MAINTENANCE GUIDEBOOK VII
TERMITE, INSECT, AND RODENT CONTROL

CHAPTER TWO - TERMITES AND THEIR MANAGEMENT

SECTION A INTRODUCTION

Termites are the most destructive wood-destroying insects in the U.S., costing hundreds of millions of dollars each year in prevention efforts, direct damage to structures and trees, and corrective costs. In an older housing development, about one of every ten houses is infested to some degree, while in newer housing, perhaps one in twenty houses is infested.

Termites are social insects of the order *Isoptera* (meaning equal wings) and, like their close relatives the cockroaches, have been around for hundreds of millions of years. As inhabitants of forests, they serve the ecosystem by consuming dead and decaying wood. When people began to live in wood structures, these structures became additional food sources and habitat for termites.

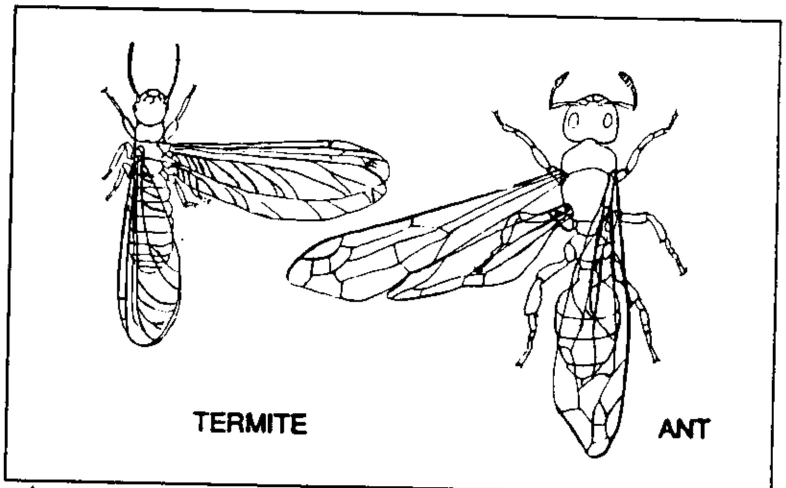


Figure 2-1

Termites are classified according to their primary habitats: subterranean, dampwood, and drywood termites. By far, the subterranean termites are the most widely distributed; they occur throughout most of the 48 contiguous states, Hawaii, lower Alaska along the Pacific Coast, and the Caribbean territories. Drywood termites, by contrast, inhabit coastal areas in the southeastern U.S. from South Carolina throughout the Gulf states, along the border with Mexico, and up the coast of California. They also occur in Hawaii, Puerto Rico, the U.S. Virgin Islands, and the Pacific Territories. Dampwood termites inhabit the states west of the continental divide, some of the southwestern states, Puerto Rico, Florida, and the U.S. Virgin Islands. Because of the ever-present threat to housing and other wooden structures, vigilance is necessary to prevent, mitigate, and eliminate termites.

SECTION B CHARACTERISTICS AND RECOGNITION

Usually, the first experience people have with termites occurs when they swarm around their homes by the thousands during spring, when they begin mating and spreading to new areas. People usually report "flying ants" and immediately call their exterminator. It is the pest-management specialist who points out the differences between true flying ants—which have two pair of unequal wings, elbowed antennae, and a narrow waist—and termites, which have two pair of nearly equal wings, straight antennae, and a thick-waist (Fig. 2-1, previous page). Close inspection of the building may reveal piles of termite wings, small white worker termites (less than 1/4 inch long) in wood below ground, and their galleries in wood structures.

SECTION C BIOLOGY OF SUBTERRANEAN TERMITES

Subterranean termites, the most widespread and destructive termites in the U.S., nest underground and within easy access of the wood which is their only food. They are social insects with a complex division of functions, including a queen, king, soldiers, supplementary reproductives, and workers (Fig. 2-2).

The life of the colony depends on the queen, which is a greatly enlarged, light brown, winged pest about 1/2-inch long. The queen can lay millions of eggs over her lifetime of over 25 years. Her egg-laying activities are augmented by supplementary wingless reproductives as the queen ages or the colony outgrows its original nest. The king is the same size and color as the queen and also has two pair of wings. It exists only to mate with the queen, and lives, as does the queen, entirely within the subterranean nest once it is established.

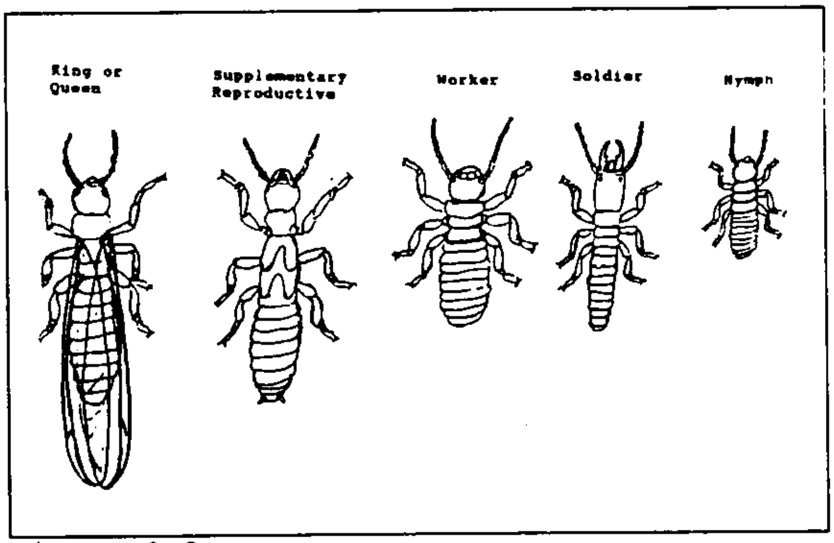


Figure 2-2

The supplementary reproductives are light in color, about 1/4-inch long, and have two pair of wing pads. They also stay entirely within the underground nest. The soldiers are white, except for an enlarged brown head capsule, and are about 5/16-inch long. They defend entrances to the nest against enemies, particularly ants, which are the primary enemies of termites. The workers, which are actually nymphs, are entirely white, about 3/16-inch long, and do all of the foraging and feeding of the colony. They may live up to five years, and are the ones that venture above-ground into structures, construct the galleries, bring wood back to the nest, and build the mud tubes that connect the nest to the galleries and the structure. They also feed the young nymphs and other castes which cannot feed themselves.

