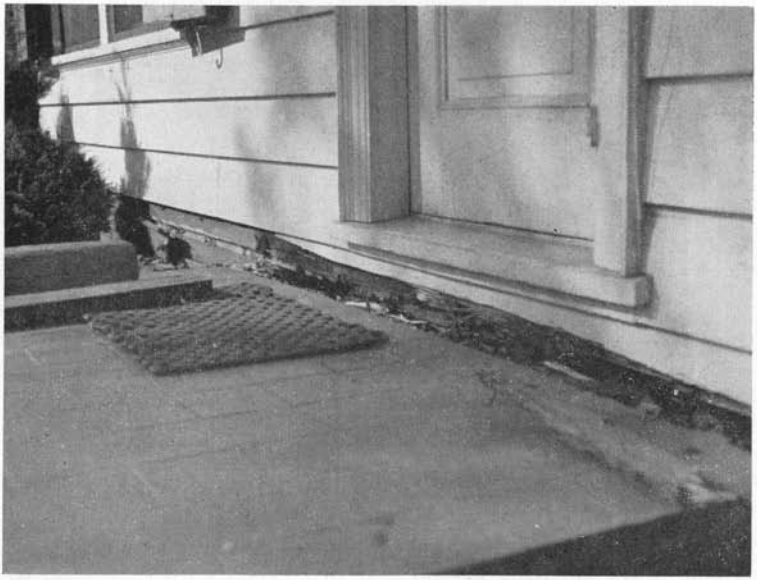
TERMITES IN BUILDINGS

Neely Turner



Direct contact between the sill and the earth fill under masonry porches or steps is an invitation to termite infestation. Part of the masonry floor has been removed to make repairs.

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Foreword

Thirty years ago termite damage in Connecticut buildings reached a stage that made obvious the need for more information on this insect. Station entomologists made the studies and investigations to get the facts people needed to cope with this problem.

The results were contained in Bulletin 382, published in 1936, and in Reports of the State Entomologist for the period 1934-37, all out of print. Since 1945, the work has been confined to continued study of termite infestations as the architecture of buildings has changed, and to keeping up with work on soil insecticides, chiefly done in the USDA. None of this has been published by this Station.

This publication has been prepared as a report of all this work and should contain the answers to many questions. We can identify insects for people concerned about termites, as well as examine specimens of wood to diagnose what insect caused the damage. Our entomologists are also ready to answer specific questions about termite treatments.

TERMITES IN BUILDINGS

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Termites have usually been considered insects of tropical and subtropical regions. It is true that there are more species of termites in such climates, particularly of mound-building subterranean species, and of the types that live independently of the soil. However, many species inhabit temperate climates, and the eastern subterranean termite (*Reticulitermes flavipes* K.) is native to Connecticut. Two or three other termites have occurred here, in wood or furniture brought in from tropical countries. None of these exotic species has become established here, and it is doubtful that they could survive in this climate except under unusual conditions.

The eastern subterranean termite was undoubtedly here when the country was colonized, and was present in posts and buildings for many years before it was recognized as a serious pest. There are definite records of termite damage in New England in 1875, and in Connecticut as early as 1909. About 1931, the number of buildings infested by termites increased sharply, and in the next five years hundreds were reported. At this time, entomologists examined a great many infested buildings in Connecticut to try to find out why this increase had occurred. The results of the examination were published in a series of reports and a bulletin, all of which are now out of print.

The increase in termite damage was one of recognition of the damage rather than increase in the abundance or distribution of the insects. For instance, a substantial percentage of the colonial houses more than 100 years old showed evidence of long-continued attacks by termites. Old factory buildings found infested were known to have been repaired repeatedly in the past on account of "rot" of timbers. One owner of a colonial house had acquired the diaries of former owners. Twice in the last 100 years there were notations of replacement of floor joists and parts of sills. At the time of the second repair, the owner wrote that the softwood beams had rotted, and that he was cutting and curing oak which should last longer. In 1934 this oak was infested with termites, and cross braces of an older date attached to it showed old termite damage.

