

AGRICULTURAL GUIDE

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Insect control

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Termites



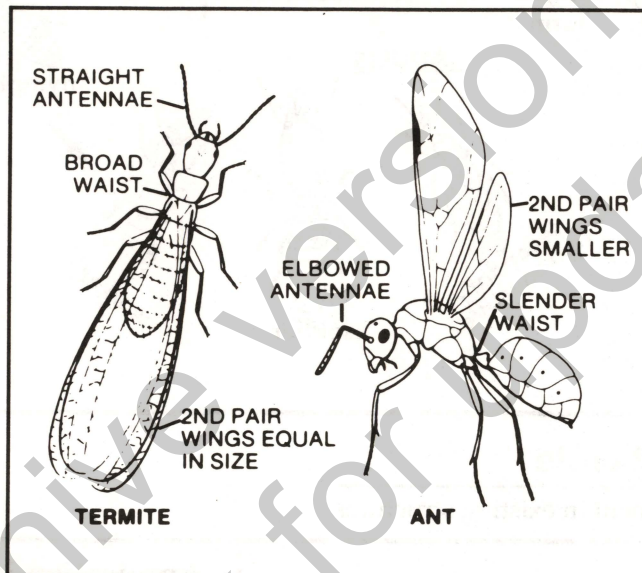
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The insect order *Isoptera* consists entirely of termites. Over 2,000 species live throughout the world. Only about 50 of these occur in the United States, and only three or four of the 50 occur under natural conditions in Missouri. In nature, termites are considered to be beneficial insects since they help to convert dead wood and other cellulose material to soil. Only when man uses wood, the normal food supply of the termite, in the realm of the termite, does conflict arise.

Termites found in the U.S. are generally grouped into four categories: (1) drywood, (2) dampwood, (3) powderpost and (4) subterranean. Members of the first three groups generally are found in the western U.S. and/or along the southern coastal areas of the U.S. from California to the Atlantic. They are occasionally introduced into Missouri through furniture or other seasoned wood. But they do not spread to other wood from these introductions. Thus, Missouri's termite problem is basically caused by subterranean termites. The most common species is the eastern subterranean termite, *Reticulitermes flavipes* (Kollar). At least two and possibly three other species of *Reticulitermes* occur in Missouri and are capable of the same damage as the eastern, but the incidence of this occurrence is very low.

Biology

Termites live in true social colonies with a division of labor among the different types of individuals. These different types, called castes, usually consist of



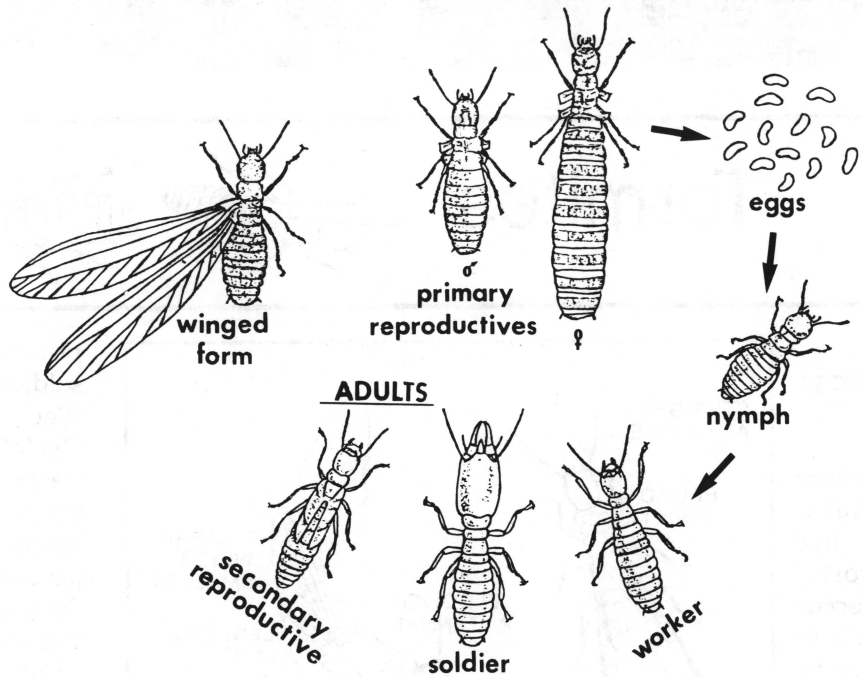
primary reproductives, soldiers, and workers. (See "Termite Life Cycle" illustration.) Castes vary considerably among the different species. Often species have secondary reproductives, and some species may not have true adult workers but relegate the "work" of the colony to nymphs. Even in those species with true adult workers, the later-instar nymphs also perform work. Soldiers defend the colony. They, like the reproductives,

