

Termite Prevention and Control by Design in the Southeast

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.



Course Description

Building enclosures are responsible for controlling heat flow, air flow, vapor flow and a number of other elements. In the southern US, they are also essential for termite prevention. This presentation will explore design considerations associated with wood-frame building enclosures and the role of control layers in addressing items such as durability, termite prevention and control, and thermal continuity. Beginning with a review of building enclosure design fundamentals and considerations, it will then cover best practices for a variety of wood-frame building enclosure assemblies and details. Next, a brief overview of termites encountered in the South will be presented, with a focus on prevention and control strategies for multi-family and commercial wood buildings. A combination of initial design strategies to prevent termites from entering structures and proper maintenance programs for surveillance will be reviewed. Finally, critical details of building enclosure assemblies (walls, ground plane intersection, windows, roofs) will be reviewed with an emphasis on continuity of critical barriers against moisture and termites. The program will conclude with an interactive discussion and opportunity for attendees to engage.

Learning Objectives

1. Review building science fundamentals and building enclosure design considerations for light-framed wood buildings in hot and humid regions.
2. Explore the role of control layers in building enclosures for elements such as heat flow, bulk water intrusion and air flow.
3. Identify the types of termites that are found in the southeast and understand their paths of entry into building structures and the damage they may cause.
4. Understand and apply the Termite Protection requirements of the most building codes for multi-family and commercial projects.

Putting Termites in the Context of the International Building Code

- Numerous sections referencing “termite protection”
- Termite protection is not just about protecting structures. We also protect contents. You can have a termite problem in steel frame and concrete block structures.
- The key to building termite resistant structures is to deny them access.
- Eliminate conducive conditions: moisture.
- Appropriate assemblies for the climatic conditions of the country



Effective Termite Protection for Multi-Family & Commercial Wood Buildings

Techniques for Keeping Wood-Frame Buildings Pest-Free

Wood-frame construction is a good choice for commercial and multi-family buildings, even in states where termites pose a higher risk. Wood buildings are safe, economical and sustainable. With the right precautions, they're also durable and insect resistant. That includes proper design and detailing, good construction practices, and a pest management strategy that involves pesticides and/or physical barriers. Where termites pose a risk, it is good practice for the general contractor to engage a pest control specialist during pre-construction to map out an appropriate plan.

According to Faith Di, PhD, Director of the University of Florida's Pest Management University, the key to effective termite prevention is making the building inhospitable to termites. "Subterranean termites, which are the most

damaging and economically important species in the U.S., follow pheromones and physical guidelines such as the outside of foundation walls. They can use any gap as a pathway—so it's important to minimize hidden access and treat critical areas."

This paper focuses on how to design and construct wood-frame buildings for termite prevention, and how to keep buildings insect free over the long term. Intended for developers and design/construction teams, it covers building code requirements, best practices, control methods, costs, and ongoing maintenance. It emphasizes subterranean termites including Formosan, and briefly covers drywood termites and other insects with the potential to cause damage.



https://www.woodworks.org/wp-content/uploads/wood_solution_paper-Effective-Termite-Protection.pdf

Termite prevention recommendations haven't really changed in ~85 years (and neither have the termites...or poor building construction)

BAD:

- Moisture
- No inspection space
- Guidelines, including plant roots leading to foundation; siding below grade, pipes and conduits
- Wood in contact with ground



Fig. 50. This sketch combines the sorts of conditions found to prevail in many localities where wood has been improperly used. Unprotected wood in or on the ground makes possible both settlement and rapid increase of the subterranean termites. Workings in stumps, poles, posts, sidewalks, and wood of buildings are shown in black, as are the galleries within the earth. *A* marks the supposed original point of entry of one of the colonizing pairs, and *B* the points of emergence of swarming alates at the proper season.

From 1934 publication (Kofoid)

The Southeast has more termite species than any other region in the U.S.

- ~2,500 termite species
- ~45 in U.S.
- Including the Formosan subterranean termite
- Top 100 global invasive species list



