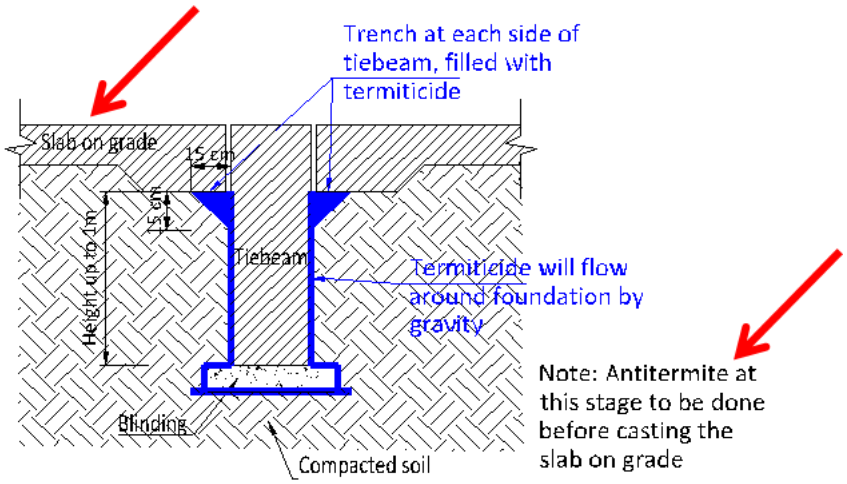


Note: Antitermite at this stage to be done before casting the blinding

TYPICAL SECTION - ANTI TERMITE TREATMENT UNDER THE TIEBEAM

1.3.4.2. Treatment at Sides of Tie Beams

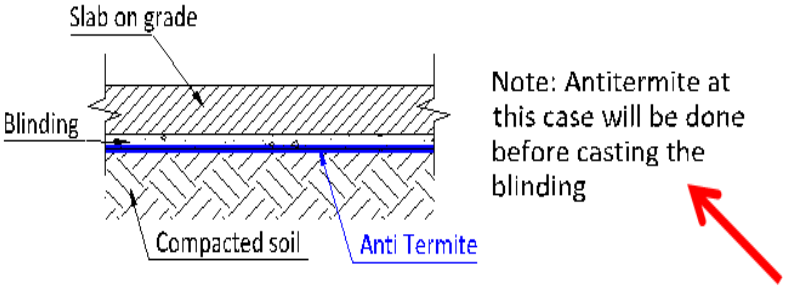
Sides of tie beams will be treated in the same way of sides of foundations until reaching the bottom of slab on grade (also if height of tie beam is larger than 1m will be treated same as foundation of height >1m).



TYPICAL SECTION IN TIEBEAM (TRIANGULAR TRENCH AT BOTH SIDES OF TIEBEAM (TO RECEIVE TERMITICIDE)

1.3.4.3. *Treatment of Slab on Grade – Case 1 (blinding layer is done under the slab)*

- Be sure the soil is levelled and compacted.
- Isolate the area with warning tapes / cones / barriers to prevent people from entering during treatment.
- Spray the termiticide as per manufacturer's recommendations.
- Do not allow people to enter the treated area until the soil absorbs the termiticide (Duration of absorption depends on type of soil, in average 2 hours).
- Blinding must be casted within 24 hours maximum (be sure the sprayed soil is protected from rain, disturbance, etc... until casting the blinding)



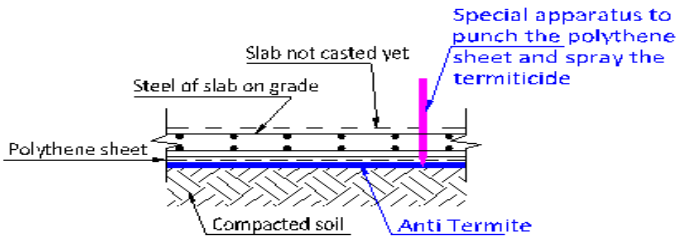
TYPICAL SECTION - ANTI TERMITE TREATMENT UNDER THE SLAB ON GRADE

CASE 1: SLAB WITH BLINDING UNDERNEATH

1.3.4.4. *Treatment of Slab on Grade – Case 2 (In case of polythene sheet only without blinding layer under the slab)*

In this case the treatment will be done only after completion of steel reinforcement of slab on grade, and before casting the slab.

- Be sure all steel reinforcement is completed and the slab on grade is ready to be casted.
- Using a special apparatus, punch the polythene sheet every 1m spacing in both directions and spray the termiticide under the polythene sheet until covering the whole portion.
- Repeat until covering the whole area of slab on grade.
- Wait for 1 hour before casting of slabs.
- Casting of slab must be done within 24 hours



Note: Since there is long time between installation of polythene sheet and casting of slab on grade, antitermite in this case will wait until the steel reinforcement of slab is ready. A special apparatus will be used to punch the polythene sheet and spray the termiticide.

TYPICAL SECTION - ANTI TERMITE TREATMENT UNDER THE SLAB ON GRADE

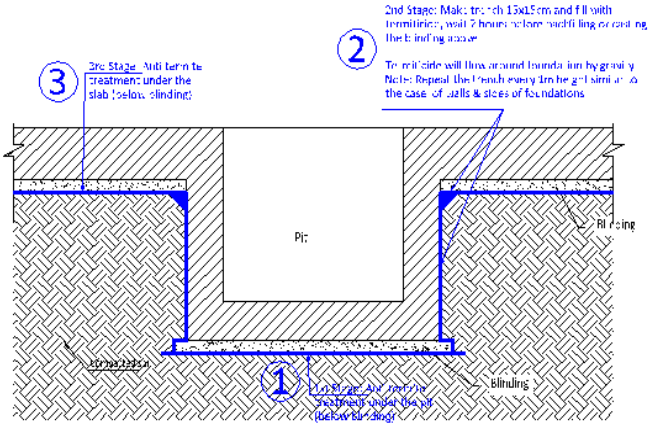
CASE 2: SLAB WITHOUT BLINDING UNDERNEATH (ONLY POLYTHENE SHEET)

1.3.5. TREATMENT OF REINFORCED CONCRETE (RC) PITS AND WATER TANKS

1.3.5.1. Treatment of RC Pits (Utility pits, lift pits, trenches etc.)

1st Stage (Under the pit):

- Be sure the soil is levelled and compacted.
- Isolate the area with warning tapes / cones / barriers to prevent people from entering during treatment.
- Spray the termiticide as per manufacturer's recommendations (see figure).
- Do not allow people to enter the treated area until the soil absorbs the termiticide (Duration of absorption depends on type of soil, in average 2 hours).
- Blinding must be casted within 24 hours maximum (be sure the sprayed soil is protected from rain, disturbance, etc. until casting the blinding).



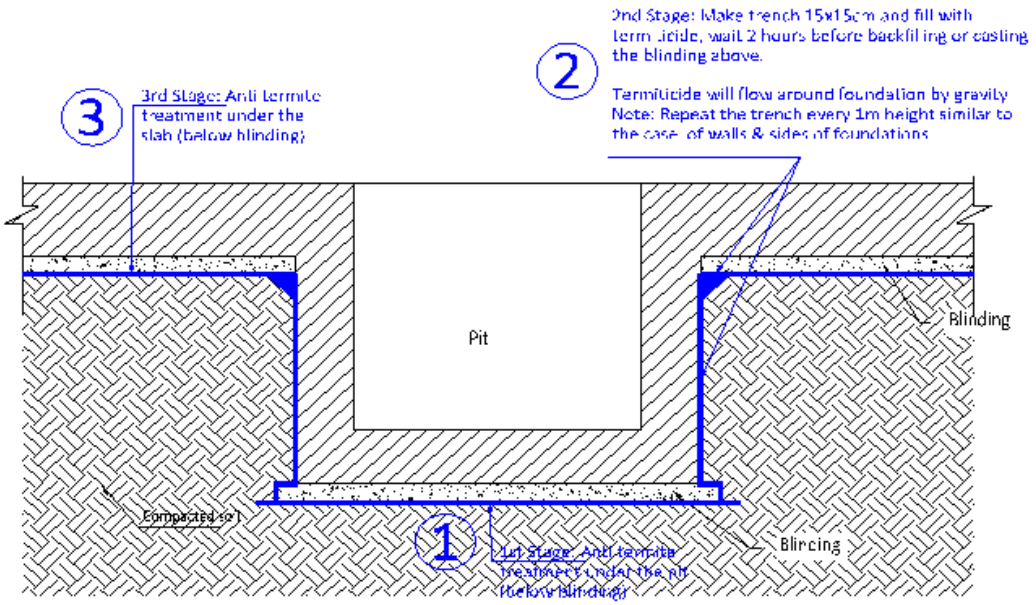
TYPICAL SECTION IN PIT - ANTI TERMITE TREATMENT

2nd Stage (Side of pit):

- Be sure the backfill around pit is complete and soil is compacted.
- Isolate the area with warning tapes / cones / barriers to prevent people from entering during treatment.
- Create a triangular trench all around the pit with height = 15cm and width = 15cm as per the figure.
- Fill the trench with termiticide and wait for 2 hours to let the liquid flow by gravity to cover the sides of pit.
- Do not allow people to enter the treated area until the soil absorbs the termiticide.
- The trench must be backfilled within 24 hours maximum (be sure the soil is protected from rain, disturbance, etc... until backfilling).
- In case of height >1m, the trench will be done every 1m height (similar to the case of walls & sides of foundations.