On the other hand, a relatively large number of new buildings were found infested. The most common point of entry was through earth or cinder-filled masonry porches or terraces. These houses were built after 1920, and the masonry porches replaced the wooden porches of the earlier time.

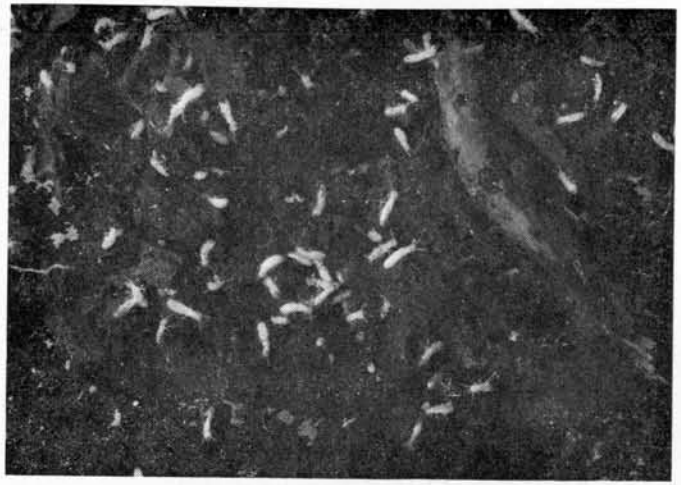

Figure 1. Termite workers, soldiers, and supplementary queens, shown about life size.

The next question was the amount of damage termites had done and a forecast of their continued importance. Of the hundreds of buildings examined, only a very few had been extensively damaged by termites. In fact, through the whole course of examination of buildings for termites in Connecticut, only one house has been found so badly damaged as to cause concern about its structural safety. This house was 150 years old. In many other cases, especially in factories, the place in which termite attacks were occurring was such that no chances could be taken on continued damage. In the newer buildings, there was seldom any sign of structural weakness.

Damage in dollars is difficult to estimate in such instances of termite attack. The value of the wood consumed is usually very small, but the cost of removing it and replacing with sound wood, high. No matter what criterion is used, termites are obviously one of the "expensive" insects in Connecticut.

On the other hand, the percentage of buildings, either new or old, infested by termites is relatively small. The evidence points plainly to the conclusion that when a building happens to be constructed in soil in which termites are present, the building is likely to be infested. One pattern of distribution did appear. Housing developments built on land recently in cultivation were seldom infested by termites, except on the site of the old farm buildings. Those in woodland, the original home of the termites, were more likely to be infested.

Thus the observations and studies showed that termites were present on many older building sites, that they were also appearing in houses built in woodlands, and that the design of Connecticut buildings allowed entry by termites. The forecast for the future could only be that termite infestations were likely to continue. Styles of architecture have continued to change. The monolithic concrete foundation has been replaced by concrete or cinder blocks. The ranch house with its concrete slab directly on the

ground has been added. On hillsides the split-level type of building has been introduced, with its construction giving the same opportunity for termite entry as earth-filled masonry porches. All these changes have proved to be just as termite-susceptible as the styles they replaced. Thus it is likely that termites will continue to damage houses built on termite-infested land.

Biology of termites. Termites are social insects that live in moist soil in colonies. Like other social insects, they have castes or forms specialized for the activities of the colony. The fertilized female or queen lays the eggs. The blind and sexless workers, which are white and live entirely under cover, care for the eggs, feed the young and the queen, and do the work of the colony (Figure 1). The soldiers, with very large heads and jaws, guard the members of the colony against attacks by other insects, mostly ants.