USDA Termite Probability Map

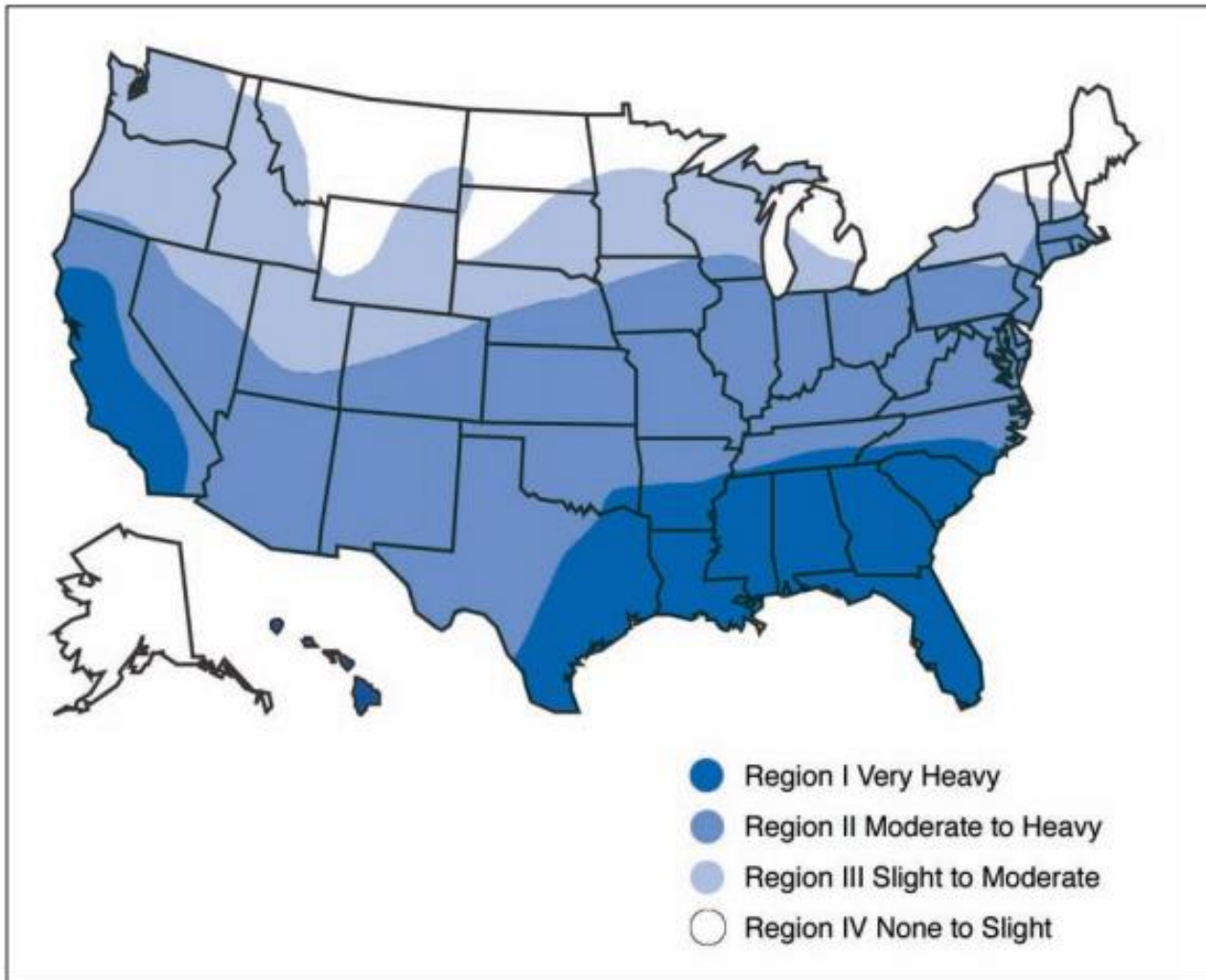


Figure 1. — Relative hazard of subterranean termite infestations in the United States.



Dated distribution map for FST (2004)

- FST in TX since 1956; 31 counties:
<https://urbanentomology.tamu.edu/urban-pests/termites/formosan/>
- Established in New Orleans, 1966

What is a termite?

- Termites are blind, soft-bodied insects
- “Cryptobiotic”
- Exploit cellulose
- Thousands to millions in a colony
- Time is on their side
- Best control: PREVENTION with good building construction practices



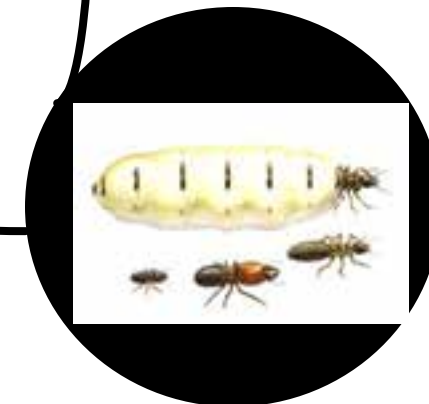
Where Termites are Found

- Drywood termites
- Attics, cabinets, trim, furniture
- Spot treatment; fumigation



- Dampwood termites
- Only where wood is constantly wet
- Dry out

- Subterranean termites; can build directly on a large colony
- Structural timbers
- Contents
- Soil termiticides, baits, borates, physical barriers (Termistop/Termimesh, Basaltic Barrier/geotextiles)



General Information on DWs

- DW infestations generally localized
- Live in dry, sound wood
- No ground connection (so galleries do not contain mud)
- Galleries run across the grain of the wood



EVIDENCE AND DAMAGE



Potter, in Mallis

Fumigation is effective. And expensive. Based on volume.