3rd Stage (Under slab at top level of the pit if any):

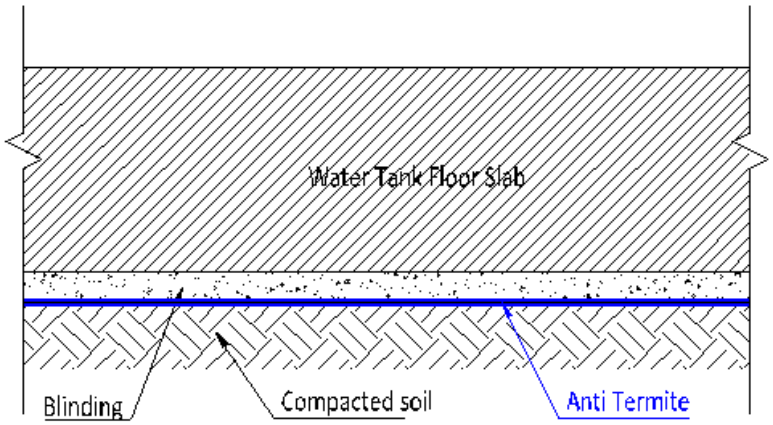
- Be sure the soil is levelled and compacted.
- Isolate the area with warning tapes / cones / barriers to prevent people from entering during treatment.
- Spray the termiticide as per manufacturer's recommendations (see figure).
- Do not allow people to enter the treated area until the soil absorbs the termiticide (Duration of absorption depends on type of soil, in average 2 hours).
- Blinding must be casted within 24 hours maximum (be sure the sprayed soil is protected from rain, disturbance, etc. until casting the blinding)



TYPICAL SECTION IN PIT - ANTI TERMITE TREATMENT

1.3.5.2. Treatment Under RC Water Tanks

- Be sure the soil under water tank floor slab is levelled and compacted.
- Isolate the area with warning tapes / cones / barriers to prevent people from entering during treatment.
- Spray the termiticide as per manufacturer's recommendations.
- Do not allow people to enter the treated area until the soil absorbs the termiticide (Duration of absorption depends on type of soil, in average 2 hours).
- Blinding must be casted within 24 hours maximum (be sure the sprayed soil is protected
- from rain, disturbance, etc. until casting the blinding)

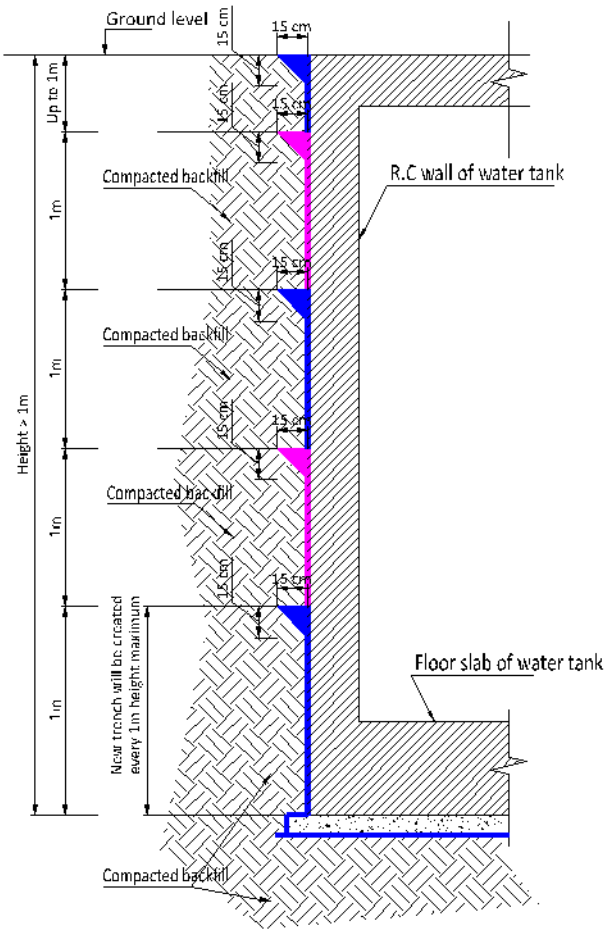


Note: Antitermite to be done before casting the blinding, allow 2 hours before casting.

1.3.5.3. Treatment of RC Water Tank Walls

Walls of water tank

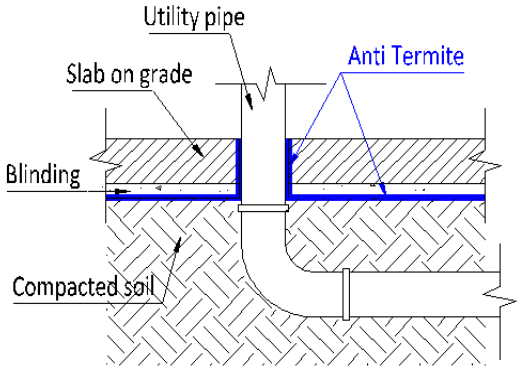
- Backfill & compact until reaching height of 1m (from bottom of wall & slab).
- Isolate the area with warning tapes / cones / barriers to prevent people from entering during treatment.
- Create a triangular trench all around the foundation with height = 15cm and width = 15cm.
- Fill the trench with termiticide and wait for 2 hours to let the liquid flow by gravity to cover the sides of foundation.
- Do not allow people to enter the treated area until the soil absorbs the termiticide.
- The trench must be backfilled within 24 hours maximum (be sure the soil is protected from rain, disturbance, etc. until backfilling)
- Repeat the previous steps every 1m until reaching the top of soil layer contacting with the wall.



TYPICAL SECTION IN WATER TANK SLAB & WALL

1.3.5.4. Treatment Around Utility Pipes & Conduits (Passing Through Slab or Wall)

- After doing the hole in slab to pass the pipe, clean the sides of hole and apply anti termite spray.
- Allow 2 hours then install the pipe & filler.
- Anti-termite mesh in this case is advisable as additional protection.

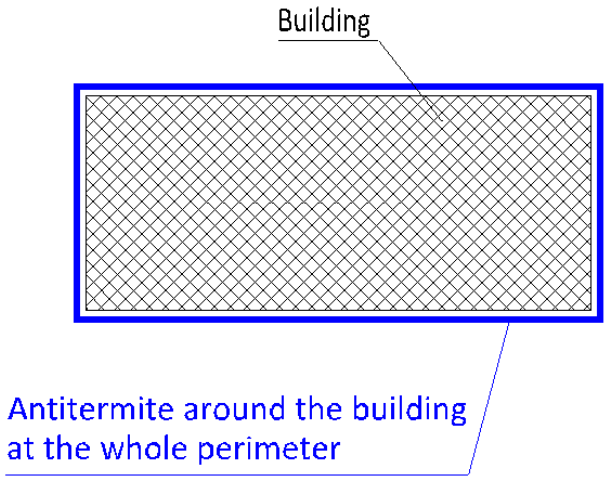


TYPICAL SECTION - ANTI TERMITE TREATMENT AROUND UTILITY PIPE PENETRATION

1.3.6. TREATMENT AROUND THE WHOLE BUILDING PERIMETER

This treatment aims to deliver termiticides at the adjacent soil of the building perimeter to provide an overall protection and prevent termite entering building perimeter.

- Be sure all the perimeter of the building is covered with treatment
- Dig a trench around the building at the whole perimeter. The trench shall be at width of 30cm and depth of 60 cm
- Spray termiticides at low pressure inside the trench until fill it up and then let it drench into the soil



ANTITERMITE AROUND THE BUILDING

1.4. METHOD 2: TERMITE BAIT STATION

1.4.1. TERMITE BAIT STATION

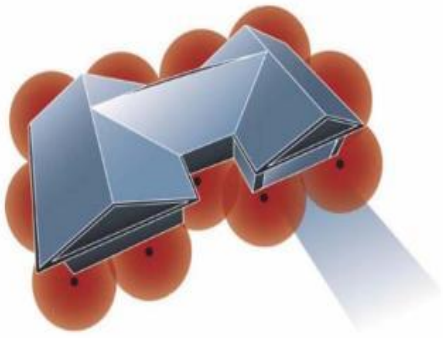
Bait stations are perforated plastic boxes installed all around the building at a specified distance from building and specified spacing in between each other depending on infestation level and product label. The stations contain special materials that attract termites. These materials are more preferred by termites than the normal wood used in building & furniture. If the building is not attacked yet, the stations will help discover the problem at earlier stage preventing damage to properties, so they are used as monitors for any future infestation.

There are two strategies for the use of termiticide baits. One involves the placement of monitoring devices containing untreated wood or other cellulose material in the soil around the structure to be protected. When termites are detected in the monitoring device, the untreated cellulose material is replaced with a treated material, referred to as a “termiticide bait”. The bait material is replenished as long as termites continue feeding. For the bait system to be effective, the proper number of stations must be installed, and the stations must be inspected or monitored regularly as indicated on the product label. When termites stop feeding, the bait is replaced with untreated wood or other cellulose material. As a variation of this strategy, devices may be pre-baited and placed in the soil in areas where termites are present.