Since the termites' ability to digest cellulose is totally dependent upon the protozoans living within their midgut, it is imperative that workers exchange anal fluid containing these organisms so that young termites can digest their food. This is accomplished by grooming among workers, a process which is important in selecting a pest-management strategy.

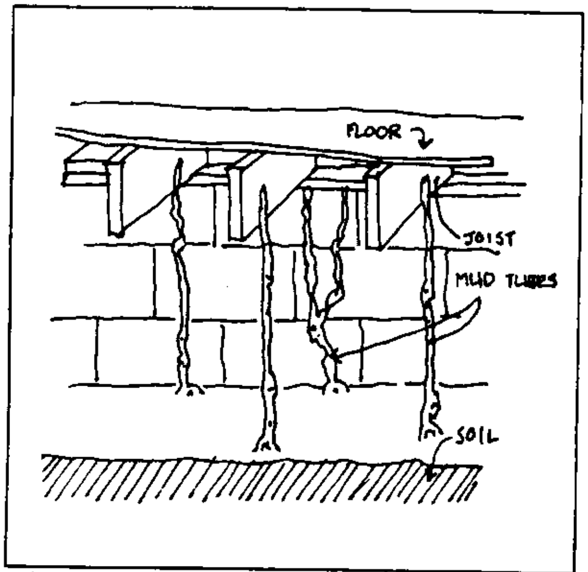


Figure 2-3

The conditions that termite colonies need to flourish are rather basic, but critical. They include relatively high moisture content in their living and feeding areas, adequate shelter and temperature, and a plentiful food source. The colony will not flourish if any of these is lacking. The high moisture content need is met by the soil in most parts of the country. Even coastal beaches, deep in the sand, provide ample moisture for termite colonies. The soil also provides termites the necessary protection from desiccation, since their cuticle is rather permeable and they can easily die from exposure in air. It has been theorized that the connecting mud tubes from above-ground food sources to nests (built from mud, digested wood, and termite secretions and excretions) protect termites against dehydration along the journey from the nest to the food source and back (Fig. 2-3).

These tubes, however, may provide protection against enemies, primarily ants. The minimum tolerable temperature for termites is -22°F. This does not mean that termites can flourish at this temperature, but rather that they can withdraw deep enough into the ground to survive that outside air temperature for a short period, usually a matter of weeks. If they have to stay too deep for too long, however, they are deprived of their primary food source, decaying wood.

Human habitats are ideal for termites. Not only do they provide the cellulose needed for food, but also the temperatures beside and underneath the building allow year-round activity by the colony. It does not take much wood to attract a mated pair of termites to set up housekeeping; a piece of a discarded 2x4 in a front porch void will do it. Of course, once that food source is exhausted, termites will move on through cracks in the foundation to find another food source, usually in the interior of the house.

1. DAMAGE

The damage done to wooden structures may take years to reach the point when any evidence is visible. Often the area of damage is inaccessible, such as behind basement walls, in crawl spaces, or where floor joists meet the wall studs. Termites preferentially eat the softer portions (the spring sapwood) of beams, joists, studs, door jambs, window sills, or wood panelling, leaving behind enough the of the harder summer sapwood to keep the structure intact (Fig. 2-4).

They will also eat through plastic sheathing, foam insulation, and any other soft obstacles on their path to their foraging sites. If there is moisture in the wood, the destructive process is accelerated by fungi which are carried on termites' bodies. Their activities also tend to increase the moisture content in the wood they forage in. Termites deposit their frass (droppings) inside the galleries or use it together with earth and decayed wood to construct mud tubes. The mixture of feces, frass, and decaying wood give the galleries a dirty appearance. Over a period of years, the wood may become so thin that literally only paint is holding it together and just touching it can cause the wood to give way. Ultimately, the building may become structurally unsound, and major supporting members may require replacement.

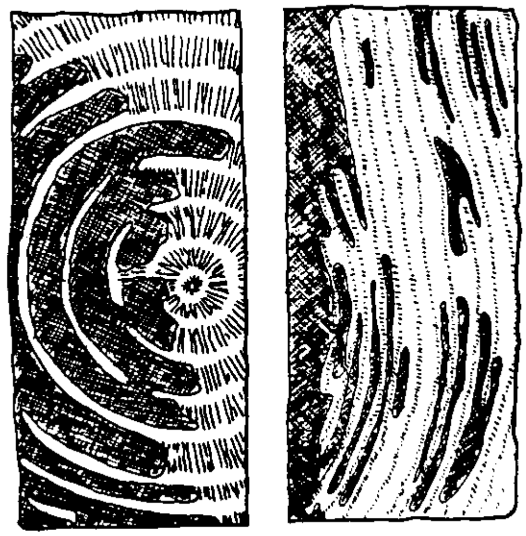


Figure 2-4

SECTION D FORMOSAN SUBTERRANEAN TERMITES

The territory of these potentially very destructive termites includes the Pacific territories, Hawaii, California, Texas, Louisiana, South Carolina, and Florida. Their caste system and general biology are similar to the eastern subterranean termite's, but they are much more aggressive, develop more rapidly than our native species, and quickly exploit new food sources. They are also somewhat larger than eastern subterranean termites (swarmers are about 5/8-inch long), yellowish- brown in color, and have hairy wings (Fig. 2-5). They swarm between dusk and midnight instead of during the day.

FORMOSAN TERMITE WING

Figure 2-5

Formosan termites also build mud tubes to protect themselves and interconnect food sources and nests. They attack wood in buildings, underground electrical and telephone cables, and over 50 species of trees and shrubs, and can kill a tree by girdling the trunk. Formosan termites have the unique ability to form aerial colonies, for instance when wood containing high moisture is exposed. Their nests are made of a durable, hard, sponge-like material called carton, composed of chewed wood, feces, saliva, and soil, and may either be underground or above ground in voids or walls of structures. Their galleries are much cleaner of debris than those of the eastern subterranean termite. Aerial colonies are formed when:

- The primary king and queen find a suitable aerial location;
- A colony finds a more suitable setting above ground and moves the king and queen; and
- Part of the colony is cut off from the ground.

From a control standpoint, it is more tolerant of insecticides applied to soil than are our native species.

SECTION E DRYWOOD TERMITES

Drywood termites live in wood that is extremely to moderately dry. They require as little as 3% wood moisture and no contact with the earth to survive. Their castes and general biology are also similar to subterranean termites, although the colonies are smaller, usually on the order of a few thousand individuals. They can occupy relatively small structures, and are often introduced with furniture, dimensional lumber, sash and door frames, firewood, fiber boards, or other cellulose-containing products.