- Several days to drop tarps
- Over 1 million cu. ft.
- Fume done over long weekend
- Challenges:
 - Finding and sealing areas to adjoining building
 - Wind tearing tarps



By far the most economically important termite is the subterranean termite. Damages structures and contents.

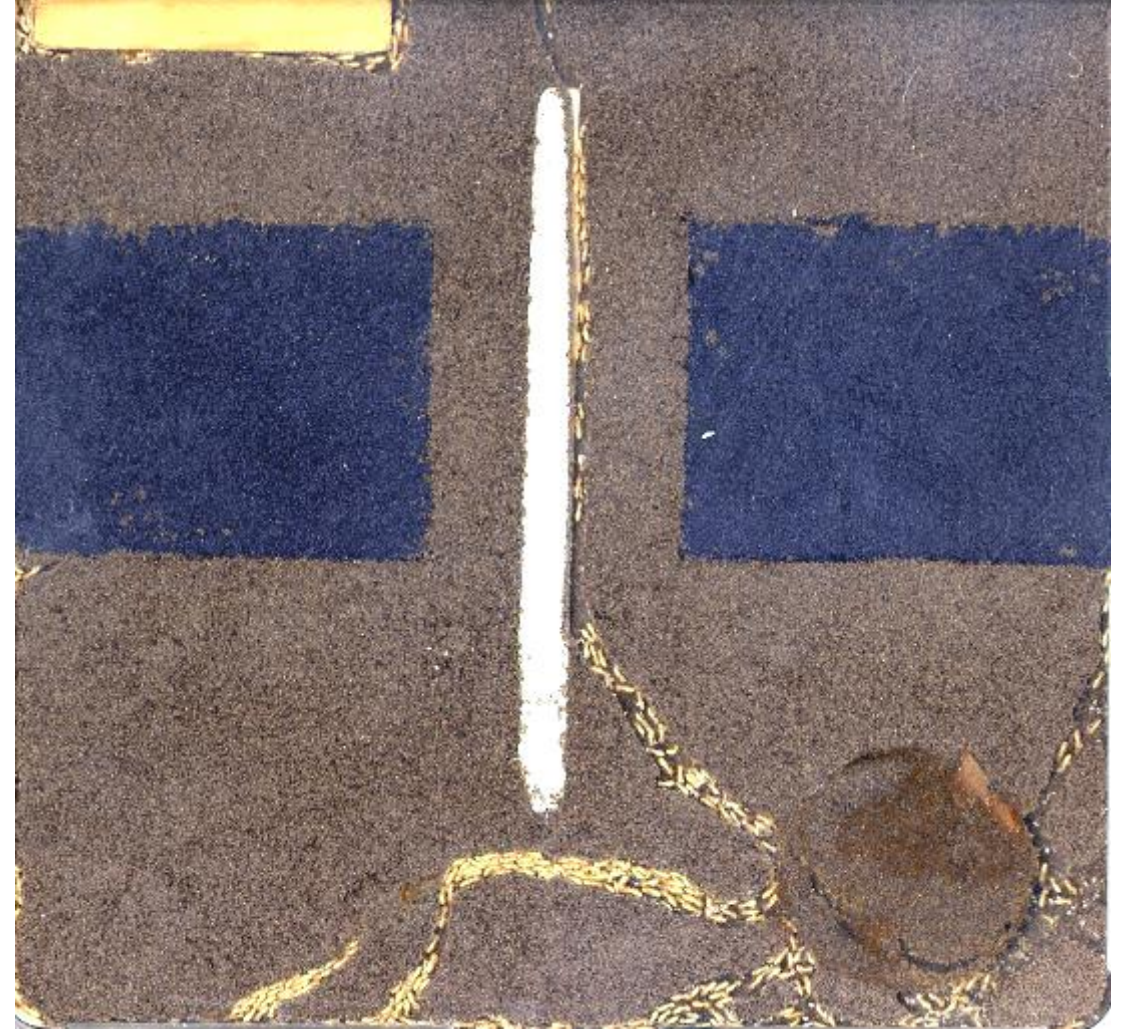


Global economic impact of termites is estimated at \$40B with 80% being due to subterranean termites

Termite Tunneling and Guidelines



Day 14



Day 14 (Found Gap 3d)

By far the most economically important termite is the subterranean termite. Damages structures and contents.



Global economic impact of termites is estimated at \$40B with 80% being due to subterranean termites

By far the most economically important termite is the subterranean termite. Damages structures and contents.