The second bait strategy currently in use involves the attachment of bait devices directly to the surface of construction elements where termites are actively feeding. These devices are pre-baited and are attached to the foundation walls, floor joists, sub-floor and other similar locations. Termites then feed on the bait material.

In-Ground/In Concrete Bait stations will be installed around the building at offset 1.5m from the building and with spacing 3m-5m depending on site conditions.

In-Concrete Station



In-Ground Station

Above Ground Station

Bait stations contain main 3 parts:

1- Perforated plastic box.

2- Wooden interceptors (special type of wood and attractant).

3- The main bait

The main idea of the bait:

- Not every toxicant could eliminate the termite colony, if the toxicant killed the termites very fast inside the station, the other colony members will not be killed.
- The solution is a relatively slow acting toxicant. The working termites will feed the other termites in the colony including the queen (the main producer of termites).
- This toxicant kills the termite only at a certain point of the termite's life cycle.
- The result is to eliminate the whole colony.

1.4.2. INSTALLATION OF TERMITE BAIT STATION

INSTALLATION OF IN-GROUND STATION:

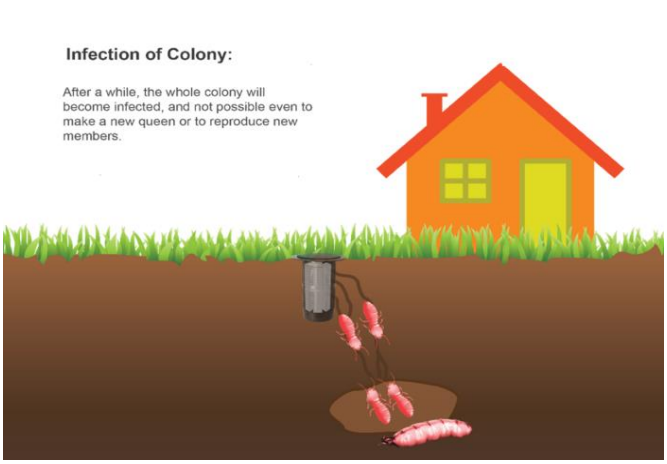
A power-driven Earth Auger is best for installing large numbers of Stations. Be sure the interceptors and termite attractant are in place before installing the Station. As the Station is going into the earth, push soil down against the sides of the station in order that the soil is packed between the Station and the sides of the hole.

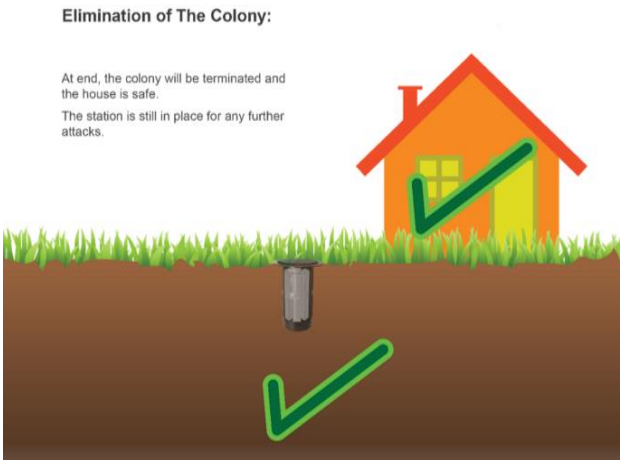
INSTALLATION OF IN-CONCRETE STATION:

The recommended opening in the concrete is 78 mm –82 mm in diameter. Holes are formed using a concrete coring device or drill. After the concrete is cored, it will be necessary to remove the earth from the bottom of the core to form a larger and deeper bait cavity.

INSTALLATION OF ABOVE GROUND STATION:

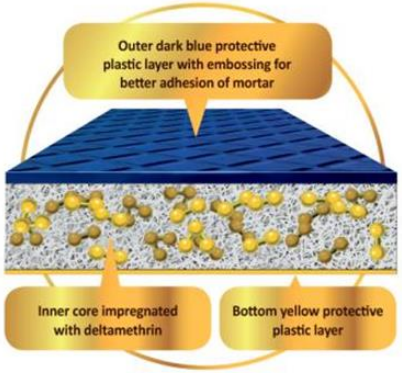
The Station is mounted against a structural element containing termite activity. Termites enter the station through termite entry holes formed in the bottom of the station and once inside the station consume the attractant that has been placed there. Install the station with the bottom or side(s) of the station as flush as possible against the chosen structural element. Use only the square drive screws supplied with the station to attach the station cover to the station. These screws help make the Station more tamper-resistant

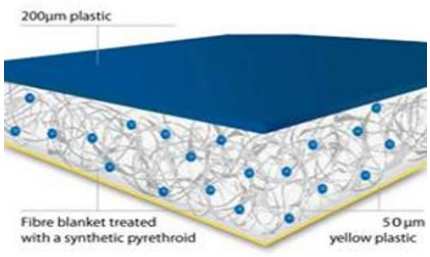




1.5. METHOD 3: ANTI -TERMITE BLANKET

Anti-termite blanket is a physical termite barrier that is used to prevent the concealed entry of termites into a building. It consists of an inner core layer impregnated with termiticide. The unique Thermo-compression Technology™ locks the active ingredient into the core layer before it is laminated top and bottom with a rugged plastic membrane. This entrapment process ensures that the active ingredient remains sealed within the inner core. This means it is non-hazardous to anyone handling the product or who comes into contact with it.



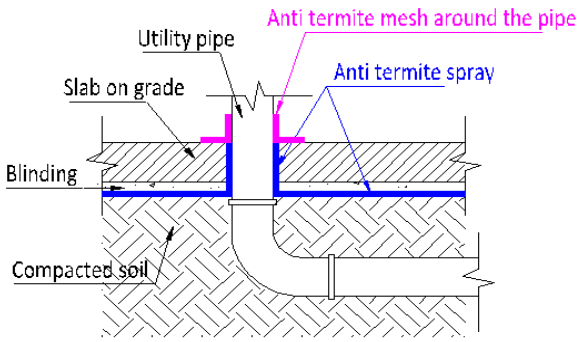


The inner core of anti-termite blanket adds to the durability and effectiveness of anti-termite blanket termite protection, as well as ensuring the deltamethrin remains encased so it cannot escape into the environment. anti-termite blanket has undergone extensive independent evaluation. The anti-termite blanket inner core, in addition to holding the deltamethrin, remains ever ready to kill and deter termites and is structured to prevent termites from penetrating the product.

The upper blue plastic layer is thicker and provides an additional benefit by serving as a moisture vapor barrier or damp-proof course. The bottom yellow plastic layer prevents the deltamethrin from leaching into the environment, thereby ensuring that it remains locked safely away from any soil organisms and soil moisture.

1.6. METHOD 4: ANTI TERMITE MESH

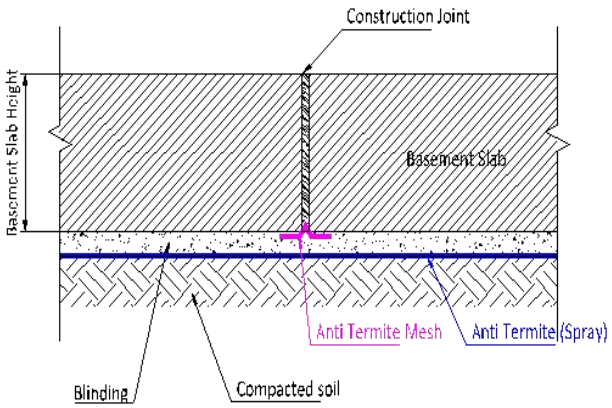
Additional Protection Using Anti Termite Mesh. Also, in case of utility pipe penetration to slab or wall, the anti-termite mesh will be installed around the pipe to prevent entrance of termites.



USE OF ANTI TERMITE MESH AROUND UTILITY PIPE PENETRATION

Additional Protection Using Anti Termite Mesh

In case of joints in concrete (settlement, construction, pouring delays, etc…) the termite can enter from the space caused by these joints. The use of anti-termite mesh in these cases is advisable. The figure shows an example of use in case of construction joint.



USE OF ANTI TERMITE MESH AT CONSTRUCTION JOINT

1.7. DATA ENTRY

All data about anti-termite preconstruction treatment must be reported for every single premise or project. Before proceeding in any preconstruction termite treatment, service providers shall obtain all premise drawings, design layout, requirements, and casting timetable form the client/ consultant. Service provider has also to submit the work plan for the client/ consultant according to received information. Therefore, for any preconstruction treatment the following data are required to include in the treatment report

1- Client/ consultant requirements and premise specifications including premise drawings, design layouts, and foundation casting timetable.
2- The submitted work plan and timetable for termite treatment (technical proposal)
3- Applied methods
4- Used termiticides details including trade name, application rate, dilution rate, area of treatment, used termiticide quantity, and the amount of applied termiticide liquid solution.
5- Termiticide supplier details with attached official invoices
6- Used tools and equipment
7- Service provider details including company name, contact details and address, staff names and occupation, staff contact details.
8- Date and time of the service
9- Client/ consultant approval and confirmation of service delivery reports
10- The construction site location
11- Copy of the label and MSDS of used materials

Chapter 2 Post -Construction subterranean Termite Treatments

2.1. INTRODUCTION

Subterranean Termites “nest” in the soil and from there they can attack structures by building shelter tubes from the soil to the wood in structures. Termiticides may be applied as liquids or baits. When applied as a liquid, the termiticide is injected into the soil or to wood members of a structure. When a bait system is used, the bait is placed in specially designed bait stations in the soil around the exterior perimeter of a structure.