are fed by the workers. The soldiers and the workers are blind, whereas the primary reproductives have eyes.

The primary reproductives are shiny black in color and are winged. They are produced in mature colonies and emerge at certain seasons of the year to take colonizing flights. After the flight, they shed their wings and pair up. Each pair attempts to start a new colony by constructing a cell adjacent to wood or other food source. Mating takes place in this cell, producing the first small group of nymphs. These nymphs are fed by the reproductive pair until the nymphs are large enough to "go to work" themselves. As the colony increases in size, soldiers and secondary reproductives are produced. New winged swarms are seldom produced until the colony is over three years old.

The workers are creamy white and very soft bodied and subject to drying out (desiccation). Thus, they need soil contact for a source of moisture. They build shelter tubes from bits of soil and excretions as passage ways from the nest to the food source. They use this same material to close any breaks in the surface of the wood they are infesting. They must have this closed

TERMITE LIFE CYCLE



Insecticide treatment table

For soil pretreatment or treatment in existing structures

Insecticide formulation

Insecticide* & formulation	Concentration to use	Dilution	
		parts water	parts insecticide
chlorpyrifos (Dursban) 42.8% 4 lb./gal. EC	1%	98	2
** (Ortho-Klor) 12.6% 1 lb./gal. EC	0.5%	96	4
fenvalerate (Tribute) 24.5% 2 lb./gal. EC	0.5%	98	2
isophenphos (Pryfon) 65% 6 bl./gal. EC	0.75%	96	1
permethrin (Dragnet) 38.4% 3.2 lb./gal. EC	0.5%	98.75	1.25
(Torpedo) 25.6% 2 lb./gal. EC	0.5%	98	2

Application instructions

These instructions apply to all listed insecticides.

When applying insecticides to:	Apply this amount
Areas to be covered by concrete	1 gal./10 sq. ft. or 1-1/2 gal. if soil is porous
Critical areas under slabs (foundation walls; around sewer or utility openings).	4 gal./10 linear ft.
Backfill along outside foundation walls; along inside of walls if there is crawl space.	4 gal./10 linear ft. per foot of depth
Voids in foundation blocks. (Apply before capping.)	2 gal./10 linear ft.

EC = Emulsifiable concentrate

* The status of chlordane is in question and will probably not be available after April, 1988.

** The only currently registered materials not restricted to use by certified applicators only.

system to preserve the necessary high level of humidity. These tubes also serve as a protective barrier against their natural enemies, particularly ants. The soldiers are also creamy white with large, dark, reddish-brown heads and strong mandibles or jaws — a relatively small number protect the colony. Supplementary reproductives are usually white, larger than the primary reproductives, and have short wing pads. They can lay more eggs than the primary reproductives and may be very numerous.

Prevention

Structures can be pretreated at time of construction to protect them from termite attack. Very few people would consider building a new house and then not insure it against damage caused by fire or other calamities. But many more houses are damaged each year by termites than by fire. Pretreatment is relatively inexpensive and highly desirable, especially in buildings constructed on concrete slabs, which are very susceptible to termite attack. There are three major areas to consider in preventing termites from invading a new building: 1) sanitation of the building site, 2) structural and construction defects and 3) barriers.

Sanitation: Remove all tree roots and stumps from the building site before starting construction. Remove spreader boards and grade stakes before concrete sets. Remove form boards and wood scraps from soil before filling or backfilling. Do not bury wood in the backfill, under porches or steps, as this may attract termites.

