

Termite Protection for Exterior Insulated Foundation Systems

BUILDER TECHNOTE

The Issue

Foam insulation materials have excellent thermal properties as well as good resistance to moisture. These characteristics make both open- and closed-cell foam materials particularly well-suited for use below grade as a foundation insulation system. Exterior foam insulation is often the preferred method for slab-on-grade, crawl-spaces, and frost-protected shallow foundations.

However, in termite-prone areas (much of the U.S. extending from Florida northward as far as Connecticut and all points to the west as shown in the map below), the use of exterior foam insulation may provide a hidden path for termites to find their way into the

structure. Although the insulation itself is not a food-source for the termites, they can tunnel through the foam to get to more nutritious material – cellulose or the wood structure. While the insulation does not increase the likelihood of termite activity around the building, it can make detection more difficult. The termites are able to bore through foam insulation or between the insulation and the foundation wall and remain concealed from view. Given an impenetrable exposed surface like concrete, the termites are more likely build mud

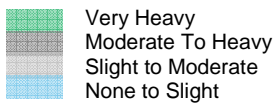
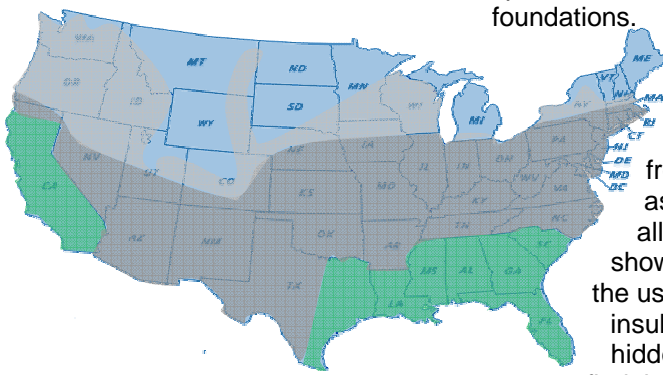
tunnels on the exterior wall when trekking from the moist soil to wood framing members and thus, increase the possibility for visual detection.

Because the areas of heavy and moderate termite infestation are also those areas where slab-on-grade or crawlspace foundations are typical, the issues of good thermal performance and recommended termite protection are often at odds. In some cases, building codes limit the installation of exterior foam plastics in heavily infested regions. The IRC, for example, states:

R320.4 Foamplastic protection. *In areas where the probability of termite infestation is very heavy as indicated in Figure R301.2(6), 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 at least 6 inches (152 mm).*

Exceptions:

1. Buildings where the structural members of walls, floors, ceilings and roofs are entirely of noncombustible materials or pressure preservative treated wood.
2. When in addition to the requirements of R320.1, an



approved method of protecting the foam plastic and structure from subterranean termite damage is provided.

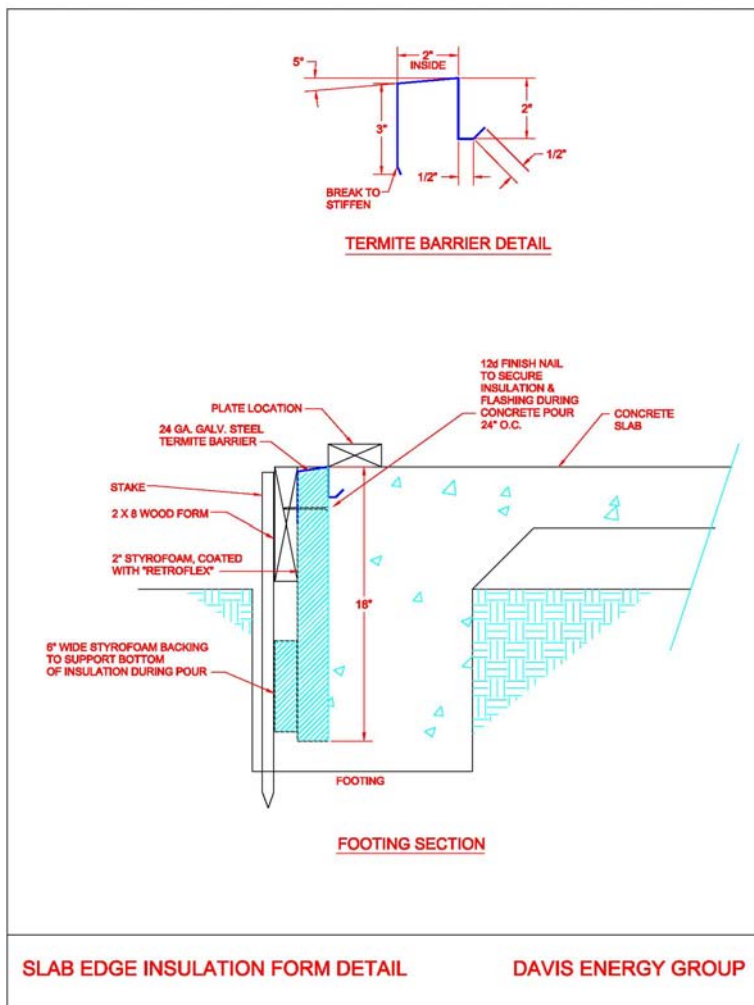
3. On the interior side of basement walls.