Post termite treatment using sub-slab foam application (foam termiticide double injection techniques – guaranteed finest in treating subterranean termites) will be done to exterminate all available termite colonies at specific areas mentioned above and to create a barrier to protect from any future attacks of termite

Application of termiticides are done in the following places:

- Termiticides are applied by trenching the top of the footing to a minimum depth of 75 cm (30 inches).
- Where drainage systems like drain tile, Trench drains are present, anti-termite treatment shall be performed in such a way that the exterminators shall avoid introducing the termiticide into the drainage system.
- If footings are exposed, the anti-termite treatment is performed just next to the footings and not below the footing bottom.
- Soil present around sewer pipes and all other structural parts of the house in contact with the soil must also be treated fully.
- The insecticides or termiticides must be mixed with water as mentioned on the pesticide label and should be applied as per the application rate on the product label (e.g., at the rate of 4 gallons per 10 linear feet, per foot of depth).
- Concrete slabs also have many other points of entry such as plumping outlets, bath traps etc. So, this slab construction requires a lot of time and labor for termite treatment.
- These slab constructions will require precise drilling to block all the entry holes of termites. Slabs should be drilled vertically along all cracks and construction joints at 30 cm (12-inch) intervals and no more than 15 cm (6 inches) from the foundation of buildings.
- The soil below the slab must also be treated from the bottom of the slab to the top of the footing.
- This drilling and treating method are also very useful for porches filled with dirt and stress cracks found in slabs.

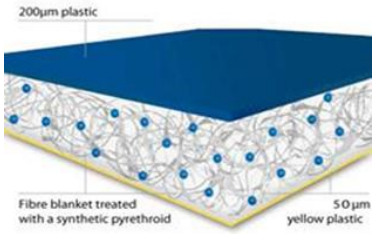
TREATMENT OF STRUCTURES

A termite treatment may involve any of the following basic steps:

- Mechanical alteration/sanitation
- Spot treatment
- Soil treatment
- Wood treatment
- Foundation treatment
- Bait/monitoring system

2.2. TOOLS AND EQUIPMENT FOR POST CONSTRUCTION SUBTERRANEAN TERMITE, DRYWOOD AND DAMPWOOD TREATMENTS.

#	Tools & Equipment	Photo	Purpose
1	High pressure powered sprayer machine		To be installed on pickups and to be sued to provide high pressured spraying termiticides
2	Termiticides injectors		To inject termiticides solutions into slaps and ensure the delivery of sufficient quantities of the solution in the between deep slaps.
3	Sprayer pump		Spraying termiticides solution whenever required in small quantities for post-construction treatments.

4	Termite detector		To detect the hidden termite infestation and its presence by detecting moisture, sound, heat or motion
5	Electric wire detector		To know the electric cables hidden underneath walls and floor
6	Power driller		To use for drilling to inject termiticides
7	Termite bait station		Termite treatment and monitoring
8	Anti-termite blanket		Anti-termite protection
9	Measurement cup		For insecticides calibration

10	Gram-base calibration spoon		To be used for adequately calibrating solid insecticides
11	Flashlight		To be used during performing inspection in dark places
12	Chemical cartridge respirator		To be worn during liquid insecticides application for respiratory protection
13	Chemical protection gloves.		To be used by pesticides handler for hands protection
14	Safety goggles		Eye protection
15	Dust mask		Respiratory protection
16	Safety shoes		Foot protection

17	Uniform		To be worn during all procedures by technicians to protect their bodies from any contact with pesticides or any hazardous materials during their work.
18	Conventional clipboard		For manual data entry
19	Data entry device, Handheld data entry terminal		For systemized or digital data entry
20	Disposable coveralls		Additional protection against termiticide contamination
21	Safety tapes		To be installed around the construction site to warn people from entering
22	Sweeping brush		Cleaning.

23	Vacuum machine		Cleaning
24	Disposable shoes cover		To be used when carry out indoor treatment for cleanliness
25	Sealing (caulking) materials		To fill and close the drilling holes after completing termiticide injection
26	Termiticide injector		To be used for termiticide wood injection
27	Electrogun		To be used for electrocution treatment of dry wood
28	Termite microwave device		To be used for dry wood microwave treatment

2.3. MECHANICAL ALTERATION /SANITATION

Wood, paper, cardboard, and other cellulose debris under or against a structure increase the risk of termite infestation. Similarly, wood supports, fence posts etc. in contact with the soil and the structure present easy access for termite entry.

Regardless of what treatment options are used, these items should be corrected. Debris must be removed, and wood /soil contacts should be broken. Termites thrive in moist environments and can survive above ground in excessively wet wood.

Correcting plumbing and roof leaks and other defects contributing to such conditions is imperative. Adding rain gutters, grading to direct surface water away from the house may be beneficial in resolving moisture conditions. Mechanical alteration/sanitation techniques alone are rarely sufficient to prevent or control a termite infestation and they must be combined with other control methods. However, the following are some exclusion and cultural steps that can help to reduce or prevent termite infestation

1- Remove all stumps, dead wood, and other cellulose containing material in contact with the soil.
2- Remove all form boards and grade stakes
3- There should be no contact between the building woodwork and the soil or fill material. Exterior woodwork should be located a minimum of 15 cm (6 inches) above the ground to provide ample space to make future inspections
4- Ventilation openings in foundations should be designed to prevent dead air pockets. This helps keep the ground dry and unfavorable for termites
5- Thorough annual inspections should be conducted to discover evidence of termite activity such as shelter tubes on foundation surfaces, discarded wings or adult termites
6- Any wood that contacts the soil, such as fence posts and foundation elements should be made of pressure treated wood

2.4. SPOT TREATMENT

When termite infestation occurs inside the buildings, that means termite nest has already been established somewhere under the floor. Termite infestation can be detected by observing termite Swarmers inside the building, or the termite tunnels over the walls. Termite usually targeted the wooden objects inside buildings especially wooden door frames.


Examples of termite tunnels

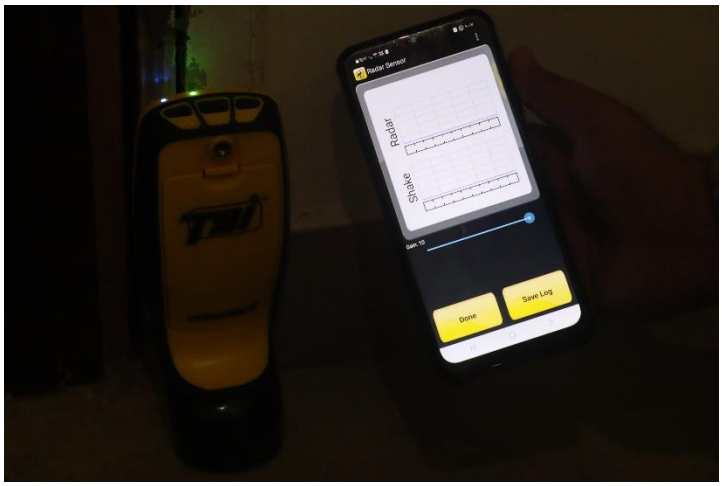

Examples of termite Swarmers (alate / males)

Once the termite occurrence is being confirmed, the termite spot treatment shall take place as the following steps.

Step 1

Inspection

Inspectors shall inspect the place searching for the spots where termite are existed, they shall look at the places where termite tunnels has stemmed out and the holes where Swarmers came out. Then inspectors shall use termite detector and scan the area around termite tunnels and holes in order to define and confirm the places where termites spot treatment shall take place.



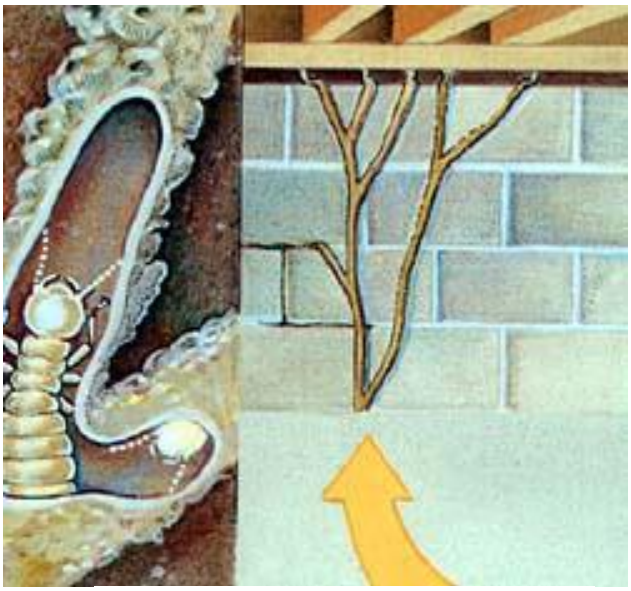
Using termite detector to define termite hidden termite activity

Termite detector is a device that uses radar technology to track the presence of termite by detecting relative moisture and /or temperature and sound or movement. As termite population is active it supposed to produce sound, temperature and moisture, termite detector is used to detect termite location based on sensing one, two or all of the three factors to locate termite infestation in hidden places.