DRYWOOD TERMITE FECAL PELLETS

Figure 2-6

The swarmers usually fly at night, but not far (a few hundred yards or less). They gain entry into buildings through ventilation ducts to crawl spaces or attics, or small cracks in the walls, and begin tunneling. No earthen tubes are constructed, so often the first evidence of their infestations are sand-like masses of six-sided fecal pellets about 1/25-inch long, which are kicked out of galleries through round holes (Fig. 2-6). The pellets may accumulate in spider webs or on surfaces below the infestation. Unlike those of subterranean termites, their galleries often go across the grain, leaving larger, more interconnected galleries. Drywood termite damage may be hidden from sight by a thin veneer-like layer of surface wood.

SECTION F DAMPWOOD TERMITES

This group is similar to the subterranean termites in terms of castes and general biology, but seldom lives in soil without wood present. Some species belong to the drywood termite family, but require more moisture than drywood termites, although not so much as subterranean termites. They nest in decayed, moist wood, and do not construct tubes, which limits the extent of their infestations. In some cases they may extend their galleries into relatively dry wood. The winged reproductives may establish colonies directly in wood, usually near already established colonies. Once a colony becomes established, the workers can move long distances through wood, but generally do not forage outside of it.

The workers and soldiers of the Pacific Coast species are large (9/16-inch to 3/4-inch long), and the swarmers are up to an inch long in some parts of their range. The dampwood termites of the southwestern states are brown and only 1/2-inch long (including wings). They are most common in late summer and early fall. The swarmers (usually dark brown) become active in late afternoon. Dampwood termites penetrate moist wood just under or near the surface of ground. Thereafter, the colony remains in the ground. Since shelter tubes are not built, their distribution above ground is limited.

Dampwood termites of Florida and the Caribbean belong to the same family as the subterranean termites, which they closely resemble, although they are slightly larger. They often swarm in the winter months. Damage done by dampwood termites varies according to species and locale, although it is less than that caused by subterranean and drywood termites. If the wood is relatively sound, Pacific Coast species will attack just the softer sapwood, as do the subterranean species. However, if the wood is decayed, they will excavate both hard and soft sapwood. Small exit holes are sometimes found between the galleries and the wood surface. In the Southwest, dampwood termites most often damage buildings having crawl-spaces. The Florida species only attack severely decayed wood, so the damage created is of secondary importance to the wood decay itself.

SECTION G INSPECTION AND MONITORING

1. FOUNDATIONS

In order to inspect and monitor for termites, it is important to understand the structural defects that permit termite infestation. For subterranean and dampwood termites, the most common routes of infestation are the basement or ground floors of structures, such as:

- Poured-concrete foundations,
- Vertical void concrete-masonry-block foundations,
- Brick foundations,
- Stone and rubble foundations.

Except for poured-concrete basements, the floor slab is usually supported by footings beneath and at the perimeter, and walls rest on top of the slab. There is usually a gravel bed under the slab. Caps at the tops of foundations can be:

- Solid block caps,
- Poured-concrete caps,
- Top course of hollow blocks filled with concrete, and
- Brick caps.

Sometimes, instead of bearing on a thickened slab, a post or stair penetrates the floor slab, bearing on a footing below. Wherever there is a joint between the wall and floor, or the wall and cap, there is opportunity for cracks to develop and become entry points for termites (Fig. 2-7). Similarly, cracks in the wall, mortar between blocks, bricks, or masonry provide entry points for termites (Fig. 2-8).

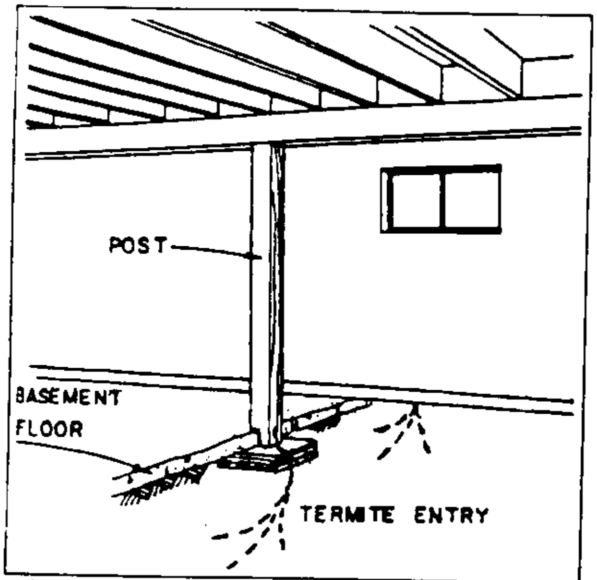


Figure 2-7 Courtesy of NPCA

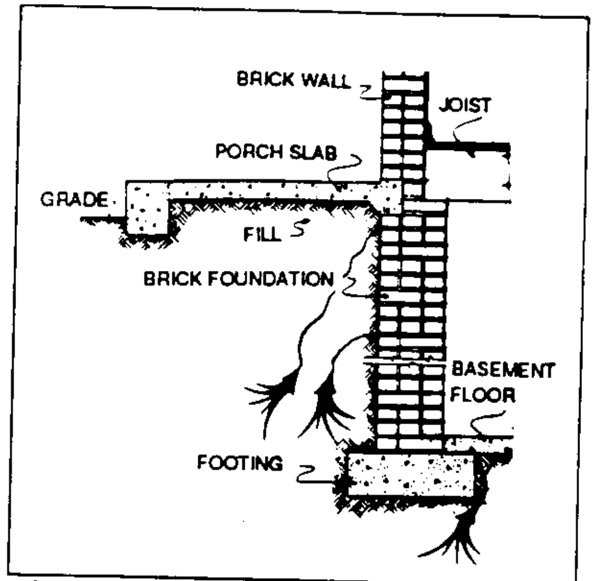


Figure 2-8 Courtesy of the National Pest Control Assoc., Inc. (NPCA)