The colony does not occupy a defined space with recognizable permanent chambers and runways. For some reason not yet determined, large colonies may produce supplementary queens which lay eggs that develop only into workers. The original queen in large colonies may also produce young that develop into mature males and females. When these molt for the last time, they are black in color and winged. They soon escape from the colony in a sort of swarm, and emerge into the light. After a brief but aimless flight, the wings are shed and the males and females mate. They attempt to start a new colony in soil not occupied by the original colony.

Flights occurring in houses are usually of no significance other than an indication that the building is infested.

Cellulose is apparently the principal food requirement of termites. In the woodlands where they lived naturally before the settling of the country, their food was mostly limbs and twigs falling from living trees, or an entire dead tree. Termites may also attack living plants, and infestations in geraniums, strawberries, phlox, and other plants with a large crown or root system have been seen from time to time. In infested buildings, they have damaged such contents as paper and books, fabrics and shoes. The cellulose is digested with the aid of bacteria and protozoa in the digestive tract.

It is obvious that a single worker termite, less than a quarter of an inch long, cannot make very many trips from a colony to a building each day, and cannot carry away very much of the wood each trip. Thus serious damage to buildings is the result of years of feeding by large colonies. It is also true that even when a large colony is present damage is relatively slow.

How termites enter buildings. Termites may enter buildings (1) through direct contact between wood and the soil, (2) through cracks or hollows in masonry or concrete foundations, or (3) through covered shelter tubes which they build over the face of masonry foundations for short distances (Figure 2).

Direct contact between wood and soil is by far the most common means of entry in Connecticut buildings. Sills in contact with the fill under masonry porches; wooden supporting posts, partitions, and steps built in basements before concrete floors are poured; and wooden hatchways, steps, porches, and even wooden basement window frames offer such direct

contact. In more than half of the infested modern dwellings in Connecticut, the termites have entered through filled masonry porches and terraces.

Entry through cracks or hollows in foundations is less common but does occur. This sort of infestation has been more common in old buildings in which the wooden framework is close to the ground.

Entry through shelter tubes *built up* over foundations is possible but seems to be relatively rare. It is most likely to occur when there are quantities of wood left in the fill near the foundation. It is much more common for termites in this area to build shelter tubes down from infested wood, possibly to gain more direct access to the soil.

Finding termites in buildings. The occurrence of swarms of winged termites (Figure 3) is sometimes the first indication that a building is infested. These winged termites may be killed easily by any household insecticide spray or aerosol if they occur in sufficient numbers to be a nuisance.