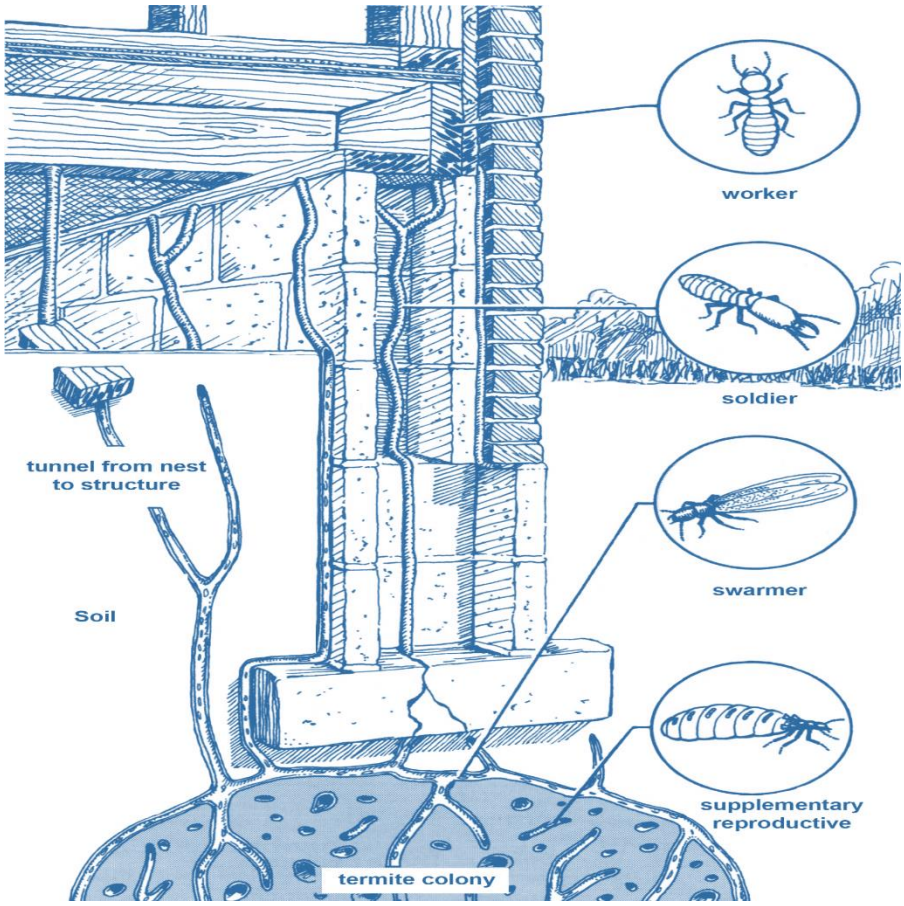
Step 2

Locating drilling spots

After locating the places where termite is extent or the termite spots, inspectors now shall define the drilling spots. Before proceeding in defining termite spots, inspectors must be aware that termite colony itself is usually located down in the bottom of the floor not in the walls and what they have seen such as tunnels and holes where termite come from are just extensions for termite nest or colony. Spot treatment aims to deliver termiticides is destroy the base of these tunnels and stop their expansion into the house as well as to eliminate the underground nests.



Termite tunnel extents from the underground nest



Termite tunnel structure

After locating area where treatment shall take place inspectors need to mark drilling holes.

Inspectors shall obtain (if possible) the drawings and layout of underground utilities pipes, connection, wires, or …etc. in order to know where to drill without causing any structural damages.

Drilling must be vertical toward bottom ground. The distance between holes shall be 30 cm.

Wire detector must be used before proceeding in drilling holes to ensure that no damage can be caused to underground power cables

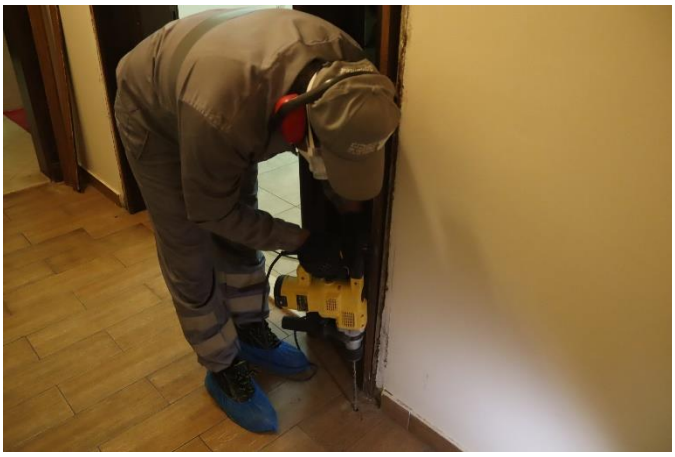
Cable detector

Written approval from the property owner must be obtained before proceeding in drilling process in order to avoid any conflict resulting from unexpected property damage resulted from spot treatment. If termite control operator did not receive a written approval, they either accept to take responsibility or reject the job order.

Step 3

Holes drilling

After marking spot, operators shall drill a hole. The hole must be drilled vertically next to termite tunnel base and toward bottom ground with dimeter 1 to 1.5 cm and average depth of 40 cm. the distance between each hole shall be on average of 30 cm.



Drilling ground holes

The number of holes required depends on the extension of termite tunnels or openings. However, make sure to drill sufficient number of holes that ensure well coverage. At least there must be two holes for each spot treatment. If the termite is detected near or on door frame, then multiple holes must be drilled on all sides of the frame base.

Drilling in multiple side next to door frame.

Once the drilling is over, the place must be cleaned out from the dust result from drilling process and also other dirt in the place.

Cleaning after drilling

Step 4

Injecting termiticides solution

After cleaning the place, operators shall proceed in injecting termiticides inside the holes using rod injector. When termiticides solution is injected inside the holes it will be absorbed by the surrounding soil. Technicians need to fill the hole multiple times to ensure delivering the termiticide solution to the nest and cover all surrounding underground area, so eliminating the existent termite and provide protection for future re-infestation.

Termiticide rod injector designed to deliver termiticides in high pressure inside holes and spray termiticides horizontally and vertically to ensure full coverage inside the hole and cover the whole zone of spot treatment.

Injecting termiticide inside the holes.

After injecting the termiticide solution inside the holes, the holes must be sealed by white cement or other suitable sealing materials.

Step 5

Sealing the holes

SOIL TREATMENT

Treatment of the soil establishes a termiticide barrier in the soil under and adjacent to a building. A continuous barrier must be established along the inside and outside of the foundation wall, under slabs and around utility entrances.

A vertical barrier is established in the soil by trenching or trenching and rodding along all sides of foundation elements such as foundation walls, pilasters, and pillars.

The trench must be at least 15cm (6 inches) in depth. Termiticide is applied by trenching or trenching and rodding from the top of the grade to the top of the footing or to a minimum depth of 75 cm (30 inches).

Where drain tile, trench drains, or other foundation drainage systems present a hazard of contamination outside the treatment zone, treatment shall be performed in a manner that will not introduce the termiticide into the drainage system.

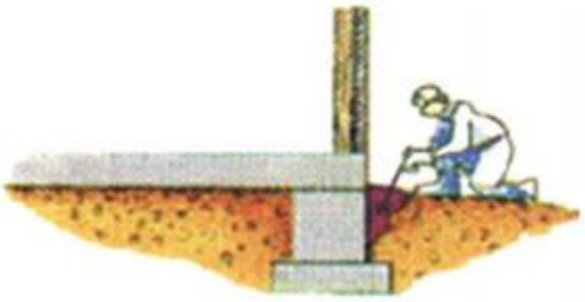
Where footings are exposed, the treatment is performed next to the footing but not below the bottom of the footing. Soil around sewer pipes and conduits and all other structural members in contact with the soil must also be treated.

The insecticide must be mixed with water as required on the pesticide label and applied at the rate of 15 L (4 gallons) per 3 m (10 linear feet), per 30 cm (foot) of depth.

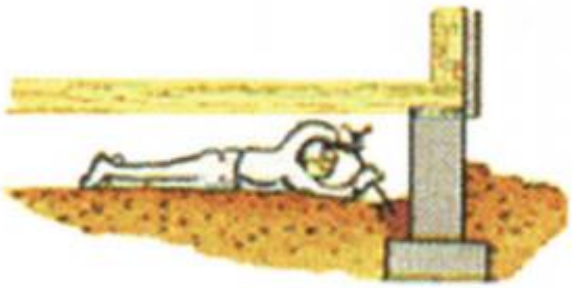
It is possible to trench around the outside of a slab after it has been poured, but this alone usually will not give satisfactory termite control because the termite colony may be entering the structure from the soil under the slab.

As previously mentioned, a slab will crack or shrink away from the foundation wall allowing termites to infest the wood above. In addition, concrete slabs usually have many other points of entry such bath traps, plumbing outlets, etc.

