SPRAY FOAM Insulation & Termites

This document addresses questions pertaining to inspection for, and treatment of, potential termite infestations in buildings using SPF insulation. It provides basic information about termite identification, inspection and treatments methods as well as discusses the importance of air-sealing and insulation of critical areas using SPF. It also presents code-compliant solutions to address these concerns.

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Spray Foam Insulation & Termites

The building enclosure serves many functions, including the control of heat, air and moisture. Creating an energy efficient building enclosure meeting current energy codes requires proper design and installation of insulation and air barrier systems. Quality design and construction of the building envelope can be particularly challenging when it comes to controlling the damage caused by wood-destroying insects, such as termites.

Spray Polyurethane Foam (SPF) is a high-performance insulation that provides integral air sealing and moisture control benefits in a single product application. SPF helps seal cracks, gaps and penetrations in the building envelope in order to mitigate air leakage and deter infestation by a variety of insects, rodents, and other pests where it is applied. SPF is not known to attract nor does it provide a food source for termites; however, it can be accompanied by the use of new technologies when inspecting for termite infestations. It is important for SPF contractors and building design professionals to understand termites and how to apply SPF insulation to facilitate termite inspection and control. This document provides:

- A basic understanding of **termite identification**
- Fundamentals of **termite inspection and treatment**
- How termite prevention is addressed by the **building codes** for new construction
- A discussion of the impact of **energy efficient construction and termite control**
- **Useful practices for SPF installation** for termite control for both new and existing buildings.

CONTENTS

I. Termite Identification

Termites are insects that are often hard to spot and identify. To the untrained eye, flying ants can be easily mistaken for swarming (alate) termites. Figure 1 shows a comparative diagram of flying ants and termites.

FIGURE 1. Comparative differences between flying ants and termites

TERMITE

- Antennae straight beadlike
- Middle part of body is broad
- Wings similar in shape, size and pattern

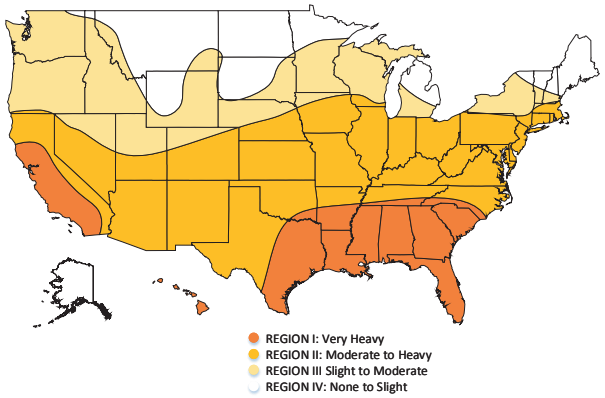
ANT

- Antennae 'elbowed'
- Middle part of body is very narrow
- Wings not alike in shape, size and pattern

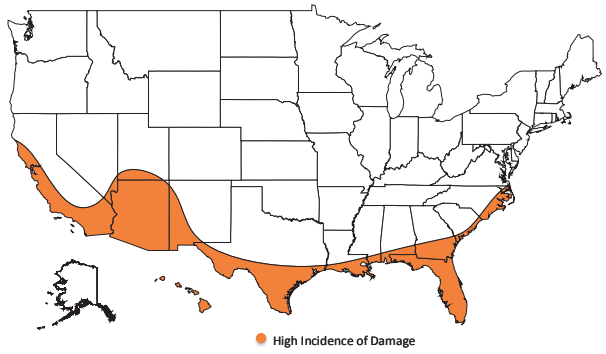
Reproduced from US Department of Agriculture Forest Service Diagram[i]

Termites voraciously consume cellulose, meaning that any plant-based material can be a source of food – including leaves, compost, wood piles, and of greatest concern, wood components and furnishings of a home. While there are many (45-50) species of termites in the US, only about 20 are known to destroy wood structures[ii]. Figure 2 shows the probability of termite infestation (by type) across the entire US.

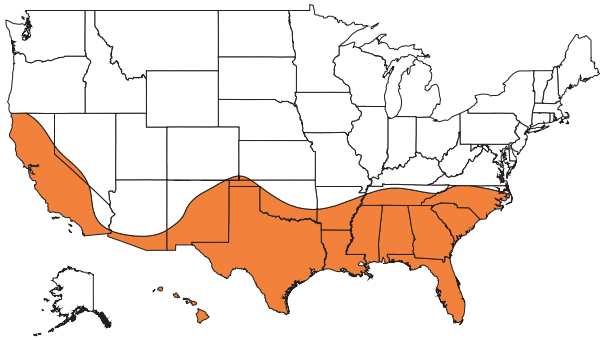
FIGURE 2. Probability of Termite Infestation for the US



Subterranean Termites – Are the most common type of termite. They build nests underground to maintain moisture levels in the colony. They use protective mud tunnels from the nest to the food source.