Box of pesticides



“IRC is a good reference for termite prevention strategies”

WW-WSP 16, pg 4

You may see state or local code language like the following:

“Termite protection shall be provided by registered termiticides, including soil applied pesticides, baiting systems, and pesticides applied to wood, or other approved methods of termite protection labeled for use as a preventative treatment to new construction. See Section 202, “Registered termiticide.”

Paths of Entry into Structures

We have >60 building construction elements at PMU that termites can exploit to enter structures and should be protected.



Soil termiticides are still the most commonly used method of control. Two times a structure can be protected: “New” construction and post-construction



Photo: B. Hamilton

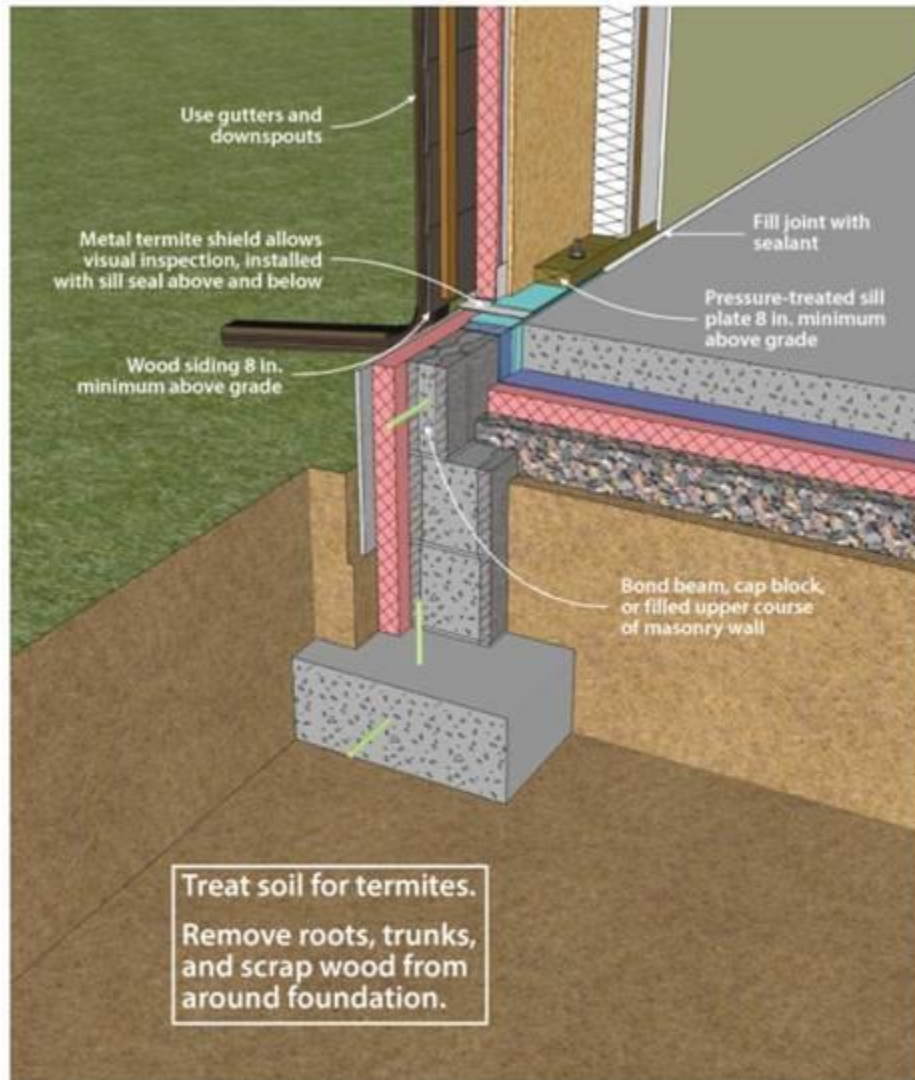


Figure 4-6. Slab-on-Grade Termite Control Techniques

TERMITE AND WOOD DECAY CONTROL TECHNIQUES

Techniques for controlling the entry of termites through residential foundations are necessary in much of the United States (see Figure 4-6). Consult with local building officials and codes for further details.

Termites can exploit every gap, including the I-bolt used to secure the sill plate to the masonry wall

In multi-family and commercial construction, when slabs contain “cold-joints” or with post-tension cable construction, it will be important to minimize “hidden access” and treat “critical areas”

Soil Termiticide Treatment

Usually Several Hundreds of Gallons

Monolithic slabs

- 1 gallon per 10 ft²
 - + 4 gallons per 10 linear feet per foot of depth around perimeter