Slab construction requires a lot of time and labor when treating for termites. Slab construction often will require precise drilling to block all termite entry points. Slabs must be drilled vertically along all cracks and construction joints at 30 cm (12-inch) intervals and no more than 6 inches from the foundation. The soil below the slab must be treated from the bottom of the slab to the top of the footing. This method of drilling and treating is also used for dirt-filled porches and stress cracks sometimes found in slabs.

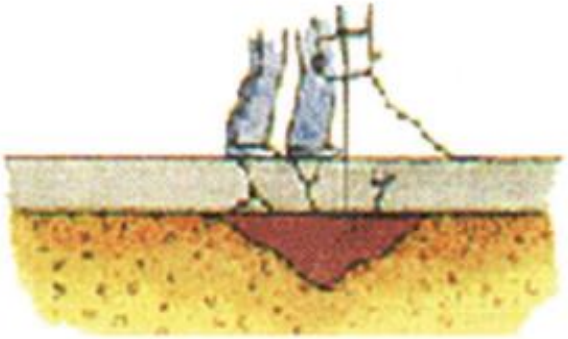


Trench and treat soil around external concrete slab edge – a common entry point.

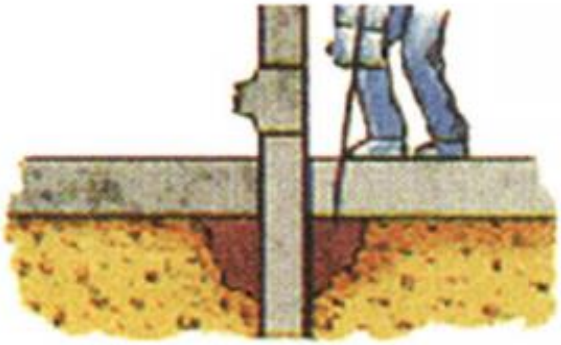


Trench and treat soil around walls and piers in the sub-floor area.

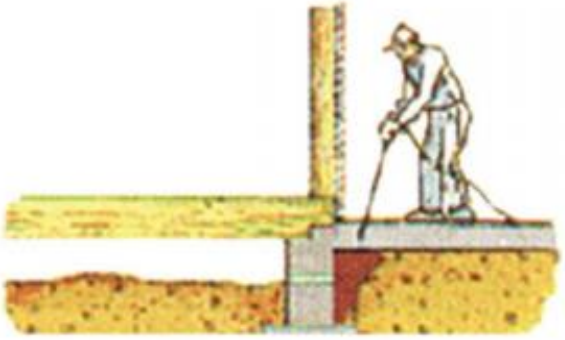
Use rod injection to treat soil along and around the external perimeter area of the building.



Drill concrete floor along all expansion joints and cracks, and treat soil thereunder.



Drill concrete floor around pipes and treat soil thereunder.



Drill concrete patio areas and treat soil area therein – a high risk termite nest location.

2.5. WOOD TREATMENT

This type of treatment involves applications of termiticides directly to wood to eliminate existing termite infestations or to make the wood resistant to termites. There are several supplemental ways in which wood treatments are used in the pest control industry.

1- Pressure-treated wood is frequently used in the construction of buildings and provides effective termite control if it is used for all wood construction, at least to the ceiling level of the first floor.
2- Spraying termiticides on the wood already in place provide only surface protection and don't penetrate to the center of the wood, where it is most needed.
3- In damaged wood, termiticide can be injected into the cavities made by termites. This will provide better control than will a brush or spray application.

2.6. FOUNDATION TREATMENT

Foundation treatments involve the application of termiticides to foundation elements. The objective of this treatment is to create a barrier by placing termiticides inside of concrete block/multiple brick walls where voids exist. This is accomplished by drilling foundation elements and injecting termiticides. Drilling and treating foundation elements allows termiticides to be placed on top of concrete footings where cracks may exist. In addition, where evidence of either past or present subterranean termite infestation exists, voids in multiple masonry foundation elements must be drilled and treated at a minimum distance of four feet in all directions from such evidence.

2.7. BAITS AND MONITORING SYSTEMS

In this termite control method baits are set for termites. The termites do not die instantly in this case. Termite exterminators prefer using a slow working termiticide when they detect the presence of termites so that the foraging termite goes back to his colony and infests other termites killing them.

A bait station made of wood is set up in nearby areas of the house. Professionals set it up to check whether termites are present. The professional inspects the bait station every three months. If termites are found to eat the wood, the bait station is treated with a termite bait consisting of special termiticides.

These systems are a recent innovation in termite control. Termiticide baits control termites by eliminating or reducing the size of the termite colony. They do not create a barrier around the structure, as do the liquid insecticides discussed earlier. Presently, termiticide baits are either insect growth regulators (IGRs) or slow acting poisons. The use of termiticide baits can significantly reduce or eliminate the need for a conventional liquid insecticide.

There are two strategies for the use of termiticide baits. One involves the placement of monitoring devices containing untreated wood or other cellulose material in the soil around the structure to be

protected. When termites are detected in the monitoring device, the untreated cellulose material is replaced with a treated material, referred to as a "termiticide bait". The bait material is replenished as long as termites continue feeding. For the bait system to be effective, the proper number of stations must be installed, and the stations must be inspected or monitored regularly as indicated on the product label. When termites stop feeding, the bait is replaced with untreated wood or other cellulose material. As a variation of this strategy, devices may be pre-baited and placed in the soil in areas where termites are present.

The second bait strategy currently in use involves the attachment of bait devices directly to the surface of construction elements where termites are actively feeding. These devices are pre-baited and are attached to the foundation walls, floor joists, sub-floor and other similar locations. Termites then feed on the bait material.

There are advantages and disadvantages to the use of termiticide baits. Baits may be used to treat structures that cannot be treated with liquid termiticides due to the presence of a well, inaccessibility of infested areas or concerns about the use of pesticides. However, in most cases, termiticide baits do not provide quick control of the termite infestation. In addition, the maintenance of bait system service agreements is normally more expensive than maintenance of conventional treatment warranties.

Where are the bait stations kept?

- **Bait stations kept under the ground:**
  In this method, we wait for the termites to find the bait station and feed on it. It will be a time-consuming process.
- **Bait stations kept above the ground:**
  Bait stations are kept above the ground and set in areas where the exterminators detect the presence of termites. As termites are already present, they easily find the bait and this method works a little faster.

Some famous bait systems are Sentricon, Exterra and Firstline. Spectracide terminate is a bait product used by homeowners.

Advantages of termite control method of Bait System: -

1- No drilling or any kind of disturbance in the house is done.
2- You don't need to treat the entire area around the house with chemicals.
3- Construction flaws don't act as a barrier.
4- Easier to install bait stations.

Disadvantages of termite control method of Bait Systems: -

1- Costs higher
2- Termites may enter the house without falling for the bait trap

2.8. ANTI-TERMITE TREATMENT FOR OUTSIDE PREMISES

Outside premises should also be treated well for protection from termites. The steps taken for anti-termite treatment of outside premises are:

- The outside walls of the building and columns are drilled with the drill bit having a length of 30 cm (12 inches) and a diameter of 12 mm up to the depth of 30 cm. If the building is stilt plus, then the side corners of the columns are drilled in the same way.
- Holes are filled with anti-termite chemicals.
- If the mud tubes are discovered, then those channels are treated with anti-termite chemical and removed fully.
- All the staircases, passage areas and other common portions are drilled and completely filled with anti-termite control chemicals. Finally, everything is sealed with cement.
- Debris must be removed regularly, and wood or soil contacts should be broken.
- Termites live in moist environments, so correction of plumbing and roof leaks must be done.
- Try to increase ventilation in the basement and add rain gutters, this will be beneficial in resolving moisture conditions.
- Mechanical alteration or sanitation techniques of termite control are one of the best ways to prevent or control a termite infestation.

After each treatment all data and information must be documented and reported, data can be reported manually or by using data software, all data must be inserted including:

1- Client / premises location and address
2- Client name
3- Workplace type (bedroom, living room, or others)
4- Control team details (company name/ personnel name)
5- Service type (follow up/ treatment/ both)
6- Date and time
7- Termite species
8- Next service date
9- Applied treatments
10- Places where termite was detected
11- Details of used termiticide including insecticide name, formulation, used quantity, application, and dilution rate, and treated places or objects
12- Recommendations and instructions giving to clients

Chapter 3 Dry wood Termite Treatments

3.1. INTRODUCTION

Unlike subterranean termite, dry wood termite does not nest in the soil. They live in dry wood structures and acquire moisture from the air and from the wood the feed on. The nest size of dry wood termite is smaller than subterranean termite which the whole colony may contain on 1000 individuals. Drywood termites infest dry, sound wood—including structural lumber, dead limbs on trees, utility poles, decks, fences, lumber in storage, and furniture. From this infested wood, winged reproductive periodically swarm to infest additional nearby wood. Dry wood termites are cryptic insects that are difficult to detect. They live deep inside wood; and except during periods when they swarm or when repair work is being done on infested homes, they are seldom seen. Colonies are small (usually fewer than 1,000 individuals), can be widely dispersed, and take years to mature. The most common sighting of dry wood termites is flying adults (called swarmers) that occur during daytime hours.

Western drywood termite, Incisitermes minor, (from left to right) swarmer (alate, reproductive), soldier, and worker. Photo by Robin L. Tabuchi.