Drywood Termites – Can create colonies in wood with no connection to the ground. These termites need little water to survive. Infestations, often found in attics, typically identified by frass pellets.



Formosan Termites – A type of subterranean termite that build nests within the soil. They can also create nests that retain moisture, thus no longer needing contact with the ground (mud tubes).

Reproduced from US Department of Agriculture Forest Service Maps

II. Termite Inspection and Treatment

The most common method to determine if termites are present in a building is by visual inspection. In a traditional visual termite inspection, a trained professional will inspect areas of the structure where termites typically enter the building and feed upon the structure (Figure 3).

However, there are newer supplemental technologies that may be used to detect termites in areas where visual inspection is difficult or impractical. These technologies include moisture meters, acoustic emission (listening devices)[iii], microwave technologies[iv], highly sensitive thermal imaging (infrared cameras)[v], air sampling (carbon dioxide and methane emissions)[vi] and even specially-trained dogs[vii].

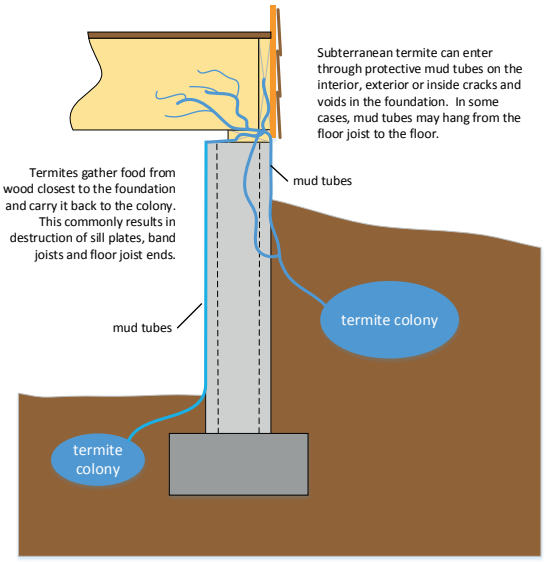
Commercially available infrared cameras have been used successfully for more than a decade to detect hidden termite infestations. Acoustic emission/radar technology, combined with moisture detection and thermography, has been commercialized[viii] to locate termite activity. These newer technologies can be used to indicate where a problem may exist, and allow for a more focused visual inspection, if needed.

FIGURE 3. Visual termite inspection

Credit: iStock Photos

Trained personnel generally inspect areas where termite infestation is likely to occur, looking for the onset of wood damage. For subterranean termites, this includes inspection of areas where the foundation meets the framing. Termite inspectors typically look for mud tubes from subterranean termites that serve as protected pathways between the underground colony and the nearby food source. Examples of mud tubes are shown in Figure 4. Inspectors also look for early damage to framing in contact with or near the foundation (sill plates, band/rim joists and floor joists). Examples of termite damage are shown in Figure 5. For drywood termites, inspectors look for frass (excrement), as well as small bore holes.

FIGURE 4. Inspection areas and evidence of subterranean termites (mud tubes)



Courtesy of SPFA

Courtesy of Hadley Termite and Pest Control

FIGURE 5. Evidence of structural termite damage

Courtesy of US Department of Agriculture Forest Service

Several states and certain home mortgage programs require termite inspections before conveyance of the property and some states require a visual inspection. In many cases, especially in regions where termite infestation can be very likely, building owners continue with annual termite inspections and treatment programs provided by pest management contractors throughout their ownership of the building. In these cases, the pest management company often provides a warranty or bond for continued or escalated treatment or, in some cases, repair of the damaged areas.

Once termites are detected, a comprehensive treatment program is usually initiated. Treatments may include application of termiticides, such as borates, on structural members. Termiticides may also be applied to the ground near the foundation. Bait traps can be installed in the ground near the colony. There are other treatments available including injected foams, whole-house fumigation, extreme heat or cold, as well as electrical charge and microwave application to the affected areas.

III. Termites and the Model Building Code

For residential construction, the International Residential Code (IRC)[ix] specifically addresses subterranean termite control methods in Section R318 during new construction, and measures depend upon the building location on the map in Figure 2. The requirement for preservative-treated or naturally durable termite resistant wood are also identified as termite control strategies are identified in the International Building Code (IBC), Section 2304.12 for commercial buildings.