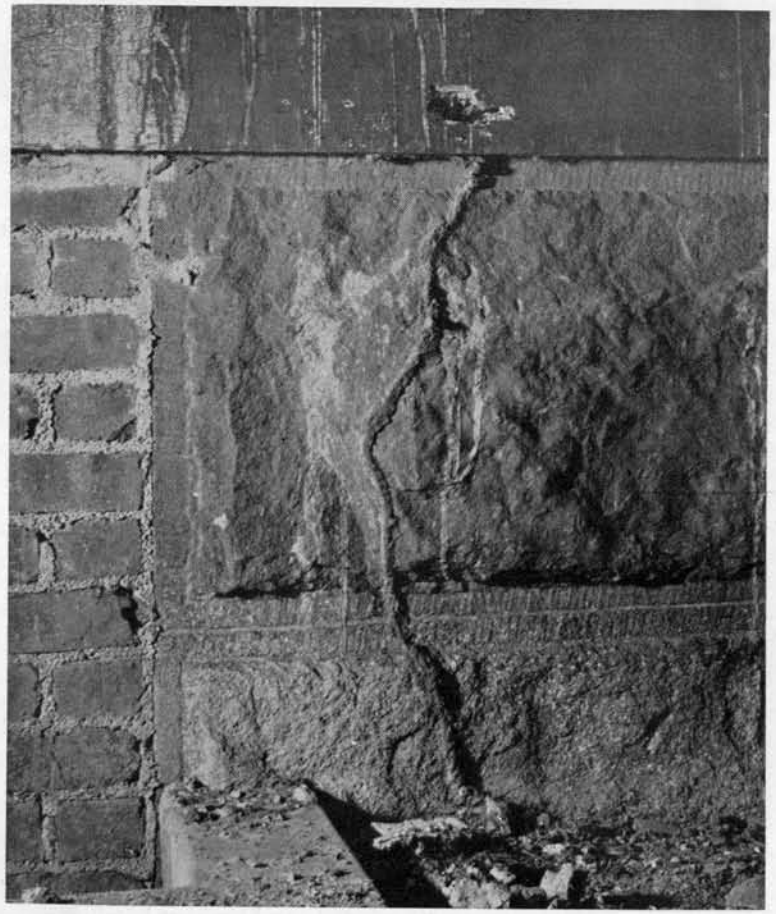

Figure 2. Termites constructed this shelter tube from wood to the ground in a partly excavated area, formerly an exterior wall.

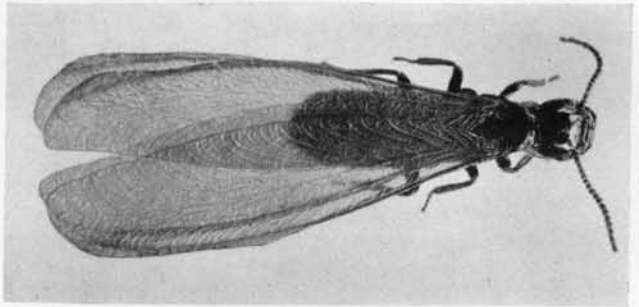

Figure 3. Winged adult termites (about ⅜ of an inch long) are feeble fliers and soon lose their wings.

Winged ants also emerge in houses during the same season as termites. The ants are wasp-waisted; termites do not have such a constriction. Ants usually occur in small numbers; termites are usually more numerous. Ants fly freely and do not lose their wings quickly; termites are feeble fliers and soon shed their wings. Ants may be present for several days; termites disappear within a few hours.

The brown, earth-like shelter tubes built over part of the foundation, or even on infested timbers, are visible evidence of infestation. If a shelter tube is in use, the inside is moist and there may be white workers there. If it has been abandoned, the entire tube will be dry and crumble easily.

Without the external evidence of winged termites or shelter tubes, it is difficult to determine whether or not termites are present in a building. Examination of posts or other wood in the ground near the building is possible. This can be done by punching the wood near the ground line with a sharp instrument, such as an ice-pick or screwdriver. If there is much of an infestation, the probe will open up some of the burrows. These are very characteristic (Figure 4). Termites eat out the soft portions of the wood and leave the hard sections. Termite burrows usually are lined with a sort of wood paste which resembles commercial wood putty.

Similar examination can be made of wooden posts in the basement and of the sill and joists adjoining masonry porches.

Insects other than termites also damage wood in houses. The powder post beetles eat the wood and leave pelleted deposits of excrement resembling wood flour in the burrows. They emerge from infested wood through small round holes eaten through the surface. Carpenter ants sometimes infest wood in houses, particularly in porches and cornices. Entry is usually made at some point where the wood is wet and soft. These ants cannot digest wood, and they cast out the "sawdust" cut in making their burrows. Ant burrows have no wood paste present. The purpose is to serve as runways and a home for the ant colony. Carpenter ant damage in buildings is usually not extensive unless the insects are ignored.

Wood in buildings is also attacked by fungi, commonly called dry-rot. This is a misnomer, because the fungi cannot get started in dry wood. Rotted wood may be checked on the surface, but it contains no burrows.