During a structural inspection for dry wood termites, inspectors look for feeding damage, shed wings, fecal pellets, and kickout holes, i.e., small holes (less than 2mm in diameter) through which termites push fecal pellets out of the wood. These fecal pellets have six hexagonal sides and are diagnostic for dry wood termites.

The faecal pellets produced by drywood termites are elongate with rounded ends and have six flattened or roundly depressed surfaces separated by six longitudinal ridges.

However, it is not possible to determine, from fecal pellets alone, whether the infestation is currently active or how extensively the infestation extends throughout the wooden piece or structure. Cleaning up the fecal pellets around a kickout hole and checking a few days later to see if new pellets have appeared can help to determine if an infestation is active

3.2. TREATMENTS

There are several chemical and non-chemical treatments for dry wood termite. Globally the whole structure treatment is widely used in which the whole house or dwelling is treated against dry wood termite infestation and it usually depends on using fumigation or heat treatment. However, whole structure as control methods is no applicable in UAE due to the associated hazard with fumigants and heat treatment that may expose the people and surrounding environment to serious health risks. In this section we will focus on local treatments for controlling dry wood infestation. The following are the approved dry wood control treatments.

3.2.1. PREVENTIVE TREATMENTS

The most effective prevention for dry wood termites can be "built-in" to a home during its construction phase. Pressure-treated lumber should be installed wherever building codes allow. In the framing stage, all untreated wood can be sprayed with borate solutions.

It is impossible to treat all wood in a completed house with residual chemicals. Exposed, unfinished wood can be sprayed with borates which repel swarming termites, but keep in mind that untreated wood may still be susceptible to infestation as the borate spray residue will not kill wandering adults on contact. Wall voids and attics can also be sprayed or dusted with various residual insecticides which kill swarming adults in search of a nest site.

3.2.2. HEAT TREATMENT

Heat treatments are used to eradicate dry wood termites from portions of a house such as an attic, porch, or bedroom, wood works, or from an individual apartment or condominium unit inside a multi-family dwelling. Heat sensitive articles are removed, and the infested area is cordoned off with polyethylene or vinyl sheets. Temperature probes are placed in the hardest-to-heat locations and heat is applied with a high-output electric or propane heater. Heat must be applied until reach the lethal temperature which is minimum of 50 C° (120 F°) for at least 1 hour. After a lethal target temperature is achieved, the area can be cooled quickly for immediate reoccupation. If a heat liable material cannot be removed, it must be thoroughly protected with insulating blankets. The same heaters that used for bed bug heat treatment can be used for dry wood heat treatment.

Dry wood heat treatment

Some examples of electric heaters

Heat treatment required high electricity voltage, well trained technicians, electricians, special equipment, and it poses many operational risks especially heat sensitive items damage and fire risk. Thus, it is not always applicable and least recommended, and it requires a lot of considerations. Therefore, before proceeding in heat treatment all risks and methodologies must be explained thoroughly to the client and never to proceed in heat treatment until obtaining client approval and confirmation.

3.2.3. WOOD INJECTION

Wood injection is the most common and recommended method for controlling dry wood termite. Wood injection or "drill-and-treat" applications have been used since the 1920s to treat dry wood termite infestations which are accessible and detectable. An insecticide is injected into small holes drilled through any wood surface into termite galleries delivering the treatment directly to the pest population. This is the simplest and most direct method of treatment. The amount of drilling required, and the effectiveness of this treatment depends on the chemical used and the nature of the infestation. Most chemicals will remain active in the wood after treatment to thwart resurgent colonies

Injecting termiticides into drilled holes using knapsack sprayer for dry wood termite treatment

Injecting termiticides into drilled holes using termiticides injector

3.2.4. RATE TREATMENT

Surface treatments with borates may help prevent subsequent infestations but will not kill the dry wood termites already in the interior of structural timbers. Liquid or foam borate solutions may provide control if all dry wood termite galleries can be located, drilled and treated. The major limitation with this procedure is the inadequate penetration of the borates into seasoned, dry wood.

Dry wood borate treatment

3.2.5. ELECTROCUTION TREATMENT

The probe of a hand-held "gun" is passed slowly over the infested wood surface and inserted directly into pellet "kick-out" holes. The high voltage and low current energy emitted by the probe electrocutes termites in the immediate application area. There is no way to measure a lethal dose at a given location in wood with this device. In some cases, holes must be drilled into wood and wires inserted to improve penetration.


Dry wood electrocution treatment using electrogun

3.2.6. WOOD REPLACEMENT

This method allows for absolute removal of a dry wood termite infestation if it is isolated to a wood member which can be detached relatively easily, as for example, a fascia board or a door. Make certain that there are no galleries leading to adjacent wood members, otherwise, they will also require treatment or removal.

3.2.7. MICROWAVE TREATMENT

Microwave energy, applied to relatively small sections of infested wood, kills termites by heating them. Thermocouples should be inserted into treated members to ensure that adequate microwave energy is delivered. Microwave equipment is not designed to treat areas where access is limited.


Dry wood microwave treatment

3.2.8. DATA ENTRY

After each treatment all data and information must be documented and reported, data can be reported manually or by using data software, all data must be inserted including:

13- Client / premises location and address

14- Client name

15- Workplace type (bedroom, living room, or others)

16- Control team details (company name/ personnel name)

17- Service type (follow up/ treatment/ both)

18- Date and time

19- Termite species

20- Next service date

21- Applied treatments

22- Places where termite was detected

23- Details of used termiticide including insecticide name, formulation, used quantity, application, and dilution rate, and treated places or objects.

24- Recommendations and instructions giving to clients

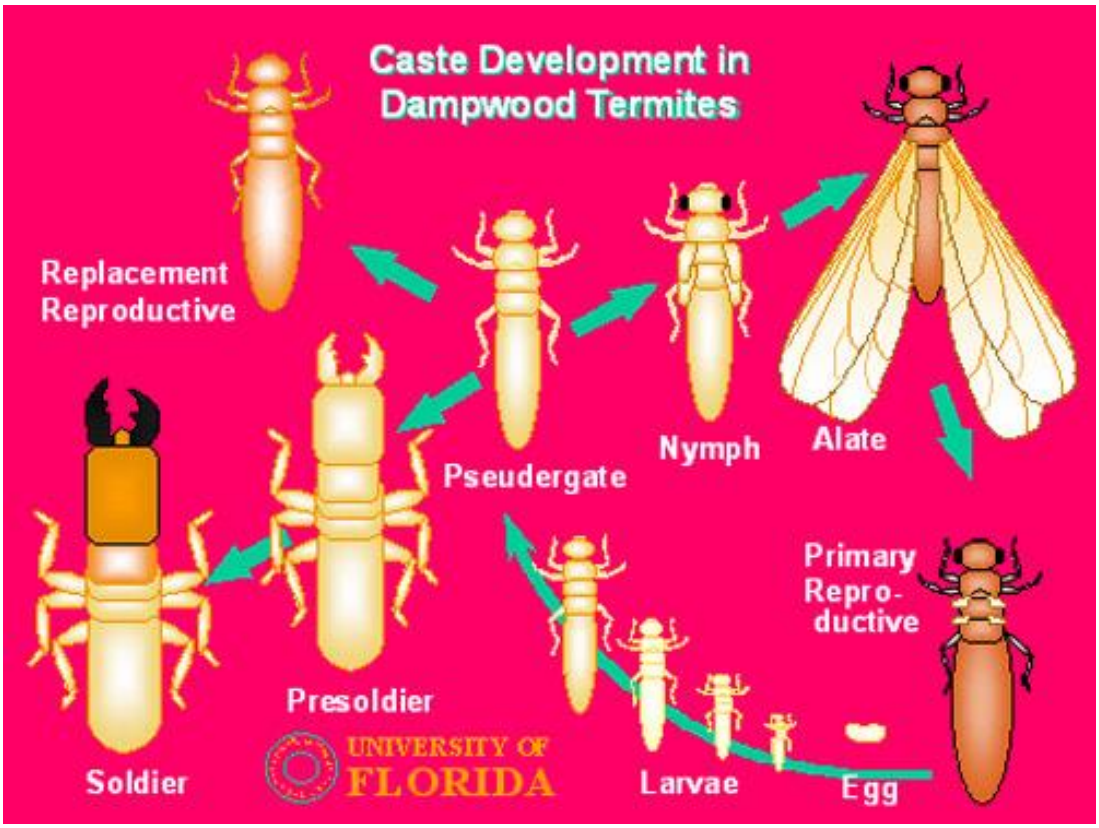
Chapter 4 Damp wood Termite Treatments

Damp wood termites need high moisture requirements, they are most often found in cool, humid areas. They typically infest decayed wood that remains moist either through contact with the soil or exposure to a water leak. Damp wood termites create large, open galleries within the wood where they live and feed. Their presence is significant as an indicator of a moisture problem or wood decay in wooden structures.