Structural and construction defects: Allow sufficient space and ventilation outlets for air movement to aid in keeping soil dry beneath houses with crawl spaces. The finished grade outside the building should slope away from the foundation so water won't collect under the house. In the final grading, allow at least 6 inches clearance between the top of the soil and the top of the foundation. Porch supports should be separated from the building by at least 2 inches. Wooden steps should rest upon a concrete base that extends 6 inches above grade. Do not place basement partitions, posts and stair stringers until the concrete floor has been poured. They should never extend into or through the concrete.

Barriers: Barriers can be considered in two major categories: 1) mechanical and 2) chemical.

Mechanical barriers

Foundations: A poured, reinforced, crack-free concrete foundation hinders the passage of termites. Termites can go through a crack as small as 1/32nd of an inch. Hollow-block or brick foundations should be capped with a minimum of 4 inches of reinforced concrete.

Slab-on-ground: Of all foundation types, slab-on-ground construction is most susceptible to termite attack. Termites can enter the wood by going over the edge of the slab and through expansion joints, openings around plumbing and cracks. The monolithic slab is best. The suspended slab is second best, and the floating types are easiest for termites to penetrate.

Metal termite shields: Properly designed, constructed, installed and maintained metal termite shields can give protection. However, good shield construction, installation and maintenance are rare. A good metal shield placed on top of foundation and piers will force termites to build tubes out in the open where they can be seen when inspections are made. Even if metal shields are used, a soil insecticide should be used around drain pipes and other unprotected potential termite pathways.

Chemical barriers

Treated lumber: Chemically treated lumber should be used for the foundation plate, mudsill and all lumber used as partition framing and furring strips below ground. For maximum protection, the wood should be pressure impregnated with pentachlorophenol, copper-arsenic salt or a similar preservative, but not creosote. Brushing, spraying or soaking the lumber with the chemical gives only limited protection.

Soil insecticides: Treatment of the soil around and under the foundation with one of the recommended soil insecticides is a good method of preventing termite attack. Soil treatment should be used as a supplement to good construction, not as a substitute for it. Treatment is needed in four areas during construction:

1. Treatment of the entire soil surface under any area to be covered with concrete, including garage floors, entrance platforms and filled porches.

2. Treatment with additional amounts of chemical to the soil beneath those areas that lie adjacent to foundation walls, beneath interior walls, around sewer and utility openings and at other possible points of entry.

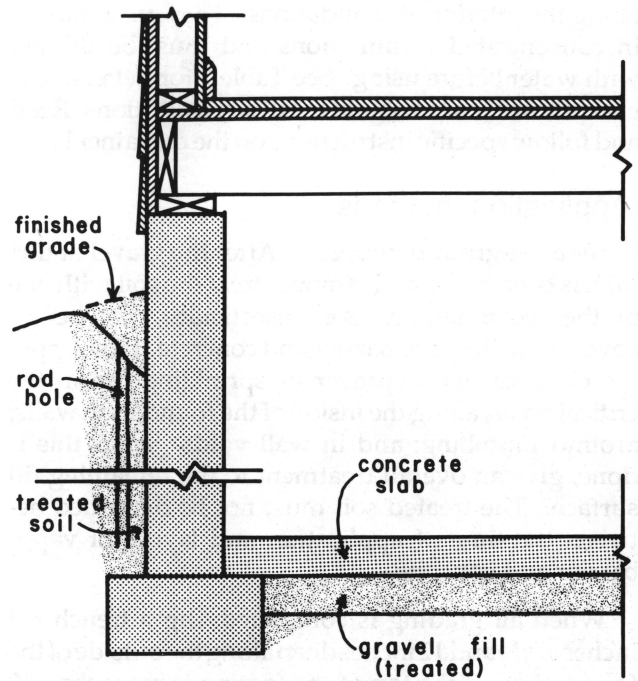
3. Treatment of footings and backfill outside foundation walls and inside walled areas where there is a crawl space. Accessible areas like these could be treated later, but it's easier to do it at construction time.

