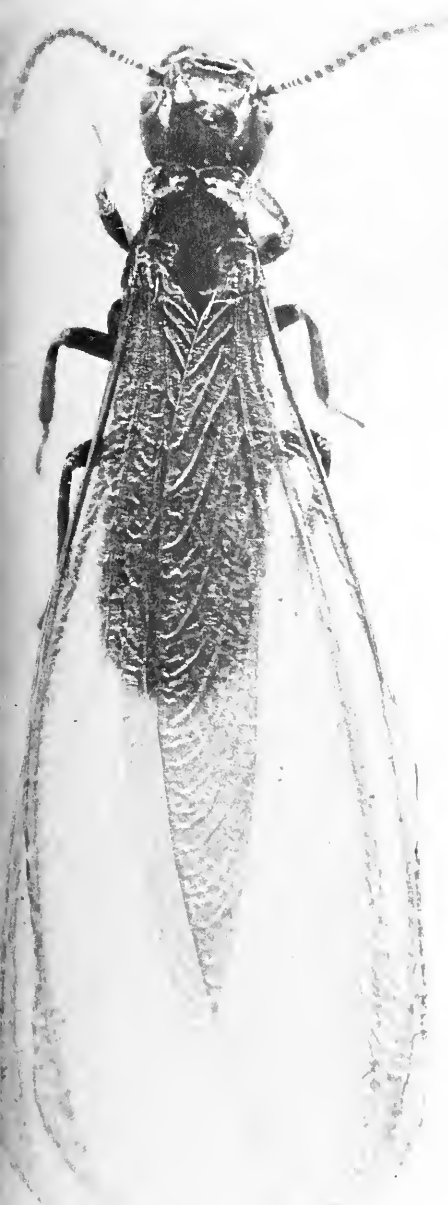


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TERMITES IN BUILDINGS

Neely Turner

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Winged adult termites (about $\frac{1}{8}$ of an inch long) are feeble fliers and soon lose their wings.

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STATE

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Foreword

The increase in numbers of Connecticut buildings infested by termites which occurred in the early 1930's prompted study and investigation of the situation. Examination of buildings disclosed that termites were present in many, and that damage was occurring. Their means of entry was determined, and both preventive construction and soil treatment studied and tested.

Results of these studies were published in Station Bulletin 382 and in articles in scientific journals and Reports of The State Entomologist. All are out of print.

When the new soil insecticides were introduced about 20 years ago, their effectiveness was determined in practical tests. Studies on means of entry have continued, with emphasis on the new types of construction in use.

This publication has been prepared as a report on all of this work. Staff members are available to identify insects believed to be termites, and to examine specimens of wood for signs of termite damage.

Information collected originally by J. F. Townsend, Neely Turner, M. P. Zappe, J. Peter Johnson, and W. T. Brigham is included in this Bulletin.

TERMITES IN BUILDINGS

Neely Turner

The only species of termite established in Connecticut is the eastern subterranean termite (*Reticulitermes flavipes* K.). These termites nest in the ground, and were certainly present long before the area was colonized. From time to time other species of termites, usually drywood forms that nest in the wood and not in the ground, have been brought into the state in furniture or picture frames. To the best of our knowledge, none of these exotic species has become established. It is doubtful if any of these, which are found in the tropics, could survive in this climate except under very unusual circumstances.

Termite damage to buildings was recorded near Boston, Massachusetts, as early as 1875, and in Connecticut in 1909. Between that first state report and 1931, only three infested buildings were reported. In 1932 there were seven; 1933, thirteen; and 1934, twenty-four. Since that time, the number of infested buildings reported has varied from year to year, but has always been large enough to confirm that termites are major pests in Connecticut.

The cause of this change has been the subject of a great deal of speculation. Certainly termite damage can be misidentified as rot, and possibly this happened in the early days. The installation of central heating systems allowed the termites to be active during the winter. But the major factor seemed to be changes in architecture. The "old colonial house" was built on stone foundations and usually close to the ground. This made it very susceptible to entry by termites. Fashions changed, and most dwelling houses were built on brick foundations which extended well above the surface of the ground. Porches in both cases were wooden. About 1920, the style changed and the "modern colonial" was adopted. Foundations were concrete, but the structure was close to grade, and the earth- or cinder-filled concrete porch or terrace was a common feature. The construction of these porches was such that termites found easy access from the fill to the wooden framework of the house. The termite "outbreak" of the 1930's could be attributed to this single factor. At that time, housing developments on cultivated farm land showed infestations only in the buildings constructed where farm buildings had existed, or along the site of a farm fence with wooden posts.