Colonies of damp wood termites consist of three primary castes: the reproductive (king, queen, and unmated winged forms called alates), soldiers, and false workers or pseudergates. Neotermes pseudergates are immature forms without external signs of wings. When wing buds become visible after molting, they are called nymphs. The pseudergates and nymphs excavate and feed on wood to nourish themselves and their nestmates. Eggs and newly hatched termites, called larvae, are usually found near the king and queen. Soldiers constitute about 5% of the colony population

Damp wood termites are much larger than the subterranean termites. The swarmers (winged termites) can be 25 mm long, including their wings. The soldiers can be as large as 20 mm. Immature: The immature termites can be as much as 20 mm long. The immature termites do the work in the colony.

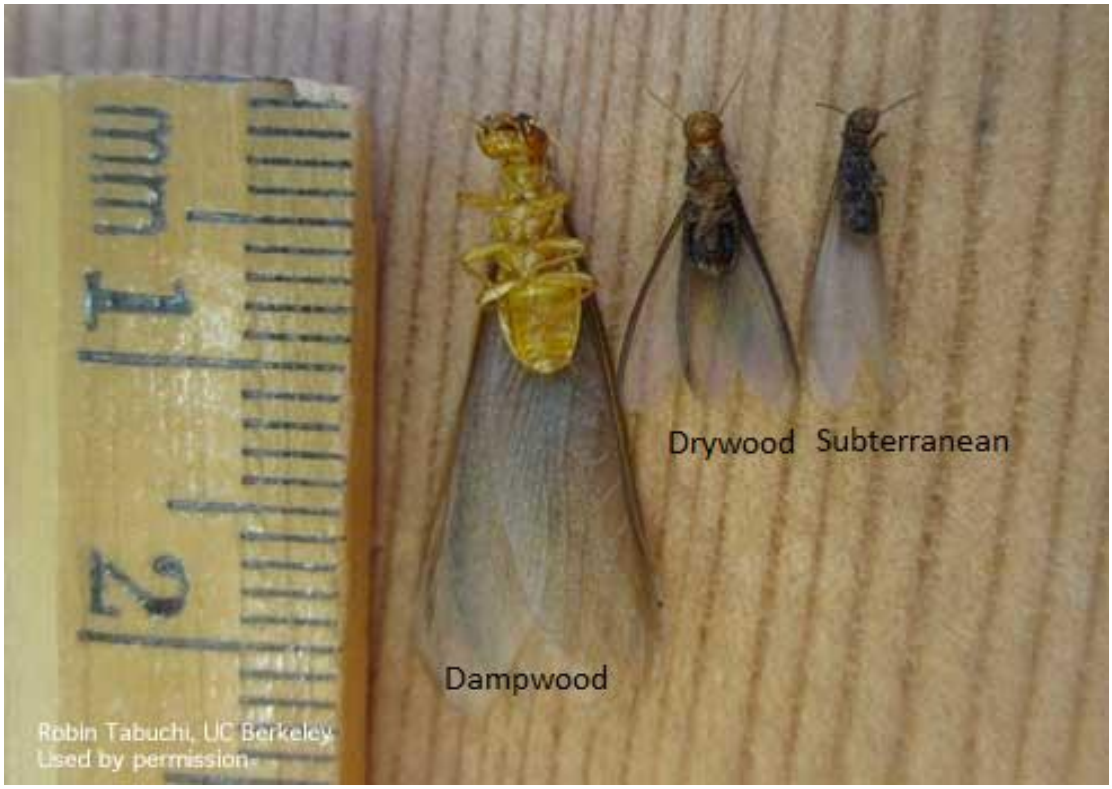
Damp wood termite immature castes



Neotermes life cycle. Graphic by Rudolf H. Scheffrahn, University of Florida

A Comparison between the workers size of damp wood, dry wood, and subterranean termite

A Comparison between soldiers size of dry wood, damp wood, and Subterranean termite



A Comparison between alates size of drywood, dampwood, and Subterranean termite

A Comparison between the damage of drywood, dampwood, and Subterranean termite

Damp wood termites often weaken homes by hollowing out support beams. This can lead to costly repairs, causing a great deal of frustration. The silent and secretive nature of these pests makes damp wood termite activity difficult to recognize until it becomes severe.

To remain hidden, damp wood termites do not construct mud tubes, rather they cover up their entry holes with their own feces. Since wood infested by damp wood termites has very high moisture content, the wood they infest can also be damaged by fungus. As one might expect, a damp wood termite infestation often indicates wood decay, as well as leaks that create excessive moisture in the home.

Damp wood termites are hard to spot because they hide themselves to prevent moisture loss, but you can look for indications of termite activity.2 Swarms coming from the home are probably the most obvious sign.2 These flights usually occur on warm evenings in late summer or fall, especially after rain.3 A thorough visual inspection is the main monitoring technique for detecting termite infestations. Look around and under the house for damp or damaged wood with holes or tunnels in it and wood that sounds hollow or soft when tapped. A screwdriver or pick is useful for prying into suspect areas and opening up holes to look for termites.9 Also look for piles of sawdust and dead insects.2 Be aware of any condition that promotes moisture or wood decay.9

There are a number of other detection methods, which vary in their availability. Electronic odor detectors can detect the gases termites emit. Although these devices are currently on the market, their effectiveness has not been fully studied. A fiber-optic scope can be used to view areas behind drywall and paneling

4.1. MANAGEMENT

The first step in management process is to identify the damp wood termite.The key infestation signs of damp wood infestation signs are:

1- Shed wings
2- Ejected wood pellets
3- The "velvety appearance" of wood galleries
4- Piles of fecal pellets outside wood galleries which are elongated (approx. .03" long) and round on the ends, but lacking the six flattened surfaces of dry wood termite pellets.

For reasons mentioned above, eliminating conditions of moisture can control structural infestations of *Neotermes*. As with the preventative management of subterranean termites and wood decay, wood-to-ground and wood-to-water contact should be eliminated to prevent colonization by damp wood termites. When untreated wood cannot be removed from a moisture source, chemical treatment may be necessary. Boron-containing salts such as disodium octaborate tetrahydrate are water soluble, so they tend to be drawn into damp wood termite-infested wood. Borate treatments can be phytotoxic, however. If desired, galleries in trees or structural members can be injected and drenched with site-specific insecticides. On direct contact, these termites are susceptible to all chemical insecticides.

4.2. DATA ENTRY

After each treatment all data and information must be documented and reported, data can be reported manually or by using data software, all data must be inserted including:

1- Client / premises location and address
2- Client name
3- Workplace type (bedroom, living room, or others)
4- Control team details (company name/ personnel name)
5- Service type (follow up/ treatment/ both)
6- Date and time
7- Termite species
8- Next service date
9- Applied treatments
10- Places where termite was detected
11- Details of used termiticide including insecticide name, formulation, used quantity, application, and dilution rate, and treated places or objects
12- Recommendations and instructions giving to clients.

12. Abbreviations and acronyms

UAE	United Arab Emirates
ADPHC	Abu Dhabi Public Health Centre
MOCCAE	Ministry of Climate Change and Environment
IPM	Integrated Pest Management
WHO	World Health Organization
EPA	Environment Protection Agency of United State
FAO	Food and Agriculture Organization of UN
TG	Technical guidelines
UN	United Nations
PPE	Personal Protective Equipment
ADQCC	Abu Dhabi Quality and Conformity Council
MSDS	Material Safety Data Sheet / Safety Data Sheet
ULV	Ultra-Low Volume

13. References

AEPMA. (2016). *A NATIONAL STANDARD: CODE OF PRACTICE FOR TERMITE MANAGEMENT.* Australian Environmental Pest Management Association (AEPMA).

Gouge, D., Olson, C., & Baker, P. (2009). *Drywood Termites.* Retrieved from The University of Arizona Cooperative Extension.

Lewis, V., Sutherland, A., & Haverty, M. (2014). *Subterranean and Other Termites.* Retrieved from University of California Agriculture and Natural Resources: file:///C:/Users/ameed.salem/Desktop/PEST%20CONTROL/services%20(SOP)/Termite%20SOP/pntermites.pdf

AEPMA. (2016). *A NATIONAL STANDARD: CODE OF PRACTICE FOR TERMITE MANAGEMENT.* Australian Environmental Pest Management Association (AEPMA).

EPA. (2018). *Termites: How to Identify and Control Them.* Retrieved from United State Envirnmental Protection Agencey : https://www.epa.gov/safepestcontrol/termites-how-identify-and-control-them

Lewis, V., Sutherland, A., & Haverty, M. (2014). *Drywood Termites.* Retrieved from University of California Statewide IPM Program: http://ipm.ucanr.edu/PMG/PESTNOTES/pn7440.html

PEST WORLD. (2019). *Termites 101.* Retrieved from www.pestworld.org: https://www.pestworld.org/news-hub/pest-articles/termites-101/

QBCC. (2018). *Termite Management.* Queensland: Queensland Building and Construction Commission.

Scheffrahn, R., & Su, N.-Y. (2007). *Drywood Termite Control: Weighing All the Options.* Retrieved from University of Florida Wood-Destroying Insects Unit.

TEXAS A&M AGRILIFE EXTENSION . (2019). *Field Guide to Common Texas Insects.* Retrieved from texasinsects.tamu.edu: https://texasinsects.tamu.edu/termite/

Waldvogel, M., & Alder, P. (2017). *Termites - Biology and Control.* Retrieved from North Carolina Cooperative Extension: https://content.ces.ncsu.edu/termites-biology-and-control