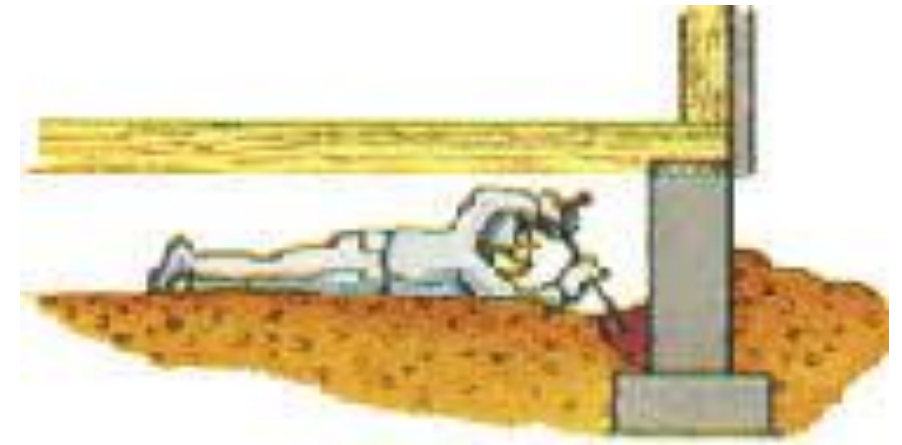
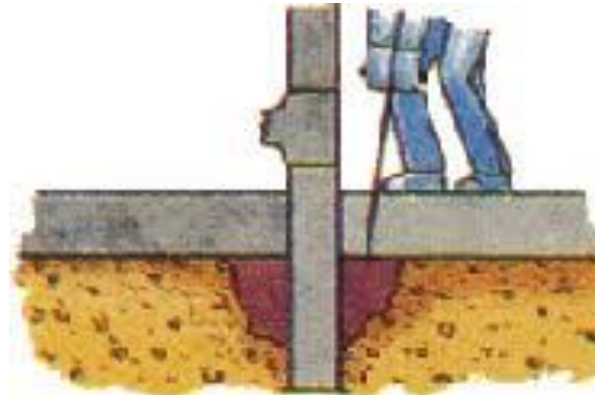
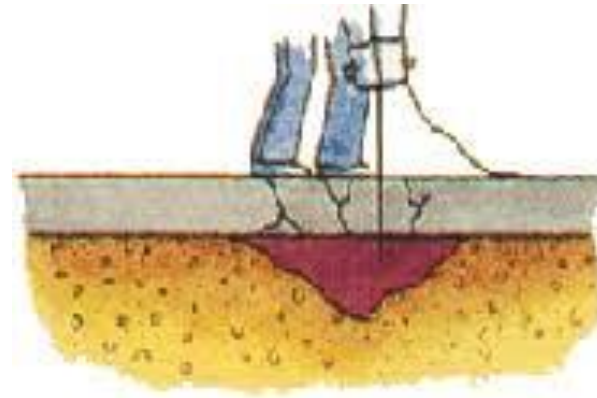
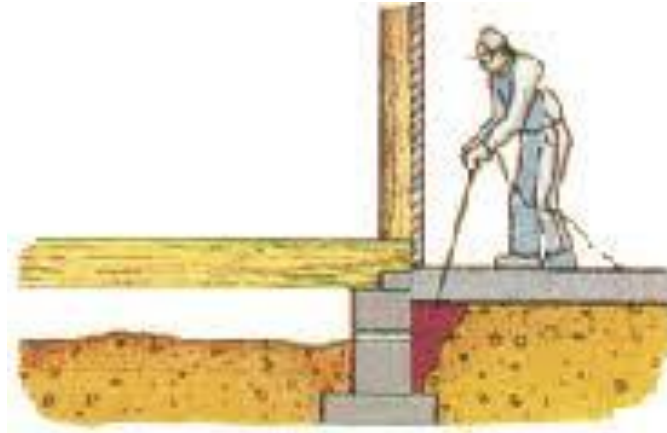
Supported or floating slabs

- 1 gallon per 10 ft²
 - + 4 gallons per 10 linear feet per foot of depth inside perimeter of stem wall (concrete block walls)
 - + 2 gallons per 10 linear feet for block voids
 - + 4 gallons per 10 linear feet per foot of depth around outside perimeter



The goal of treatments is to create a treated zone or barrier

Images used in training of application methods



In reality, termiticide distribution in soil is analogous to the chocolate parts of a marble cake



From BTF, UGA

babeinthecitykl.blogspot.com (EX-Z750)

Soil Termiticides are Applied in an Imperfect World so
We Need to be as Thorough as Possible



Soil Termiticide Treatment



Any disturbance to the treated soil can displace the termiticide. Even the simple act of laying out and moving the hose for treatment has to be thought out.

Soil Termiticide Treatments and Changes in Plans

=RETREATMENT OF AREA

“If soil treatment is used for subterranean termite prevention, soil area disturbed after initial chemical soil treatment shall be retreated with a chemical soil treatment, including spaces boxed or formed.”

Moving plumbing and adding bay windows, etc.