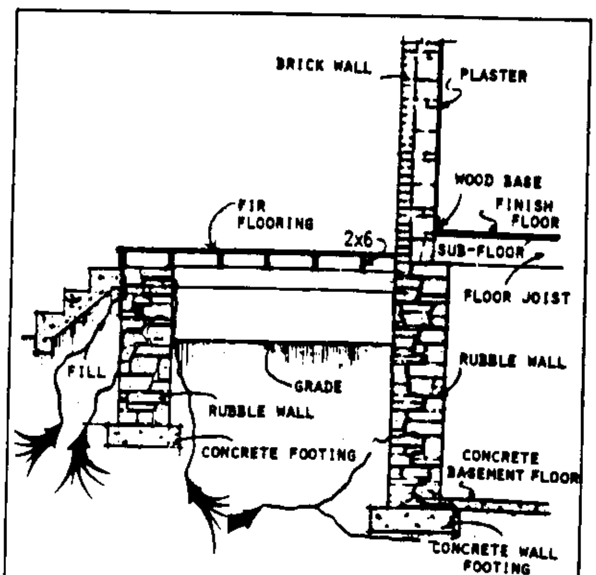


Figure 2-9 Courtesy of NPCA

Faults in blocks may also provide access for termites to the joists. Poured-concrete walls and piers, brick, hollow block, masonry walls, or wooden piers, are all used in crawl-space type buildings. Piers constructed of poured concrete, concrete blocks, bricks or treated wood provide support for the overlaying floor joists. Termite access is through cracks or voids that occur. Access through piers or directly from the crawl space itself are easy portals of termite entry, since the distance is short and mud tubes may escape notice (Fig. 2-9).

Slab-on-grade construction has become very common in the last 30 years. The best type from a termite-protection standpoint is a monolithic slab, consisting of a solid, unitized slab and footing (Fig. 2-10, next page). The supported slab (Fig. 2-11, next page) is tied at its ends to the foundation wall. The floating slab type "floats" over a gravel layer, and is structurally independent from the foundation wall (Fig. 2-12, next page).

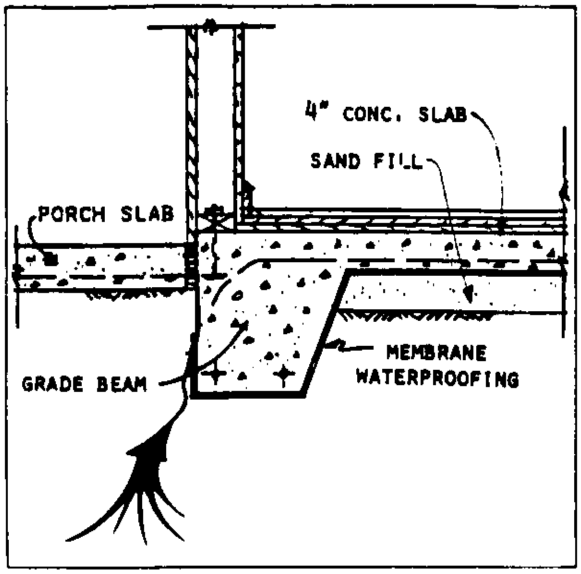


Figure 2-10 Courtesy of NPCA

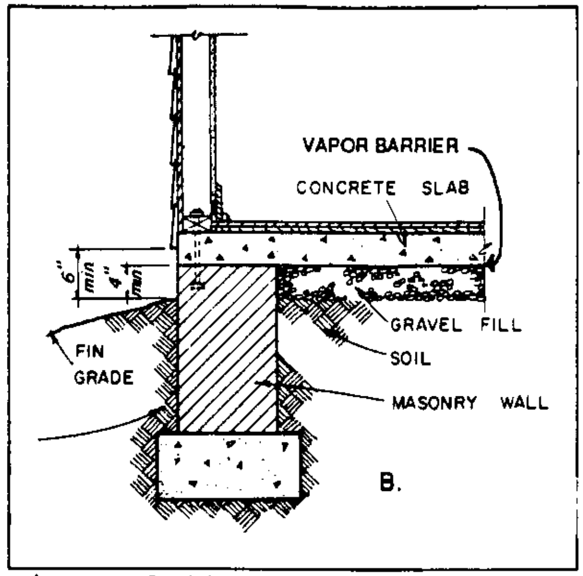


Figure 2-11 Courtesy of NPCA

All three types of slab provide access for termites once cracks develop in the slab or foundation wall. This is most likely to occur at the expansion joint of the floating slab. Once in the building, termites have ready access to the wooden studs, joists, floor sheathing, and finished interior wood.

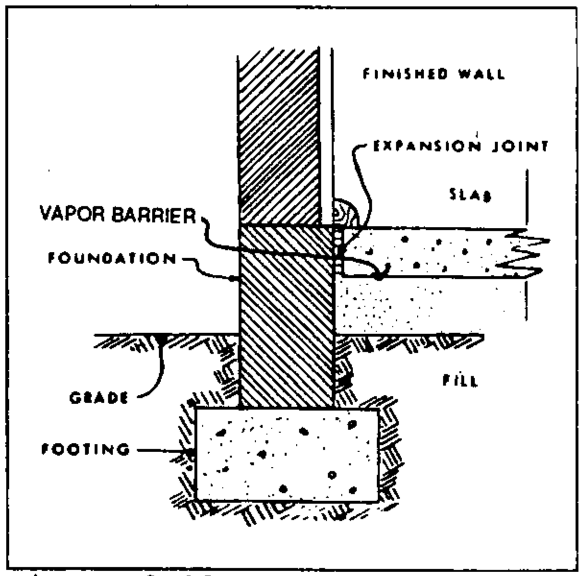


Figure 2-12 Courtesy of NPCA

2. SITE HISTORY

The pest manager should be familiar with the history of the site. Developments that were once heavily wooded areas, particularly with softwood trees, often have dense populations of termites. Sources of moisture in developments may also attract termites. Utility pipes and electrical conduits that run under a structure or up from the ground are natural paths for termites to invade, and should be checked carefully for mud tubes.

3. TOOLS

The tools of inspection are a flashlight, awl or ice pick, small hammer, moisture meter, hacksaw blade, measuring tape, a stethoscope or other sound-listening device, and graph paper to diagram termite entry points and damage. In addition, an inspector needs coveralls and a bump hat to get safely into tight areas under the structure.