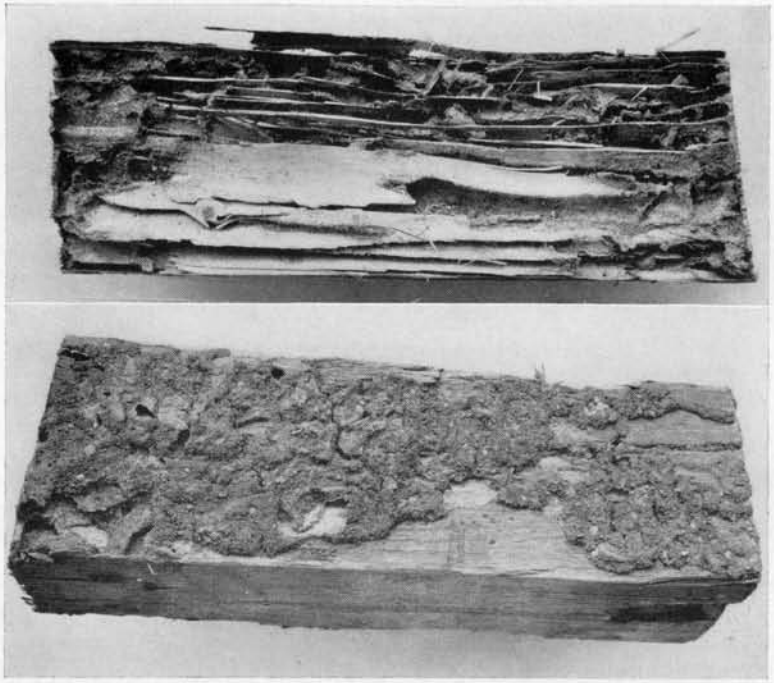

Figure 4. Lower photo shows external appearance of infested wood; top, a section of the same block opened to show termite burrows.

Prevention of Termite Damage

The easiest way to avoid damage by termites is to take preventive measures when the building is constructed. In Connecticut the probability that any one building will become infested has been considered too low to stimulate building inspectors to require termite-resistant construction. Some individuals have been interested, and the requirements are given here.

Termite-resistant construction was worked out in tropical regions to prevent attacks by a variety of termites native to those regions. Such of these measures as are adaptable to Connecticut houses with basements are as follows:

1. The foundations shall be of monolithic concrete, or of solid unit masonry laid solid in cement mortar and capped below woodwork with at least one inch of cement mortar. The top of the foundation shall be at least 12 inches above the final grade level.

2. Foundations adjoining masonry porches or terraces shall be of monolithic concrete with an extra thickness to avoid a crack between the fill and wooden portions of the building (Figure 5).

3. There shall be at least 18 inches clearance between the ground and any pipes, air ducts, etc., attached to the floor above in any partially excavated area. Such areas shall be provided with ventilation either from the basement or from the outside.

4. No wooden construction shall be used below the first floor framework except (a) basement stairs set on and not in the basement floor, and (b) basement posts or partitions set on concrete piers or curbs at least 6 inches above the finished basement floor.

5. If wooden construction is to be used in basements (such as family- or game-rooms) additional measures are required. The principle is to prevent cracks between floor and foundations, in the floor, and in the foundations.

In recent years termite control companies have developed systems of pretreating the soil under and around houses just before and during construction. This seems to be an excellent supplement when there is to be wooden construction in the basement.

Houses built on concrete slabs are just as vulnerable to termite entry as houses with basements. Here, most of the infestations have come in through expansion joints in the slab, or through wood in or near the soil at entrances. Pretreatment seems to be the minimum measure which should be taken in construction of such houses. If it is done properly,