In areas of moderate infestation, the decision about how best to protect homes against serious termite damage is initially up to the builder and ultimately, up to the homeowner to continue with a long-term program. This technical note provides a summary of techniques and building practices that offer a degree of protection from termite infestation. Correct installation of the selected system(s), regular inspection and maintenance, and good building details are the best defense against termites and assurance of a long-lived home. However, keep in mind that none of the systems described below will guarantee termite-free structures. They serve only as deterrents or as methods of facilitating detection before severe damage occurs.

Control Sources of Food and Moisture for Termites

Risk of termite infestation can also be reduced by controlling moisture at the foundation and by eliminating termite food supply near the foundation. The following simple construction and site management rules should be followed:

- Grading must have a slope of at least 5% for the first 10 feet from the building on all sides.
- Driveways, patios, and masonry walks that intersect the foundation should have a minimum 2% slope away from foundation.
- If the home is not designed with large - 2 or more feet - overhangs



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at the eaves, gutters and downspouts should be installed.

- Downspouts and sump pump water must discharge 3 or more feet from building.
- Sprinkler heads should be located 2 or more feet from the house and adjusted so that water does not hit the building while operating.
- Condensate line(s) must discharge 2 or more feet from the building and be located 5 or more feet from the dryer vent.

Physical Termite Barriers

	Targets:	Subterranean Termites
Termite Shields or Flashings	How it Works:	Termite shields are physical barriers fitted to the foundation of a house. The shields are flashings between masonry and wood that have edges that channel tunneling insects out away from the wall and out to daylight where they can be detected.
	Pros:	Effective in diverting termites to a visible location. Economical and easy to install during pre-construction.
	Cons:	Termite shields will not protect a structure from termites but force termites to tube around them where the tubes will be more visible. Not easy to effectively retrofit in a post-construction installation.
	Approx Costs:	Materials that are appropriate for flashings also serve as termite shields. Copper, plastics, stainless steel, corrosion-coated metals and a polyethylene-based product are appropriate shield materials. These vary in price from \$1.68 to 8.80 per square foot of installed flashing. Proprietary flashing products are also available and will run slightly higher. Termite mesh products can also be used as shields.
Waterproof Membrane	How it Works:	One approach has termiticides incorporated into the solution of bituminous asphalt foundation waterproofing mixtures. Another approach is a self-adhering poly membrane – Polyguard 650XT.
	Pros:	Economical because of the labor savings provided by one application.
	Cons:	Requires proper installation; discontinuity of the finish breaks the barrier. Provides a barrier at application area, only, so sub-basement slab area requires separate treatment.
	Approx Costs:	Cost ranges between \$1.02 and 1.36 per square foot for a one-coat application of bituminous material.

- There must be no wood debris, either scraps from construction or remains of removed trees, in the backfill.
- Plants and turf must be at least 2 feet from the foundation.
- Organic mulch is not recommended within 2 feet of the foundation.
- Wood fences or decks that abut the house should be pressure treated.

Physical Termite Barriers

- All pipes, wiring, and conduits that penetrate a slab at grade, or masonry within 12” of grade should be sealed.
- Chemical and/or physical termite barriers should be installed (see more below)
- Homeowner instructions should be posted near the water heater, electrical panel, or furnace describing how to maintain the home to reduce the threat of termite infestation by controlling moisture and having annual termite inspections.

Termite Barriers

If you are living in any of the areas of the United States where a threat of termites exists, and if you are using exterior rigid foam insulation on slabs, then you should consider using one or more termite barriers to reduce the probability of termite infestation. Termite barriers do not guarantee a termite free home. Chemical treatments can be effective if they are maintained - even the longest lasting work for only about 5 years. Termite barriers can be broadly categorized as physical – where some material is placed in their path to impede their movement into the structure, and as chemical – where chemicals are used under and/or around the home to repel or kill the termites.

Physical Barriers

Physical barriers that offer varying degrees of protection (see Table 1) include:

- Termite flashings that provide a physical barrier between the foundation and the wood structural elements.