These measures detailed in the IRC Section R318 include:

- Borate treatment of select wood members (**Figure 6**)
- Termiticide application on the surrounding ground areas (**Figure 7**)
- Termite baiting systems (**Figure 8**)
- Use of preservative treated wood or termite resistant wood (**Figure 9**)*
- Physical barriers (sheet metal or wire mesh) between foundation and framing (**Figure 10**)
- In areas of very heavy termite infestation:
    - The use of foam plastic insulation is *not permitted* on the exterior face of walls, or below footings, foundations or slabs that are below grade.
    - Foam plastic on above grade walls must be 6″ above the ground.

**Also included in IBC Section 2304.12*

It should be noted that the IRC and IBC are model building codes, which may be adopted in full, in part, or modified by state, county, and municipal authorities. This will be addressed later in the document.

FIGURE 6. Borate treatment of select structural wood components

Courtesy of Palmetto Exterminators

FIGURE 7. Termiticide treatment of the ground below slab and near the foundation

Courtesy of US Department of Agriculture Forest Service

FIGURE 8. Termite baiting systems

Courtesy of HomeGuard Distributors, Inc.

FIGURE 9. Termite resistant wood near the foundation

Courtesy of Root River Inspections

FIGURE 10. **Physical termite barriers and shields**

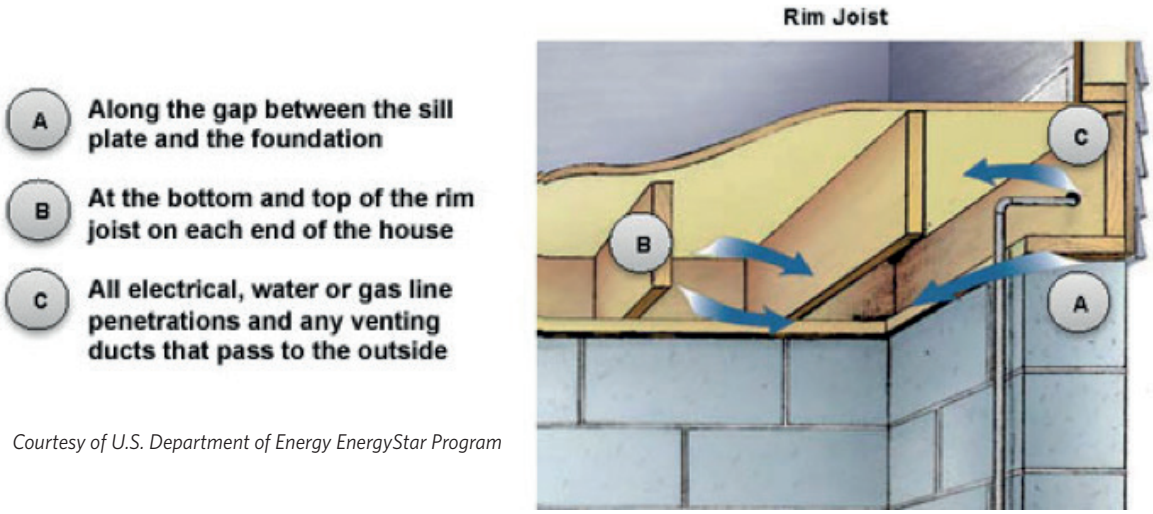
Courtesy of New Prairie Construction

IV. Energy Efficiency and Visual Termite Inspection

Recent changes to the model energy codes now call for buildings with increased levels of insulation and significantly reduced air leakage. One of the most significant sources of air leakage in framed buildings where the framing meets the foundation, as shown in Figure 11.

Driven by differential pressure, air infiltration occurs through gaps between the sill plate and foundation, at the bottom and top edges of the rim joists, and through various penetrations for plumbing, wiring and ductwork. In homes built more than about 10-15 years ago, these areas were rarely insulated and almost never properly sealed.

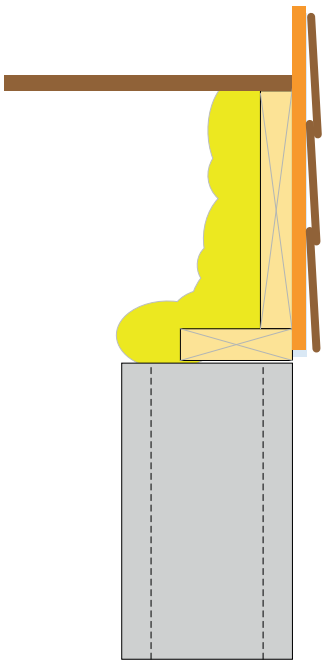
FIGURE 11. **Air infiltration paths near the building foundation**



Courtesy of U.S. Department of Energy EnergyStar Program

SPF is often used by builders of new homes and weatherization contractors in existing homes at the framing-foundation area, and is often regarded as an especially cost-effective and reliable means to insulate and air seal these critical areas[x]. Figure 12 shows the installation of closed-cell SPF from beneath the subfloor to the top of the foundation, providing long-lasting insulation, air sealing, and moisture control.