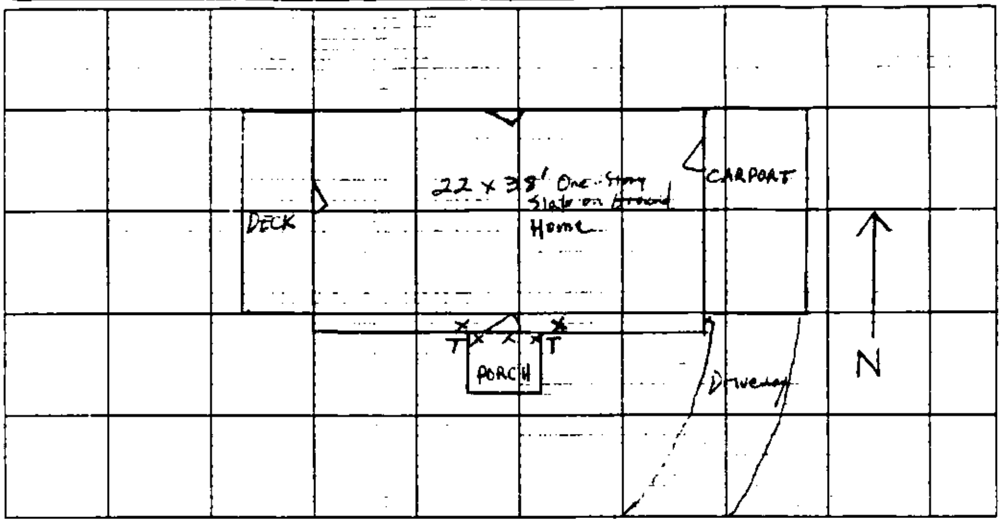
4. THE INSPECTION

Before starting the inspection, always interview the residents, who often they have some knowledge of previous termite problems, where moisture occurs, and possible hidden joints or voids. Next, size up the exterior of the structure and draw a diagram on graph paper (Fig. 2-13), noting dimensions, grading, drainage, carports, garages, decks, any structural wood in contact with soil, and location of wood piles. The graph should account for hidden joints, voids in porches, and moisture-laden areas.

Note any exterior wood that shows excessive moisture or decay, and give that area a close look when surveying the inside. Also, observe any possible roof-leak problems, either under the shingles, around chimneys, or toward the structure near downspouts. Blistered paint, insect or woodpecker attack areas, and evidence of insect exit holes, feces, or sawdust are additional points of concern. Outside, in areas where there are planters or earth-filled porches, use a hacksaw blade to insert under window and door sills. The blade should not penetrate beyond the sills or headers.

In the interior, examine every room systematically. Look for possible signs of decay, damage, and moisture in all wooden structures. For example, if there is a drip or leak under the sink, fill up the sink and examine underneath after it empties to see if water appears at the bottom of cabinet. If water is leaking from any area, "sound" (tap and listen for a hollow sound) the nearby wood with a hammer, then look for possible mud tubes on adjacent water pipes. In walking through a residence, notice whether or not floors seem to sag or buckle in places; sagging members may indicate termite damage. Similarly, water stains, buckling paint, or bulging plaster are indicative of moisture-laden areas which need further scrutiny. There may be stained walls where Formosan termites have deposited mud on the interiors of walls. Sound baseboards as well—these are primary areas of attack. Examine cracks occurring around door or window frames since these may be portals of entry for drywood termites.

AAAA Termite Company 4 Greenback Way Woodstock, MD	OWNER T.J. Wood	OCCUPANT Same	DATE July 4, 1994
	TREATING ADDRESS 2 Ivywood Drive	CITY Woodstock	STATE MD ZIP CODE 22222
	BUSINESS PHONE 111 111-1111	HOME PHONE 999 999-9999	ACCOUNT # 00001-94



BASED ON CAREFUL VISUAL INSPECTION OF THE READILY ACCESSIBLE AREAS OF THE PROPERTY.

☐ A. Visible evidence of wood destroying insect infestation was observed. No control measures were performed. Evidence observed: ____________

☐ B. No visible evidence of infestation from wood destroying insects was observed.

☒ C. Visible evidence of infestation was noted; proper control measures were performed. Insects or infestation observed:
Termites active in porch support posts, wood paneling next to door. Mud tubes on concrete porch

☐ D. Visible damage due to ____________ has been observed in the following areas. (including, but not limited to)

☐ E. Visible evidence of previous treatment

DAMAGE OBSERVED ABOVE, IF ANY: *(Check One)*

☒ A. Will be/has been corrected by this company.
☐ B. Will not be corrected by this company.
☐ C. Recommend that damage be evaluated by a qualified building expert and repairs be made, if necessary.

ADDITIONAL COMMENTS *(If necessary, continue on reverse.)*
Shrubbery cut back to observe front of house. Excessive moisture due to heavy mulch present. Gravel driveway

OBSTRUCTIONS AND/OR INACCESSIBLE AREAS OBSERVED

BASEMENT	N/A
CRAWL	N/A
MAIN LEVEL(S)	Floor covering (carpet) replaced
ATTIC	Not observed
EXTERIOR	Dense shrubbery
ATTACHED GARAGE/PORCH	Firewood present

1. JOISTS HIDDEN: (a) suspended ceiling, (b) fixed ceiling, (c) insulation, (d) floor over joists, (e) ducts.
2. WALL COVERINGS: (a) paneling, (b) dry wall, (c) plaster, (d) tile, (e) cabinets, (f) shelving, (g) wallpaper.
3. FLOOR COVERINGS: (a) tile, (b) carpet, (c) linoleum, (d) built-ins
4. PERSONAL POSSESSIONS: (a) stored material, (b) boxes, (c) pictures, (d) clothing, (e) furniture, (f) appliances
5. RAFTERS HIDDEN: (a) suspended ceiling, (b) fixed ceiling, (c) insulation
6. RAISED FLOORING: (a) flooring elevated with sleepers beneath
7. EXTERIOR: (a) dense shrubbery, (b) siding, (c) window well covers, (d) planters.
8. PORCH: (a) no access or entry beneath floor surface, (d) debris.
9. ADD'L ITEMS: (a) standing water, (b) debris, (c) firewood, (d) no access or entry, (e) absence of safe or stable access

DIRECTIONS
Treated entire perimeter of house at 12" intervals with rods. Also, rodded perimeter of house on interior by drilling through slab at 12" intervals. Drilled through and treated concrete porch slab underneath. Used Dragnet TC, 84 gallons.

KEYS	INFESTED AREAS	TYPE	LOCATION	INFESTED AREAS	TYPE	LOCATION
AI - ACTIVE INFESTATION	SILL PLATE	X	Front door	SIDING		
O - OHB	JOISTS			SOFFETS		
T - TERMITES	SUB FLOOR			CEILINGS		
P - PPB	WALLS			LINTELS		
M - MOISTURE	STUDS			STAIRS/STEPS		
PR - PRIOR REPAIRS	FINISHED FLOOR			SUB ROOF		
PT - PRIOR TREATMENT	TRIM	X	Front door	RAFTERS		
X - DAMAGE	DOOR FRAMES	X	Front door	SHEATHING		
CA - CARPENTER ANTS	WINDOW FRAMES			LEDGERBOARD		
CB - CARPENTER BEES	SHELVING			BASEBOARD	X	Near door
PI - PRIOR INFESTATION	ATTIC			POST OR COLUMN	AI	Porch
	BAND BOARD			OTHER Paneling	X	Near door

AUTHORIZED SIGNATURE | PURCHASER/OWNER SIGNATURE

Figure 2-13

In the basement, carefully examine areas around the base of stairs, and columns which may extend through the floor slab. Also, examine the floor joists where they meet the basement wall for signs of sawdust, feces, and spider webs; their presence usually indicates some insect activity. Probing suspect timbers with an ice pick or sounding, using a small ballpeen hammer, may yield a positive finding. Inspect plumbing accesses throughout the house, as these often will reveal sawdust, mud tubes, or feces if termites are present.