Since World War II the modern colonial has remained in vogue, and the ranch-type has been added. This more recent style is built just as close to the ground as the colonial, and also has the same concrete porches and terraces with the same easy access to termites. Moreover, the woodlands, once avoided for development, have become preferred. Since the woodlands are the natural home of termites, more infested dwellings are to be expected.

Damage Caused by Termites

Hundreds of buildings have been examined carefully for termite damage. Only one dwelling house has been found so badly damaged as to cause concern about its structural safety. Two other houses had very extensive damage, and in the recent past had been strengthened by auxiliary columns. All these houses were more than 150 years old. In newer buildings, there was seldom any sign of serious structural weakness.

Estimates of damages in dollars are difficult to make and defend. The cost of the wood consumed is usually very small, but the expense of removing and replacing it with sound wood is high. The cost of control by use of insecticides is relatively high.

Biology of Termites

Termites are social insects, and have castes or forms specialized for the work 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, which have very large heads and jaws, guard the members of the colony against attacks by other insects, mostly ants.



Figure 1. Termite workers, soldiers, and supplementary queens, shown about one and one-half times life size.

The colony does not occupy a defined space with recognizable permanent chambers and runways. It is usually located below the frost line and in moist but not wet soil. A colony is produced very slowly, until for reasons not yet understood some supplementary queens are developed. The eggs produced by these queens will develop into mature males and females. When these molt for the last time, they are black and have four wings (Cover photo). They 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 as an indication that the building is infested.

Worker termites construct runways in all directions in search of food. The principal food is cellulose, which is digested by the aid of protozoa in the digestive tract. 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. They may attack dead roots of living trees. Infestations have been found in living geraniums, strawberries, phlox, and other plants with a large crown, from time to time. In infested buildings, they have fed on paper and books, fabrics and shoes.

It is obvious that a single worker termite, less than a quarter of an inch long, cannot consume much wood at a time, and cannot make very many trips from the colony to wood in buildings in a single day. Thus serious damage to buildings is the result of years of feeding by a large colony or colonies.

How Termites Enter Buildings

Termites may enter buildings (1) through direct contact between the wood and the soil, (2) through cracks or hollows in masonry and 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 concrete porches and terraces (Figure 3); wooden supporting posts, partitions, and steps built in basements before concrete floors are poured; and wooden hatchway, steps, porches, and even basement window frames offer such direct contact. In more than half 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 means of entry has been more common in older buildings with stone foundations than in modern structures. Masonry block foundations are also vulnerable.

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



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

There is no record of establishment of a termite infestation in a house from infested fireplace wood or lumber. It is possible that this could occur, but very unlikely.

Finding Termites in Buildings

The occurrence of swarms of winged termites may be the first indication that a building is infested. Such swarms may occur as early as January, in heated houses, but are more common in February and March. They may take place as late as July indoors. Out of doors, the swarms usually occur between the middle of April and August first. In buildings, the termites appear from a crack either in the floor or woodwork. They come out rather rapidly for several minutes, and then disperse. These winged adults may be killed easily by any household insecticide spray or aerosol if they occur in sufficient numbers to be a nuisance.

Winged ants of about the same size as termites may also emerge in



Figure 3. 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.

houses. The ants are wasp-waisted; termites do not have such a constriction. Ants usually occur in small numbers; termites usually are more numerous. Ants fly freely, do not lose their wings quickly, and may be around for several days; termites are feeble fliers, shed their wings, and disappear within an hour.

The brown, earth-like shelter tubes (Figure 2) 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 a section is broken away, the workers will repair it. If the tube has been abandoned, it 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 screwdriver. If there is much of an infestation, the probe will open up some of the burrows. These are very characteristic (Figure 4). The soft portions of the wood are eaten, leaving the hard sections. There may be accumulations of a sort of wood paste which resembles commercial wood putty. There are also distinct spots of excrement.

A similar sort of examination can be made of wooden posts in the basement, and of the sill and joists adjoining masonry porches.