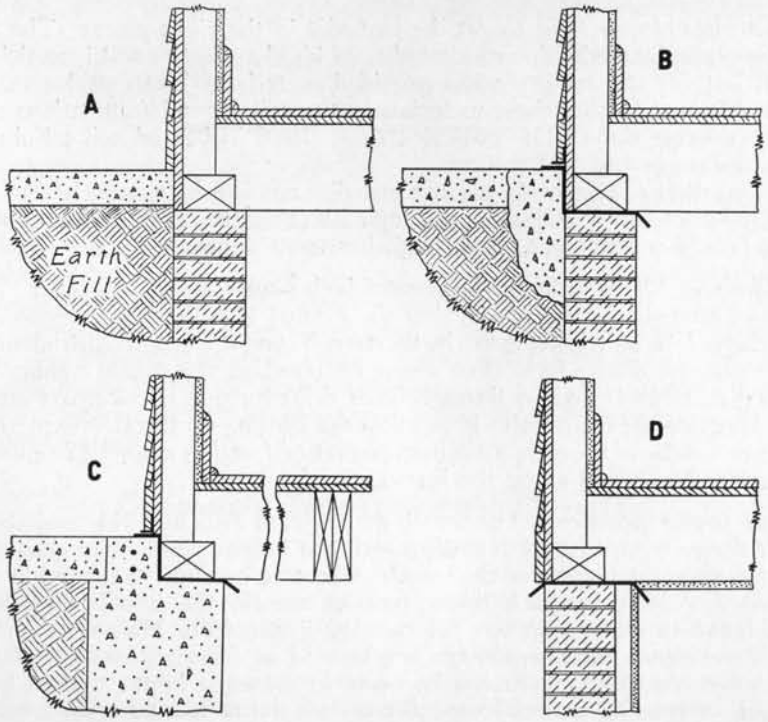

Figure 5. Earth-filled masonry porches and steps: A, affords easy entry to termites; B, a metal shield and a concrete barrier eliminate earth-to-wood contact; C, similar to B, used in new construction, cross bracing may replace solid header sometimes used at the sill; D, a metal shield used to protect woodwork above furred-out basement walls.

termites cannot persist in the soil under the slab, and much of the hazard of infestation will be eliminated.

Protection of susceptible materials stored in infested buildings. The contents of infested buildings are sometimes damaged by termite attack. This occurs particularly when the materials are stored without disturbance for long periods of time. An inexpensive and effective way of avoiding such damage is the construction of short piers on which metal shelving may be used for storage of the susceptible products (Figure 6). Such shelves should be located at least a foot away from partitions or walls.

Control of Termites in Buildings

The change of the structure of an infested building to conform to termite-resistant specifications has usually prevented further damage. However, such changes may be relatively expensive, and many people have preferred the less expensive chemical treatments. The principle on which these work is the impregnation of the soil with a chemical toxic to termites, thus stopping them from their trips to the wood of the house.

Individual termites are very susceptible to many insecticides. The problem has always been to get the material in the right places. The development and introduction of a number of highly effective soil insecticides which last for several years has provided materials. There still remains the problem of placing these materials in the soil around foundations and under concrete slabs. The critical area is the 6 inches of soil adjoining the foundations and under slabs.

Termite-treating materials are usually applied in a trench dug on the outside of the foundations, through holes drilled in the floor of masonry porches or terraces, or through basement floors.

Slab houses. The trench may be about 6 inches wide and a foot deep. The material diluted in water is added at the rate of 1 gallon for 5 linear feet of trench. The soil is replaced in the trench, and sprinkled with about 1 gallon for 10 linear feet. For masonry porches, the same amount of treating material is poured through holes drilled about a foot apart and 6 inches outside the main slab. If termites are coming up through expansion joints or cracks in the slab, a similar amount of treating material is applied through holes drilled along the line of the joint.

Houses with a basement. The trench may be 6 or 8 inches wide and about a foot deep. A bar is used to make a series of holes about a foot apart and 2 feet deep in the bottom of the trench. Treating material is applied at the rate of 2 gallons for each linear foot of trench, the trench filled and sprinkled with about 1 gallon for each 10 linear feet. Masonry porches and, if necessary, basement floors are treated as for slab houses. If the foundation has voids, holes can be made in masonry joints, and at least 1 gallon of treating material used for each 5 linear feet of wall.