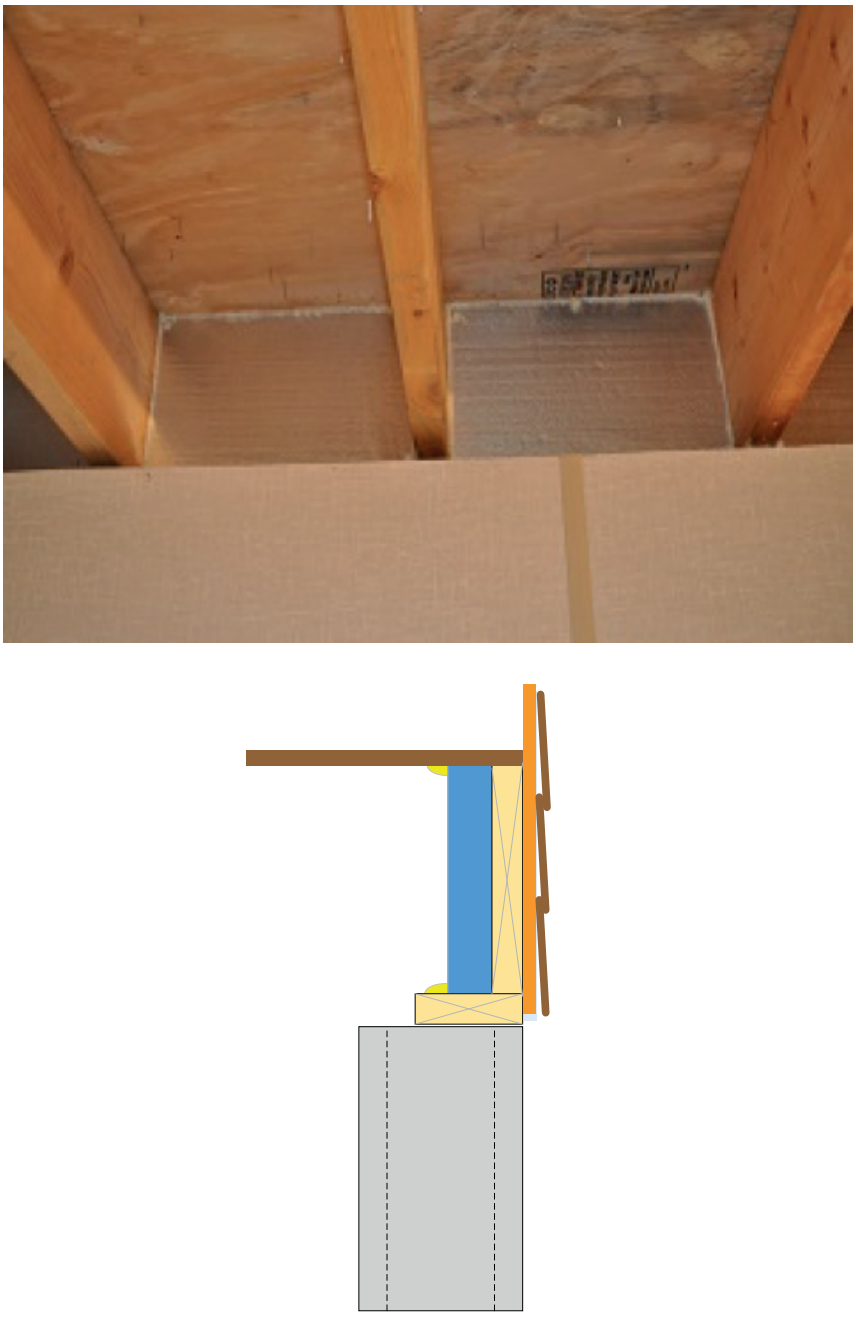
FIGURE 12. Closed-cell SPF insulation at the foundation-framing area



Courtesy of SPFA

Alternative methods of insulating these areas may include the use of cut foam insulation board perimeter sealed with caulk or polyurethane foam sealant, as shown in Figure 13. This approach, is used by some weatherization contractors. It is generally more labor intensive than SPF application, as it requires cutting of the foam board followed by the application of a caulk or sealant. It can be especially difficult application in tight areas and will require cutting around engineered wood I-joists. Like SPF, this application provides long-lasting insulation, air sealing and moisture control. Note that this method does not always provide sealing of the gap between the sill plate and foundation.