Other insects also damage wood in houses. Carpenter ants excavate wood softened by moisture or by rot to make a nest. They cast away the bits of wood removed as a sort of sawdust, which accumulates in

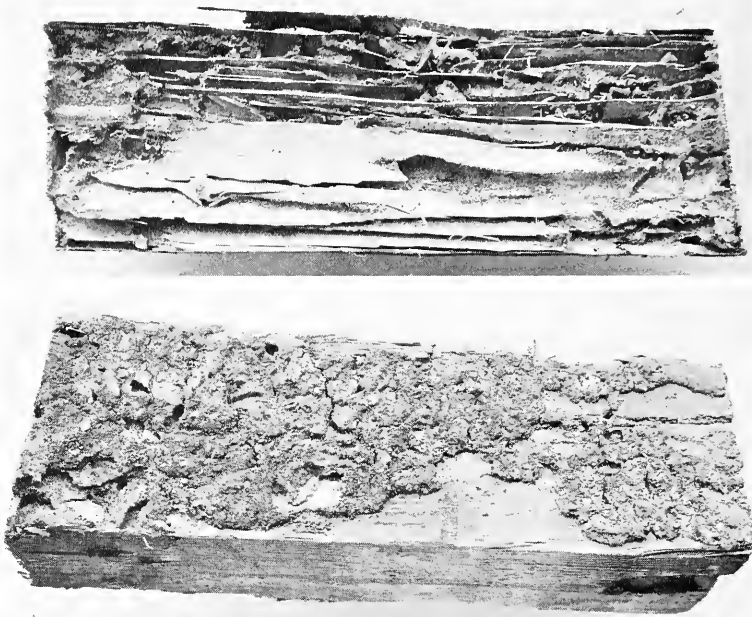


Figure 4. Lower photo shows external appearance of infested wood; top, a section of the same block opened to show termite burrows.

little piles below the infested wood. Ant burrows have no wood paste present and no spots of excrement. They usually contain legs and other hard portions of the insects which they use as food. Powder post beetles eat the wood and leave pelleted deposits of excrement resembling wood flour in the burrows. When they emerge from infested wood they do so through small round holes eaten through the surfaces. The powdered excrement sifts from these holes.

The old house borer (*Hylotrupes bajulus* L.) is very destructive in houses in northern Europe. The common name is somewhat confusing, because in Connecticut it has been found in new houses. The adult is a long-horned beetle, emerging late in the summer and laying eggs in cracks in lumber. The larvae feed for several years before maturing. The beetles which emerge into a house probably cannot lay eggs in finished woodwork. However, those which come out inside walls can find suitable sites for egg-laying. In some cases in Connecticut, the infested houses had been built only a year or two before the beetles were found. It is likely that infested lumber was used in construction of these houses.

The wharf borer (*Naccerdes melanura* L.) is another long-horned beetle occasionally found in buildings. It is usually found only in wood that is wet for long periods of time. Since such wood will also rot, this pest is not considered serious.

Fungi also grow in wood, especially in damp situations. This causes the "dry-rot" so often found in buildings. Actually fungi cannot grow in dry conditions. Rotted wood may be checked on the surface, but unless it is also infested by insects, there are no burrows.

PREVENTION OF TERMITE DAMAGE

The easiest way to avoid damage by termites is to take preventive measures when the building is constructed. Special care is needed in design and construction near or below grade level, so that termites do not have an easy and convenient way to reach wood.

The most common means of entry in Connecticut has been through masonry porches and terraces. The simplest construction to avoid this entry is use of an additional thickness of foundation which prevents contact between wood and fill (Figure 5).

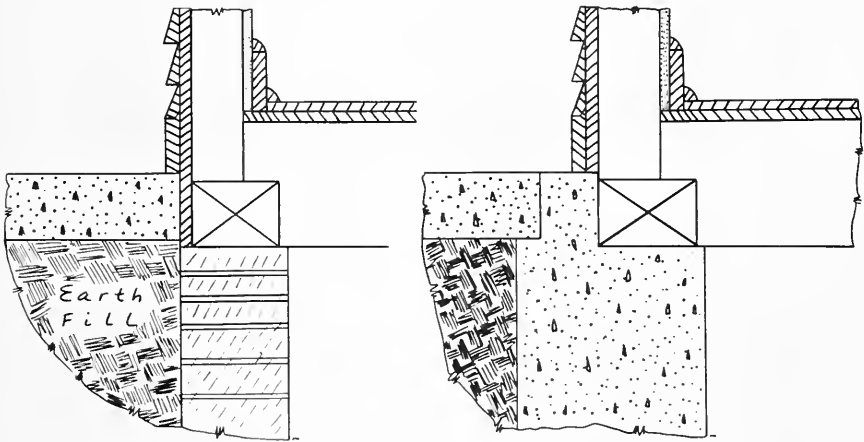


Figure 5. Cross-section of construction of masonry porch or terrace showing (1) easy access from fill (at left), and (2) construction with an extra thickness of foundation (at right).