In slab-on-grade construction, look carefully at the expansion joints, even if it means pulling up wall-to-wall carpeting. Although termites rarely occur in the attic (except for drywood termites), inspect bracing and rafters carefully for evidence of damage or mud tubes. Note any unseen areas in the report. Pay particular attention to evidence of leaking water, especially around chimneys, vent pipes, and sheathing on eaves.

Carefully inspect every part of the crawlspace by using a flashlight, since it is a likely area for hidden mud tubes or dampwood termites because of the proximity of ground and the first floor wood substructure. Also check the storage sheds and garage which usually give termites easy access to the house, if attached or nearby. Finally, review carefully any unseen areas and voids, and record this data in the inspection graph.

Regardless of the type of termite infestation, it is imperative to describe as thoroughly as possible its origin as well as its extent. In addition to the graph, a descriptive report needs to be prepared for future reference, whether or not there is an actual infestation.

SECTION H PREVENTIVE MEASURES

The implementation of preventive measures discussed here can minimize costly repairs of termite damage.

1. SUBTERRANEAN AND DAMPWOOD TERMITES

Dampwood and subterranean termites cannot thrive without ample moisture in the wood of structures, in the adjoining soil, or both. Therefore, repairing defects and correcting patterns that allow water or excess moisture into any part of the house will help minimize termite damage. For example, if the ground slopes toward a structure, it should be regraded to redirect the runoff away from the structure. It is also necessary to ensure that water from roof, downspouts, porches, driveways, patios, and slabs runs away from the structure, and that leaky drains, baths, toilets, and plumbing are repaired inside the residence. If crawl spaces have no ventilation, installation of vents will prevent moisture accumulation. Gutters should be clear of debris so that water does not pour over their tops during rain storms. Roof flashings must not allow water to flow under the membranes and shingles. Flashing around chimneys and vents should be tight and sealed so that water cannot run down into the structure. Damp tree branches close to the structure should be cut back.

It is also necessary to remove wood debris from under the building or near the foundation, firewood that is closer than 6 inches to the building, and wooden planters next to the building. Modify untreated wooden structural members so that they are more than 18 inches away from the soil. This may involve regrading if siding or joists are too close to the soil, or installing a metal termite shields or a concrete barrier beneath the wood. If decay is evident but slight, treat unpainted wood with a suitable wood preservative (see Section J). Paint exposed untreated wood. Replace supporting posts, stairs, and fences made of untreated wood with pressure-treated wood (see Section J). Caulk areas where moisture can enter around windows, door frames, or sills.

Foam insulation has become a problem in recent years since while termites cannot digest foam, they easily tunnel through it to reach wood. Where foam insulation is in close contact with the ground, it might mask termite tunnels and hide structural damage. Therefore, it is essential to ensure that it does not extend closer than 18 inches from the soil. Even with this precaution, most termite-control companies will not guarantee against termite infestation if a building has foam insulation, because of the high risk that infestation will go undetected.

2. DRYWOOD TERMITE INFESTATIONS

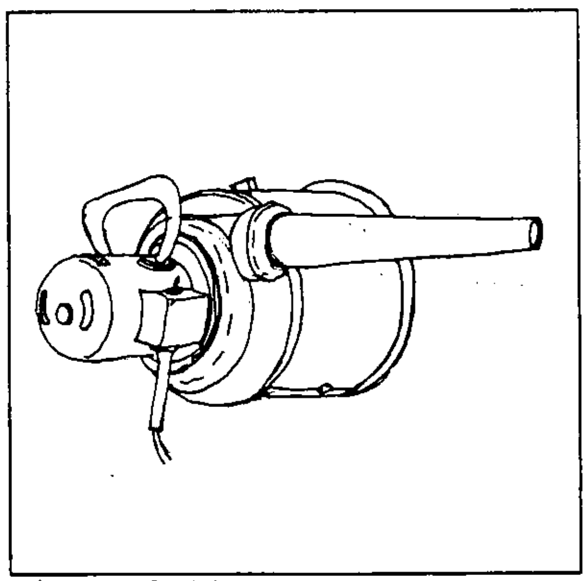


Figure 2-14

No single measure can prevent the possibility of drywood termite attack; however, several measures can be taken that can reduce the threat. Sanitation is critical to successful prevention. It is also important to avoid importing drywood termites on furniture, crates, and cellulose building materials. Remove stored lumber, firewood, and dead branches nearby, since these are ready sources of drywood termites. Exclusion of swarmers by screening ventilation portals to the attic or crawl spaces used to be recommended, but such screening often becomes clogged with debris and cobwebs, leading to moisture problems. Painting or preserving untreated wood and caulking cracks between wooden joints in siding or around windows and doors yields better results. Chemical treatment of wood with boric acid derivatives is an effective barrier to attack, although in high-risk areas it is probably better to use pressure-treated wood for framing subflooring, exterior doors, windows, and trim. In recent years, prevention of drywood termites by applying fluoridated silica gel dusts to attics, wall voids, and crawl spaces has proven effective. The dust is applied at the rate 1 pound per 1,000 square feet using an electric dust blower, and even a thin film of dust is effective for the life of the building (Fig. 2-14, previous page). It has the added benefit of being lethal to other pests, particularly cockroaches.

SECTION I CHEMICAL PREVENTIVE BARRIERS

Since few buildings are termite-proof, a preventive chemical-barrier treatment around buildings located in high risk infestation areas is an excellent precaution. Preconstruction treatment of structural wood can be accomplished with a dip-diffusion method, using a 10% disodium octaborate tetrahydrate solution. Such "Timborized" lumber is available in many areas commercially. Additionally, sodium-borate solutions can be applied to exposed structural wood during construction ("dry in" stage) or after construction is completed, which is also suitable for all wood not in contact with the ground and not exposed to rain. Applications can be made to wood in attics, walls, around windows, floors and subfloors, joists, and sill plates.