4. Treatment of empty spaces or voids in concrete blocks.

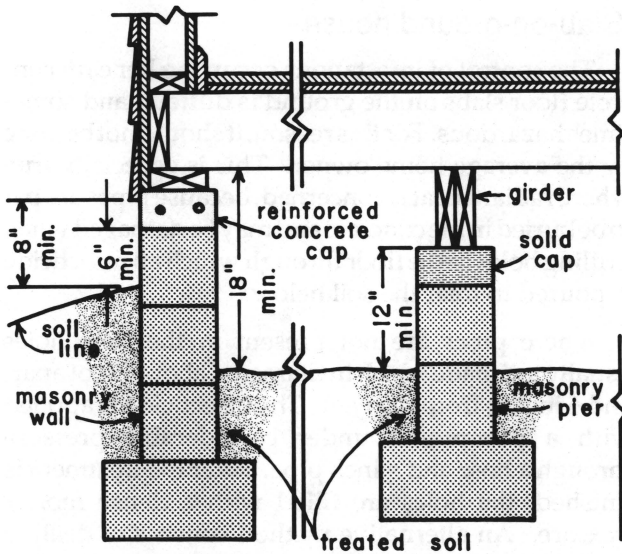
Insecticides to use and how to use them: The insecticides recommended are water emulsions. Unlike oil solutions, they will not injure plants when used along exterior foundation walls. Neither will they creep up walls and damage floors, as oil may when applied

Termite control vs. construction type

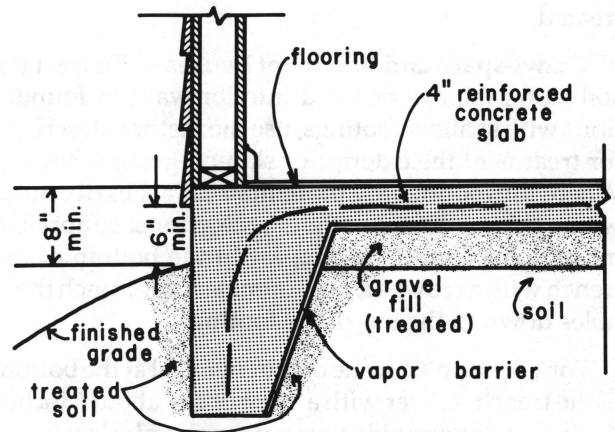
Subterranean termites nest in the soil, which provides the necessary source of moisture. They feed on cellulose, which is usually obtained from wood. The correct application of an appropriate soil insecticide creates a barrier between the termites in the soil and the wood in the house. This is the basic principle of termite control.