Concerns with Liquid Termiticides

Use of many gallons of chemicals to treat a structure

Longevity questions

- Soil type, climate, etc

Can't be used in certain situations

- Wells
- Low lying areas
- Areas subject to high moisture



Situations Where Baiting Systems May Be Preferred

Close proximity to wells

High water tables

Concerns about chemicals

Situations:

- Where termiticides may wash away
- Resulting from poor construction practices
- Where pets and vertebrate pests may dig
- Where soil will be disturbed by landscape or irrigation system installation and maintenance

Subterranean Termite Baits

- Low impact approach
- Highly selective
- Requires no drilling in concrete
- Control can often be achieved without entering the structure
- Uncertain of efficacy in multi-story buildings
- Possible to use “above ground” bait
- Not effective against *Nasutitermes* or drywood termites

Why Bait? Challenging Building Construction

Rigid foam board below grade

Foam insulation to the third floor with FST infestation

Rationale: If termites are not in an area, structures are not as risk



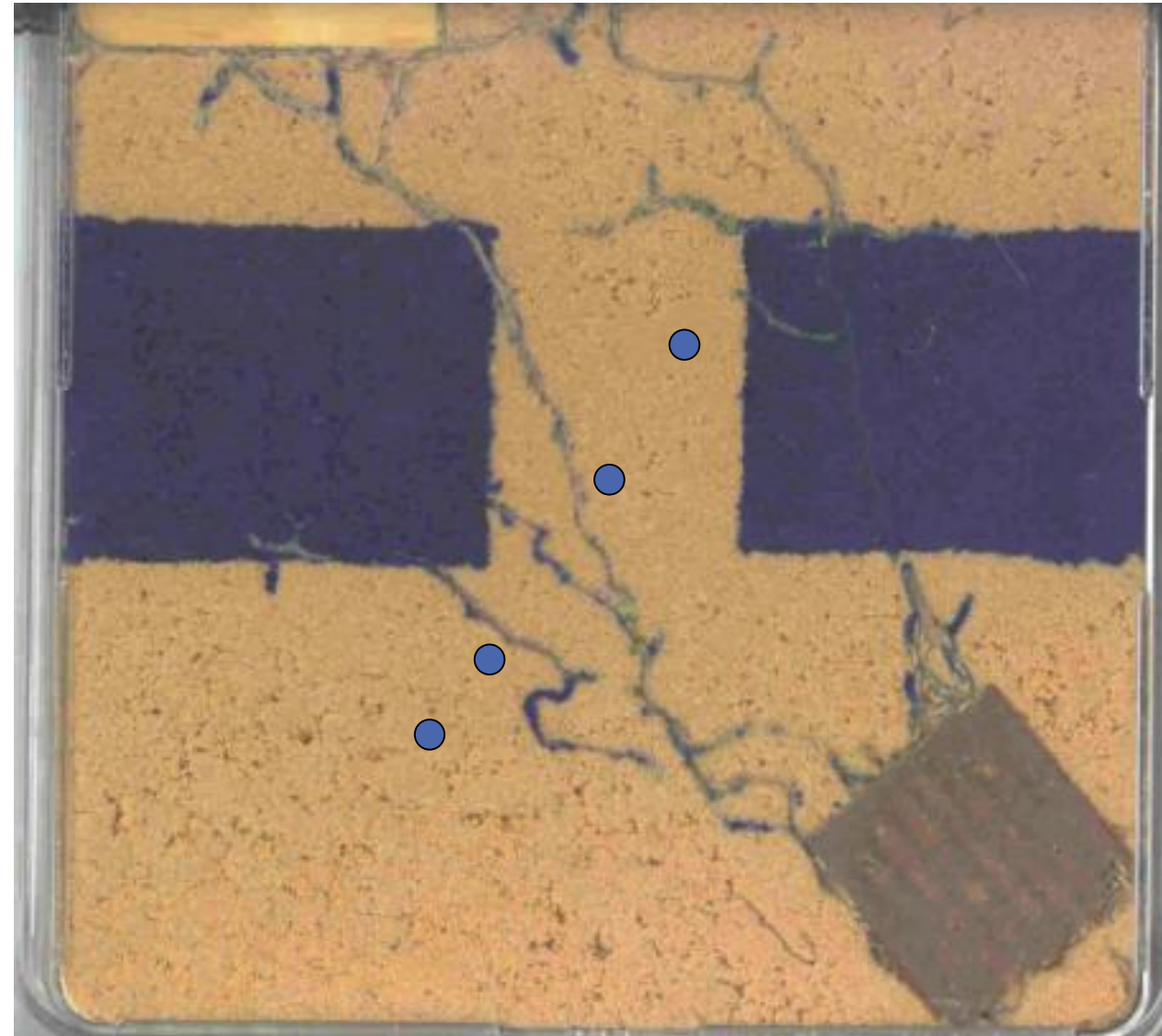
Baiting Systems



Disadvantages of Baits

Success also depends on skills and dedication of the technician for installing, monitoring, baiting, and maintaining the bait station

On-going cost of maintaining the system



If bait stations are placed in areas of “conductive condition,” more stations are “hit” and faster.