Sodium-borate solutions penetrate into the wood, treating more than just the surface, and protect and preserve the wood permanently. Sodium borate functions as a slow-acting stomach poison in insects and decay fungi. Termites accumulate the active ingredients while they feed. These slow-acting poisons allow the termites to move throughout the colony to spread the insecticide by the feeding of nymphs, soldiers, and reproductives. Sodium-borate solutions can be brushed or sprayed onto bare wood or drilled and pressure treated into known infestations.

A soil pre-treatment performed during construction provides the most effective barrier. The principle is to provide a pesticidal barrier in the soil that will be in contact with the foundation. For basement construction, after excavating the building site and putting down the gravel or dirt fill, treat the soil in the whole area with a power spray under low pressure. Upon completion of foundation walls, treat the soil in a trench on the inside of the wall. After grading is complete, treat the soil in a trench along the exterior of the wall. Treat any voids in concrete masonry blocks with the chemical. Finally, treat fill dirt where porch or attached garage or carport pads will be poured, at the rate recommended on the label of the termiticide container. Before pouring concrete slabs, a moisture barrier of polyethylene sheeting should be in place.

For slab-on-grade construction, the procedure is basically the same, except that less pesticide will be needed along the outside walls, since the depth from grade to footing is generally 2-3 feet or less. Treat wherever utility chases enter the slab at the labeled rate. In crawl-spaces, apply the pesticide in a trench along inside walls and partitions, around utility entrances, and around piers (Fig. 2-15, next page). Soil-treatment termiticides must be applied in strict accordance with the recommended rates of the manufacturer, which are shown on the container label.

REMINDER: Due to the sensitivity of chemical treatment, it is strongly recommended that such work be contracted out to a licensed professional termite-control contractor.

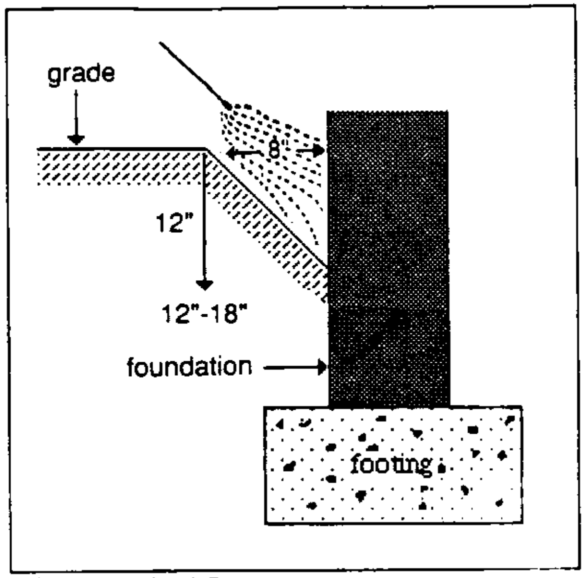


Figure 2-15 Courtesy of NPCA

1. **POST-CONSTRUCTION TREATMENTS FOR SUBTERRANEAN TERMITES**

If a residence has had termites in the past, or if there are conditions conducive to termites (evidence of infested wood around the foundation and cracks in the foundation or porch voids), it is reasonable to assume that a chemical barrier is necessary to protect against future infestation. When an infestation occurs, the *entire* barrier requires reestablishment. Treating just the area of infestation often fails to prevent termite entry, and results in costly callbacks.

Unpainted or unsealed termite-infested wood can be remedied by painting (brushing) or spraying sodium-borate solution on it. At the same time, eliminate moisture problems that may have led to and sustained the moisture needs of the colony. Wood with known infestations or galleries should be drilled and pressure-injected wherever possible.

In buildings with basements, the typical treatment includes long-rodding (36-inch long injection rod) to inject pesticide along the wall perimeter (Fig. 2-16). A tentative guide for spacing injection rods may be every 12 inches in loam soil, every 6 inches in clay soil, and every 18 inches in sandy soil.

Since significant portions of all breaches in chemical barriers occur at porch stoops containing voids, a recommendation is to drill through to the voids on each side of the porch, and inject the pesticide (Fig. 2-17, next page).

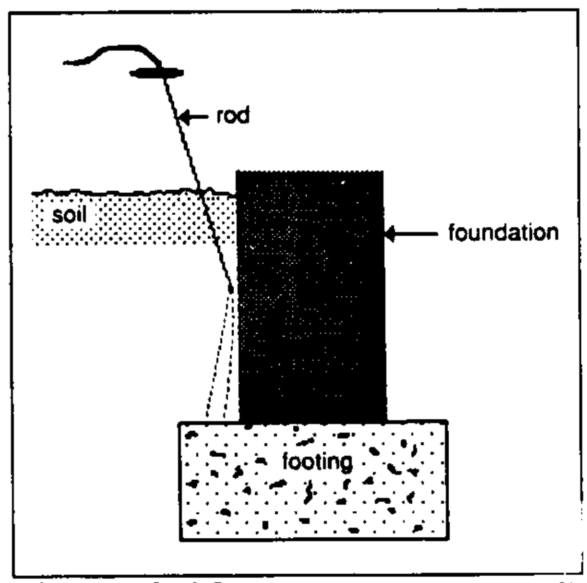


Figure 2-16 Courtesy of NPCA

In basements having other than a monolithic slab, drill through the slab next to the expansion joint along the walls, and inject. In areas with low-lying decks, short-rodding may be needed to get into the foundation area. If there is a fireplace, apply