		Targets:	Subterranean Termites
Aggregate Barriers	Targets:	Subterranean termites	
	How it Works:	Consist of aggregate mixtures, like basaltic sand, used to replace soil around the foundation of a building. The grains of the sand are too big for the termite to tunnel through, too closely-spaced for the termite to move between, and too heavy for the termite to move out of place.	
	Pros:	Most easily installed and most effective for pre- construction application.	
	Cons:	Use of sand barriers is still experimental, and must be followed with post-installation and regular subsequent inspections.	
Mesh Barrier	Targets:	Subterranean termites	
	How it Works:	This system consists of a fine woven marine grade stainless steel mesh, which is used as a physical barrier between new construction and ground contact. The mesh is too small for termites to pass through and too hard for them to chew through.	
	Pros:	Effective for over 50 years. Can be effectively installed at openings in the slab, only, such as around the tub drain.	
	Cons:	Only applicable in new construction. Only effective where installed.	

- Waterproof membranes that are designed to also perform as termite barriers.
- Aggregate mixtures used under and around the foundation that are virtually impenetrable by termites.
- Stainless steel meshes that are impenetrable to termites.

Chemical Termite Barriers

	Targets:	Subterranean Termites
Soil Barrier Treatment with Pesticides	Targets:	Formosan and Subterranean termites
	How it Works:	Operator pumps a continuous chemical barrier into soil around and under the house. Repellent pesticides only keep termites away. More costly non-repellents can kill the entire colony. Some methods include burying piping to make replenishment of termiticide more effective.
	Pros:	Works fast and protects for at least 5 years, if application is undisturbed by digging. Works most effectively in a new construction application.
	Cons:	Uses many gallons of pesticide. May affect nearby wells and waterways. Harmful to mammals. Repellents leave a smell temporarily.
Baits	Targets:	Formosan and Subterranean termites
	How it Works:	Termites take pesticide from in-ground stations buried around the house and carry it back to the nest. Eventually the entire colony dies. Baits need to be monitored by a professional four times a year.
	Pros:	Uses little pesticide, which remains in a tamper-resistant container. Can protect inaccessible areas.
	Cons:	May take months to work. Termites can infest a house before finding bait.

At this time, the most practicable physical barriers in terms of cost and simplicity of installation are termite flashings. Although flashings may not prevent termites from getting to the wooden structural members of a home, properly installed flashings will force termites to the outside of the home, where their tunnels can be detected. Flashing details for exterior foam insulation on slabs can be found in the following:

- www.southface.org and type "Insulating Foundation" in the

Search box. Two useful documents will be listed. *Insulating Foundation* shows details for all types of foundations. *Slab Insulation* is a Technology Fact Sheet developed for the US Department of Energy that deals specifically with slabs.

- http://www.eere.energy.gov/buildings/building_america/pdfs/babp_tradecrafts.pdf gives design details for foundation insulation provided by the Building America Program.

A number of materials are available for termite flashings. However if an ACQ-treated sill plate is used, and if the flashing comes in contact with that sill plate, then copper or stainless steel will avoid corrosion due to galvanic action. Standard 16 ounce copper sheeting, as used for other flashing purposes may be used. There are also a number of flashings comprised of thin (e.g. 3 ounce) copper, laminated to other materials that are offered specifically as termite flashing. These include:

- YorkShield from York Manufacturing,
- Cop-R-Shield from Advanced Building Products Inc., and
- Copper flashing from Amerimax Home Products, Inc. is listed as a termite flashing.

Also, a polyethylene film-based product from Polyguard, developed for use in insulating concrete forms, is approved by ICC-ES for termite applications. In addition, a stainless steel mesh material, Termimesh, developed specifically for termite protection, is a possibility.

Chemical Barriers

The idea of a chemical barrier is to treat the ground beneath and around the foundation with either termite repellent or termite-toxic chemicals. The primary downside is the environmental impact of the chemicals, and of course the chemicals need to be replenished periodically – perhaps at five year intervals. Replenishment is neither as easy nor as effective as the initial treatment unless a reticulation system – a piping system to distribute the termiticide - has been installed during construction.

Baiting systems, although technically not chemical barriers, are claimed to be quite effective if properly installed and maintained. Their primary advantage is their environmental friendliness, as on limited amounts of termiticide are required.

Summary

This Technote provides options for reducing the threat of home-infesting termites that include rigid foam insulation on the exterior of slab foundations. Be sure to check with your local code officials regarding the code acceptability of exterior insulation and the code requirements for using exterior insulation.

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