The other very common means of entry has been into wood extending through the concrete basement floor. This can be avoided by constructing the floor first, and placing all wooden construction on it.

In houses built on concrete slabs, reinforcement is required to prevent cracks, and there should be no joints underneath wooden partitions.

Especially tight construction of floors and walls is required if the basement is to be finished with wood.

Care must be taken to avoid changes that allow termites to enter after a house is built. Wooden posts or trellises set in the ground and attached to the house furnish easy access to termites. Additional fill to raise the grade may bring the soil in contact with wooden construction.

Termite-resistant construction should be considered seriously for houses

which will be supplied by water from a well on the premises. Details for such construction can be found in USDA Home and Garden Bulletin No. 64.

Pretreatment

Some termite control companies have developed systems of pretreating the soil under and around houses during construction. This allows thorough treatment in areas which are hard to reach after the building is completed. It is an excellent supplement to other precautions, especially when there is to be extensive wooden construction in basements, or a building on a concrete slab. The method must be used with care if the water supply of the building is from a well on the premises (see also page 14).

Susceptible materials, such as books, paper, clothing, and leather goods, stored in infested buildings may be damaged by termites. Such materials may be protected by storage on free-standing shelves, preferably metal, or even on wooden shelving constructed on short masonry piers (Figure 6).



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

Control of Termites in Buildings

Serious damage to the structure of infested buildings is more a matter of years than of weeks or months. For this reason, the decision as to how and when control measures need be taken can usually be reached deliberately. Even if there is evidence of structural weakness (as in older buildings) temporary support can be provided while plans are being made for repairs and control.

Changes in the structure of an infested building to conform to termite-

resistant specifications have usually prevented further damage. However, such changes may be relatively expensive, and many people have preferred the less expensive chemical treatment of the soil around and under the building. The principle on which these chemicals work is the thorough mixing of an insecticide toxic to termites in the soil occupied by termites, or through which they must travel to reach the building.

Individual termites are very susceptible to many insecticides. The problem always has been to apply the material in the right places. Several highly effective soil insecticides which persist for years are available. When these are applied properly to the 6 inches of soil adjoining the foundation, and under slabs, control has resulted.

These insecticides are usually applied in trenches dug on the outside of foundations, and through holes drilled in the floor of masonry porches or terraces and through basement floors (both adjoining the foundation and along any infested partitions).

Houses on Concrete Slabs

The trench may be about 6 inches wide and not more than a foot deep. The diluted insecticide is applied 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 each 10 linear feet. For masonry porches, the same amount of material is poured through a series of holes 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 material is applied through holes drilled along the line of the joint or crack.

Houses with a Basement

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

Soil Insecticides

Soil insecticides are usually applied as water emulsions. The concentrated insecticide is mixed with water to form the desired concentration. The ones used most commonly in Connecticut have been chlordane, dieldrin, and heptachlor.

Chlordane has been used at 1 percent dilution, which means 1 gallon of 46 percent concentrate in 48 gallons of water.

Dieldrin has been used at .5 percent dilution, or 1 gallon of 1.5-lb. dieldrin concentrate in 36 gallons of water.

Heptachlor was also used at .5 percent, or 1 gallon of 23 percent heptachlor concentrate in 48 gallons of water.

These insecticides are somewhat toxic to people, and the concentrates should be handled only when wearing rubberized gloves. There are other directions for safe use on the labels.

The Federal Housing Administration has issued standards for Individual Water Supply Systems (wells). These standards provide (1102-3.3) that the minimum distance between a well and chemically poisoned soil be 100 feet. This distance may be reduced to 50 feet "only where the ground surface is effectively separated from the water bearing formation by an extensive, continuous impervious strata of clay, hardpan, rock, etc. The well shall be constructed so as to prevent the entrance of surface water and sewage as effectively as the undisturbed impervious soil prior to the well construction."

"1102-3.5 Individual water supply systems are not acceptable in areas where chemical soil poisoning is practiced if the overburden between the ground surface and the water bearing formation is coarse-grained sand, gravel or creviced or channeled rock which will permit the recharge water to carry the toxicants into the zone of saturation."

Commercial Termite Control Companies

There are companies in Connecticut that specialize in termite control, and many pest control operators (sometimes called exterminators) make termite control treatments. All are licensed under state statutes, and have passed an examination on safe use of pesticides.

In general, termite treatments are in the same category as other items of maintenance of buildings; a competent professional with proper equipment and a knowledge of the subject can do a better job than an inexperienced home owner. Selection of an operator may be made on the same basis as any other type of building maintenance.

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