Borate-Containing Compounds

Disodium octaborate tetrahydrate (DOT)

- Similar to boric acid
- Acts as a stomach poison
- Termites will generally avoid wood that has been treated with borate compounds
- Treatment methods include penetrating (sometimes referred to as borate pressure treated or industrial) and topical
- Includes borate-containing compounds like Bora-Care
 - Bora-care is the only borate approved for new construction in Florida

Challenges with borates



Borates

“If a registered termiticide formulated and registered as a wood treatment is used for subterranean termite prevention, Sections 1816.1.1 through 1816.1.6 do not apply. Application of a **wood treatment** termiticide shall be as required by label directions for use, and must be completed prior to final building approval. **Changes in framing or additions to framing in areas of the structure requiring treatment that occur after the initial wood treatment must be treated prior to final building approval.**”



Invasive species issue: The “newest” termite species in Florida that does not respond to baits and borates



Nasutitermes corniger

Borates—can be a helpful “add-on”



Florida allows borates as a stand-alone, new construction treatment. Most states do not allow borates as a stand-alone. Be aware!

Physical Barriers

Barrier prevents termite penetration

Termi-mesh

- corrosion-resistant stainless steel

Must be installed at time of construction



Table of Possible Control Methods for Wood Frame Construction

Method	Subterranean	Drywood	Decay Fungi	Longevity	Comments
Soil termiticide	Yes	No	No	2 to 15+ years	Math
Baits	Yes	No	No	4 to 7+ years to indefinitely as long as system is maintained	Relying on termite foraging
Wood treatment	Treated areas only	Treated areas only	Treated areas only	10+ years; inorganic salt	Can be used to meet 2304.12 on wood-decay
Physical barriers	Yes	No	No	10+ years	QA? Could be excellent option for larger structures; \$\$

Best practices: Use more than one method in conjunction with good building practices. Eliminate debris, no wood-to-ground contact, hidden access, moisture

Please plan for at least a 6" inspection space

“In order to provide for inspection for termite infestation, clearance between exterior wall coverings and final earth grade on the exterior of a building shall not be less than 6 inches (152 mm)...”





Inspection space preferred

Conducive conditions

And the termite company knew it

A 6" space will allow for corrections after landscaping is installed



These are designs that encourage conducive conditions



Conducive Conditions

Moisture...is the root of all evil (infestations)



Specify practices that protect against decay and termites

“Condensate lines and roof downspouts shall discharge at least 1 foot (305 mm) away from the structure sidewall, whether by underground piping, tail extensions, or splash blocks...”



Specify practices that protect against decay and termites

“...Gutters with downspouts are required on all buildings with eaves of less than 6 inches (152 mm) horizontal projection except for gable end rakes or on a roof above another roof.”



Termite Problem Areas

Roofs and Gutters

Complex roofs and improper flashing

- Trap water
- Contribute to leaks

Downspouts directed close to building

- Rainwater erodes treated soil
- Moisture degrades termiticides



Termite Problem Areas

Windows

Windows with inadequate or no flashing

- Allows moisture to seep in

Windows with top moldings

- Act as ledges to catch water



Build with termite resistant materials

“Plastic composites containing wood, cellulosic or any other biodegradable materials shall be termite and decay resistant as determined in accordance with ASTM D7032.”

Build with termite resistant materials: A note about foam

“In Florida, extruded and expanded polystyrene, polyisocyanurate and other foam plastics shall not be installed on the exterior face or under interior or exterior foundation walls or slab foundations located below grade. The clearance between foam plastics installed above grade and exposed earth shall be not less than 6 inches (152 mm)...”



The same reasons that made termite control a challenge are true today

- Many states are “visual and accessible” states
- Spray foam obscures evidence of termites





Georgia Dept. of Agriculture Consumer Notice

- The Georgia SPCC does not regulate PSFI, but it is “responsible for regulating the Pest Management industry in Georgia.”
- To inform consumers “how PSFI may adversely impact the ability to inspect for and control termites, carpenter ants, wood boring beetles, and other pests including rats and mice.”

Rodent rub marks
Photo: B. Williams



Spray Foam Insulation & Pest Management

The Georgia Structural Pest Control Commission (SPCC) serves the public by adopting regulations and policy to protect the health, safety and welfare of the citizens of Georgia. As part of their mission, the SPCC works with GDA to educate the public about structural pest management. This document was created to provide a background on spray foam insulation and issues related to pest management.