Soil insecticides. Aldrin, chlordane, and dieldrin have been tested for at least 10 years and still kill termites. Heptachlor is still completely effective after 5 years, the total duration of the tests (Johnston[1]). Aldrin, dieldrin,

[1] Johnston, H. R. 1961. Volatilization is big factor in stability of termiticides in the soil. Pest Control 29(1):40.

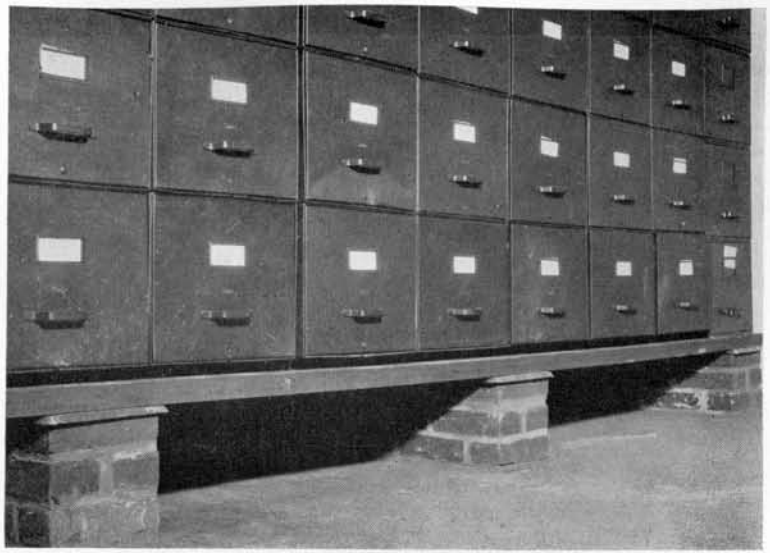

Figure 6. Records stored on a termite-proof rack in the basement of an infested building.

and heptachlor have been applied at a concentration of .5 per cent active ingredient. Such a dilution means 1 gallon of 2-lb. aldrin concentrate in 47 gallons of water; 1 gallon of 1.5-lb. dieldrin concentrate in 36 gallons of water; or 1 gallon of 23 per cent heptachlor in 48 gallons of water. Chlordane has been used at 1 per cent dilution, or 1 gallon of 46 per cent concentrate in 48 gallons of water.

These insecticides are somewhat toxic to people, and the concentrated form should be handled only when wearing rubberized gloves. There are usually directions for safe use on the labels, as well as suggested dilutions. Many companies also furnish pamphlets containing directions for use in termite control.

Commercial Termite Control Companies

There are companies that specialize in termite control, and many pest control operators (sometimes called exterminators) make termite control treatments. Their services vary all the way from reconstruction plus chemical treatments with "guarantees," to "spot" treatments of areas where termites are working. In general, termite treatments are much like other items of building maintenance; a competent professional with proper equipment does a better job than the inexperienced home owner. On the other hand, the home owner who gets an estimate of $300 from one operator, and of $65 from another, is just a little puzzled as to how to proceed. A study of the written proposals usually shows the high estimate includes 5 or 10 years of re-inspection, and sometimes the cost of any re-treatments necessary. The low estimate may include the treatment of only an earth-filled masonry porch that is infested with termites.

Selection of an operator may be made on the same basis as any other building maintenance. In the termite control field, there are state and national organizations of the firms interested in improving their services. Since both types of organizations have definite standards for membership, this is one way of selecting the more dependable operators. In general, service organizations owned locally, or with management owning property locally, have established a local reputation which can be ascertained by inquiry. There is nothing about termite control that makes firms located far away from Connecticut necessary for termite control. Finally, Chambers of Commerce and Better Business Bureaus have a great deal of information on service operators.

Acknowledgments

The studies made in the 1930's were by J. F. Townsend, Neely Turner, and M. P. Zappe. Mr. Zappe continued his work until his retirement in 1954, when W. T. Brigham and J. Peter Johnson conducted some of the examinations.