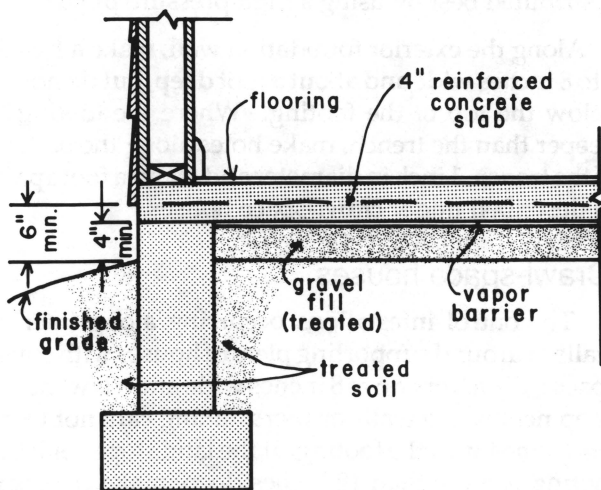
Basement type construction



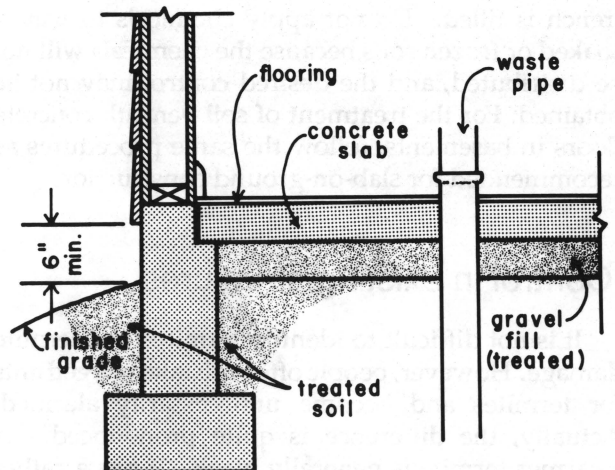
Crawl-space type construction



Monolithic type of slab



Suspended type of slab



Floating type of slab

along the interior of foundations. They are available in concentrated formulations and must be diluted with water before using. See Table 1 for details. The chart shows how to obtain the desired dilutions. Read and follow specific instructions on the container label.

Application methods

Slab-on-ground houses — After the gravel or dirt fill has been made and tamped, treat the soil with one of the recommended soil insecticides, just before covering with vapor barrier and concrete. First, apply the chemical with sprayer or sprinkling can in the critical areas; along the inside of the foundation walls; around plumbing; and in wall voids. After this is done, give an overall treatment to the remaining fill surface. The treated soil must not be disturbed between the time of application and laying of vapor barrier and concrete.

When all grading is completed, dig a trench 6-8 inches wide and 12 inches deep along the outside of the foundation. If the top of the footing is more than 12 inches below the surface, make crowbar holes in the bottom of the trench as described for basement homes. When the soil is replaced in the trench, it must also be treated.

Crawl-space and basement houses — To treat the soil along the exterior and interior walls of foundations with shallow footings, use the method described for treatment the exterior or slab-on-ground houses. Where the footings are more than 12 inches deep and where large volumes of the chemical must be applied, make holes about 1 foot apart in the bottom of the trench with a crowbar, pipe or metal rod. Punch these holes down to the top of the footing.

Pour or sprinkle some of the chemical at the bottom of the trench. Cover with a layer of soil about 6 inches thick. Pour or sprinkle more of the chemical on top of this soil layer. Mix the chemical thoroughly with this layer. Tamp well. Continue to add more layers of soil, mix with chemicals as before, and tamp until the trench is filled. Do not apply chemicals to water-soaked or frozen soils because the chemicals will not be distributed, and the desired control may not be obtained. For the treatment of soil beneath concrete floors in basements, follow the same procedures as recommended for slab-on-ground construction.

Control in existing structures

It is not difficult to identify termites and termite damage. However, people often mistake winged ants for termites and become unnecessarily alarmed. Actually, the difference is quite pronounced. A swarmer termite is generally black. It has a rather straight body and four cloudy-white, equal-length

wings that are twice as long as the body. The winged ant, on the other hand, may be similar in color but has a wasp-like waist and four clear wings, unequal in length, and much shorter.

The white, soft-bodied, wingless worker termites, although seldom seen, are the ones that do the damage. They eat the soft grain of wood, leaving a thin shell outside and a splinter effect inside.

To check for termites, probe any wood near the foundation or soil with an ice pick or screw driver, especially the plates, header joists, ends of floor joists and any hardwood flooring. Presence of earthen "shelter tubes" on foundation walls and wood is also evidence of infestation. Termites build the tubes from bits of soil, which they use to close up breaks in the surface of infested wood.

If you find damage, there is no great hurry to apply control measures. Termites work slowly, and a few weeks' or even months' delay is of little consequence.

Slab-on-ground houses

The control of infestations occurring beneath concrete floor slabs on the ground is difficult and sometimes hazardous. For this reason, it should not be done by the average home owner. This is especially true where radiant heat is concerned, because pipes are pat to be buried in the concrete and may be damaged when drilling holes in the floor through which an insecticide is poured to treat the soil below.