Reference – Polyurethane Spray Foam Insulation (PSFI)

The following is important information for Georgia consumers related to *Polyurethane Spray Foam Insulation*.

The Georgia Department of Agriculture **does not** regulate Polyurethane Spray Foam Applicators, but is responsible for regulating the Pest Management industry in Georgia. The Pest Management industry has noticed an increase in PSFI installations in the State of Georgia during routine inspections for wood destroying organisms and have brought this to the attention of the SPCC. This publication is an effort to inform consumers how PSFI products may adversely impact the ability to inspect for and control termites, carpenter ants, wood boring beetles, and other pests including rats and mice.

If you are considering the installation of PSFI or have already installed this product, we urge you to read the following information to ensure you understand the risks associated with this product.





Challenges
for
termite/WDO
control and
building
construction
will continue

Solutions will
evolve...**So
what to do?**

Termite prevention recommendations haven't really changed in ~85 years (and neither have the termites...but can we...)

Do:

- Decrease moisture
- Keep and ample inspection space
- Decrease guidelines, including plant roots leading to foundation; siding below grade, pipes and conduits
- Eliminate wood in contact with ground

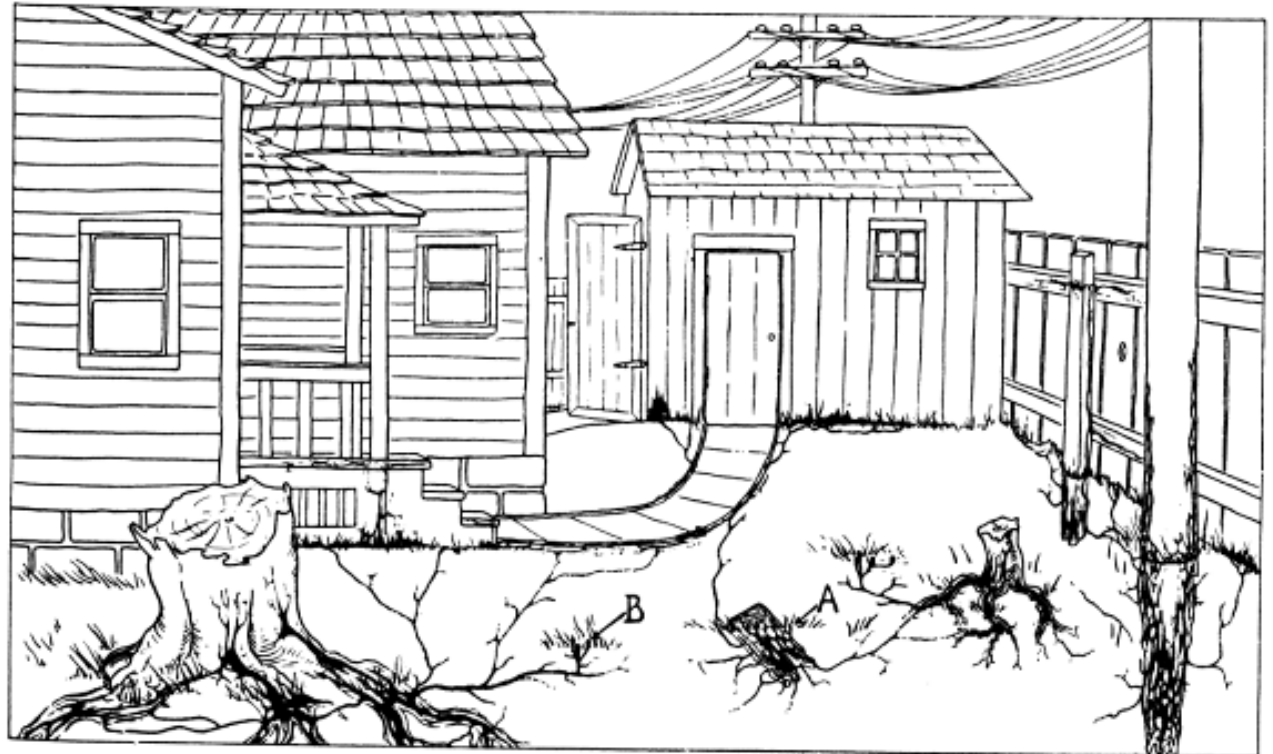


Fig. 50. This sketch combines the sorts of conditions found to prevail in many localities where wood has been improperly used. Unprotected wood in or on the ground makes possible both settlement and rapid increase of the subterranean termites. Workings in stumps, poles, posts, sidewalks, and wood of buildings are shown in black, as are the galleries within the earth. *A* marks the supposed original point of entry of one of the colonizing pairs, and *B* the points of emergence of swarming alates at the proper season.

From 1934 publication (Kofoed)

> QUESTIONS?

This concludes The American Institute
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