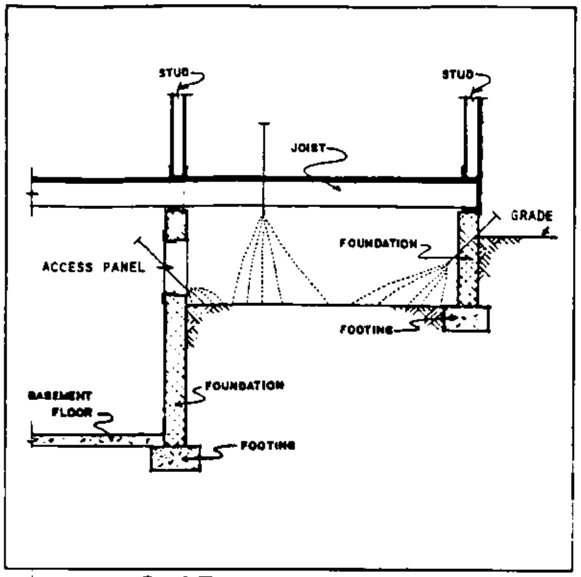


Figure 2-17 Courtesy of NPCA

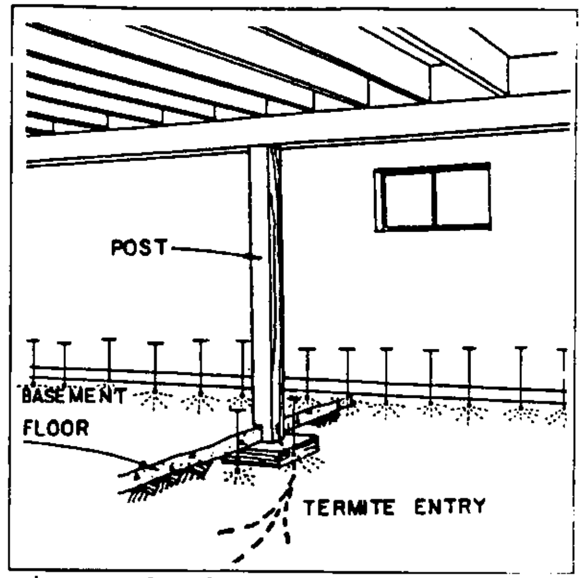


Figure 2-18 Courtesy of NPCA

pesticide to its base area, as low as possible. Drill and inject adjacent to any utility line or structure extending through the basement floor (Fig. 2-18).

Slab construction requires that pesticide not only provide a barrier around the outside, but also underneath the slab, so that any possible cracks are protected. Special formulations (see Section J) may be needed to get pesticide all the way under slabs. Also, drill through the slab and inject wherever there are expansion joints, including any junction between the slab and the wall (this is unnecessary in monolithic slabs). In crawl-spaces, treatment along walls is the same as for other construction, except there should be rodding around support piers and entryways for utilities.

2. POST-CONSTRUCTION TREATMENTS FOR DAMPWOOD TERMITES

The chemical barrier used for subterranean termites is also effective for dampwood termites. Eliminate excess moisture in wood to prevent attack by dampwood termites.

3. POST-CONSTRUCTION TREATMENTS FOR DRYWOOD TERMITES

The type of treatment required depends largely on the location and extent of infestation. If the infestation is light and accessible, 1/4-inch holes drilled into infested timbers at 12-inch intervals, and insecticidal dust (one ounce of boric acid per 30 holes at a minimum) blown into the holes, would be sufficient. Taking advantage of termites' mutual grooming, this small quantity would exterminate the termites. The holes can also be injected with a residual termiticide (see Section J) combined with a suitable fumigant. After treatment, the holes should be plugged with dowels or corks.

If the infested areas are mainly structural, extensive, and inaccessible, fumigation may be the best treatment. This is an expensive and highly technical procedure that should be undertaken only by licensed fumigators. However, it offers no protection against future infestations. The basic procedure is to wrap the entire building in gas-tight tarps made of nylon, rubber, neoprene, or plastic (Fig. 2-19, next page). Seams between sheets of the tarps are rolled together and joined with metal clamps or heat-sealed. The bottoms of the tarps are anchored to the ground with "sand snakes" (sand-filled canvas bags). It is essential that the entire structure be airtight for fumigation, so careful attention to each detail is necessary. The building is fumigated with sulfuryl fluoride, or other suitable fumigant.

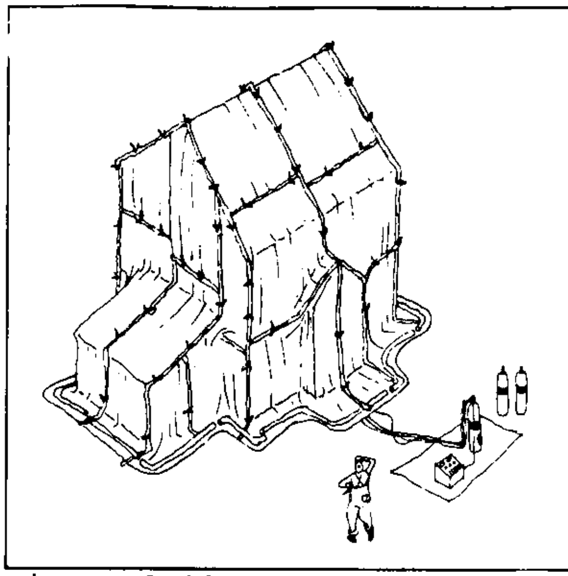


Figure 2-19

The structure must remain closed for a couple of days or so, and monitored with a gas meter (fluoroscope) to assure that adequate concentration is maintained throughout the treatment period. Warning signs should be posted and entrance to the building prohibited until the building is cleared by the fumigators. After fumigation is complete, the tarp is opened and the fumigator monitors the gas concentration until it reaches a safe level. Failure to do so represents a safety hazard.

Infested, stand-alone items such as furniture, construction timbers, or crates can be treated in a fumigation chamber in similar fashion to buildings. Termite experts recommend that, following fumigation, attics and voids be dusted with silica gel to minimize the possibility of reinfestation.

SECTION J CHEMICALS REGISTERED FOR TREATMENT OF TERMITES

CHEMICAL	TYPE	PRIMARY USE	SITES
Boracare (sodium isoborate)	Boric acid derivative	Treatment of infested wood, drywood termites	Unpainted structural timbers
Chlorpyrifos	Residual Organophosphate	Pre-treatment Post-treatment	Soil, inside and outside
Demon (cypermethrin)	Residual synthetic pyrethroid	Pre-treatment Post-treatment	Soil, inside and outside
Dragnet (permethrin)	Residual synthetic pyrethroid	Pre-treatment Post-treatment	Soil, inside and outside
Dri-die (silica gel)	Fluoridated silica dust	Pre-treatment especially for drywood termites	Voids in walls and attics
Ethylene dibromide	Fumigant	Post-treatment of serious infestations above ground	Voids, wood members
Methyl bromide	Fumigant	Post-treatment drywood, Formosan termites	Whole house, wood members above ground
Pentachlorophenol	Wood preservative	Pre-treatment	Unpainted structural members
Tim-bor (disodium octaborate tetrahydrate)	Boron derivative (dust or 10% solution)	Pre-treatment of wood, post-construction treatment of galleries and infested wood	Unpainted wood, injection into galleries, unpainted structural members
Vikane (sulfuryl fluoride)	Fumigant	Post-treatment drywood, Formosan termites	Whole house, wood members above ground

END OF CHAPTER TWO