Where pipes are not present in the slab, holes usually are made $\frac{1}{2}$ inch in diameter, about 1 foot apart and 6 inches from the wall. The insecticide is applied with a pump and under considerable pressure through a hose and $\frac{1}{2}$ inch pipe. After the treatment is finished, the holes are filled with a dense mortar mixture. An alternative method consists of drilling the holes through the foundation walls so the chemical can be introduced into the soil just below the slab. The holes are made about 3 feet apart, and the chemical is distributed best by using a high pressure pump.

Along the exterior foundation wall, make a trench 6 to 8 inches wide and about a foot deep, but do not go below the top of the footing. Where the footing is deeper than the trench, make holes along the bottom of the trench, 1 inch in diameter and about a foot apart, as described under crawl-space houses.

Crawl-space houses

To control infestations occurring along interior walls or around supporting piers of houses with crawl spaces, dig a trench 6 to 8 inches wide and a few inches deep next to the walls or piers, taking care not to go below the top of the footing. If the land slopes or if the footing is more than 12 inches deep, make crowbar, pipe or rod holes about 1 inch in diameter and a foot

apart in the bottom of the trench. The holes should go to the footing. This will help distribute the chemical evenly along the wall.

The trench along the exterior foundation wall is also made 6 to 8 inches wide, but about a foot deep. If needed, holes are also made in the trench bottom, as described for the trench along the interior wall.

Basement houses

Where the termites are coming from beneath the concrete floor in the basement, remove any wood that may extend into the ground, treat the soil, and then seal cracks or holes with a dense cement mortar. Where the infestation is located between the floor and wall (expansion joint) or around a furnace, make a series of 1/2 inch holes, spaced about 1 foot apart, through which a chemical can be poured or injected. Holes along a wall should be made about 6 to 8 inches from it, so as to clear the footing and reach the soil beneath.

Where the infestation occurs along the exterior foundation wall in houses having full basements, it is necessary to treat the soil to a greater depth than is required for other types of houses. The trench is prepared in the same way, but the pipe or rod holes should extend down to the top of the footing to aid in proper distribution of the chemical to all parts of the wall. This is especially important in masonry foundations where numerous mortar joints are below grade and which may be susceptible to termite attack.

Treatment of wood

The treatment of wood infested by subterranean termites is of very limited value. It involves drilling small diameter holes at intervals into the termite galleries in infested wood. The idea is to flood these galleries with a liquid or dust formulation of insecticide to kill those termites that may be present. If done properly, this will quickly kill termites that have been cut off from the main colony in the soil by the chemical barrier treatment. It also may prevent reproductive forms from swarming after the soil treatment. It also may prevent reproductive forms from swarming after the soil treatment. Without this type of treatment, a

proper soil treatment should be sufficient for subterranean termites. This treatment just speeds up the death of those termites in the wood.

Insecticides registered for spot-treatment of wood include: (1) dusts of bendiocarb (Ficam), boric acid, and silica gel. (2) liquids of bendiocarb (Ficam), chlorpyrifos (Dursban), fenvalerate (Tribute), propoxur (Baygon), and resmethrin.

Pest control operators

Sprayers, safety equipment, other specialized equipment and special knowledge are usually required for the proper application of termite insecticides. A qualified pest control operator has this equipment and knowledge. Securing the services of a reliable pest control operator is also advisable since most registered soil termiticides are restricted to use by certified pesticide applicators only. Obtain bids, a description of the work to be done and details of any guarantees from two or more firms. Study this information and then make your decision.

Cautions

The insecticides mentioned in this guide are potentially toxic to people and other warm-blooded animals and must be handled with care. Do not permit them to come in contact with your skin. Wear rubberized gloves for protection. Where the insecticide is being applied with pressure through holes in walls and piers, use a cellulose acetate face guard so the chemical cannot splash back onto your face. If contact with the insecticide occurs, wash the skin immediately with warm, soapy water.

When the insecticide is being applied in an enclosed area, provide a free circulation of air.

- Do not apply these insecticides to the soil beneath a plenum air space.
- Do not treat soil beneath structures that contain cisterns or wells.
- Do not treat soil that is water-saturated or frozen.
- Do not apply in any situation that might result in contamination of any water supply. Keep children and pets away from areas where these insecticides are being prepared and used.