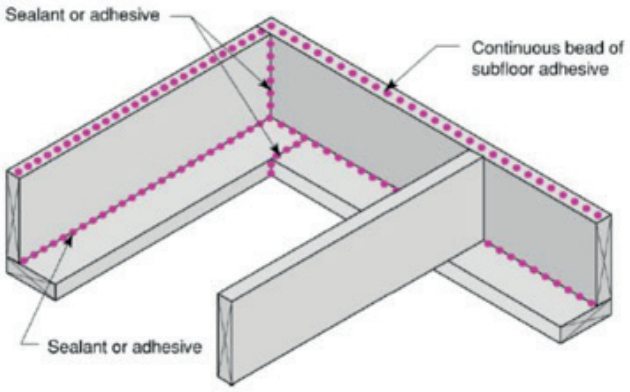
FIGURE 13. Foam board insulation and sealant/caulk at the foundation-framing area



Top: Courtesy of Dr. Energy Savers Bottom: Courtesy of SPFA

Another means of insulating and air sealing of the framing near the foundation involves application of a caulk or sealant around the perimeter of each cavity, followed by installation of insulation batts, as shown in Figure 14. Like the use of foam board insulation, it requires a labor-intensive caulking or sealing. It should be noted that unlike SPF and boardstock, this is not a permanent installation.

FIGURE 14. Sealing and insulating the band joist with fiberglass batts (improperly re-installed)



Courtesy of U.S. Department of Energy Building America Program

Courtesy of Pacific Northwest National Laboratory

In some buildings, the SPF application of Figure 13 is extended to insulate conditioned crawlspaces and basements by applying a continuous layer of insulation from the subfloor to the vapor retarder/barrier installed on the floor of the crawlspace or to the slab in the basement, shown in Figure 15.

FIGURE 15. SPF insulation of a conditioned crawlspace wall

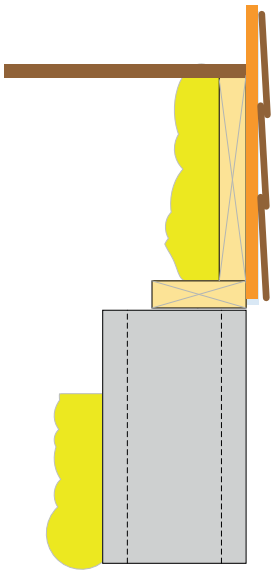
Courtesy of SPFA

The concern by some pest control and inspection companies with these permanent applications of foam plastic in the rim joist, shown in Figures 12 and 13, is that it does not permit removal of the insulation for traditional visual inspection of the sill plate, band/rim joists or the ends of the floor joists. This challenge can be addressed through use of newer technologies when inspecting for termites.

In addition, some states including North Carolina[xi], Georgia[xii] and Alabama[xiii] have modified the model code to include a termite inspection strip above and below the top of the foundation wall to expose the sill plate and lower band/rim joist for visual inspection. SPF can be installed in this manner to meet these state-specific codes, as shown in Figure 16.

FIGURE 16. Installation of SPF to provide termite inspection strip

Courtesy of ThermalTech Insulation



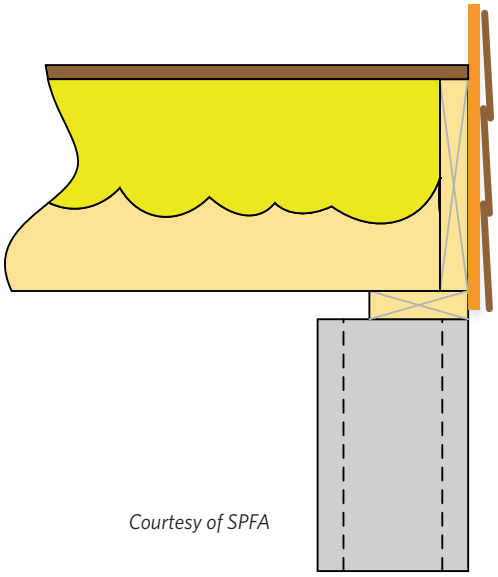
Courtesy of SPFA

It should be noted that the SPF installation of Figure 16, while sealing some air leakage paths and meeting certain code requirements for termite inspection strips, does not seal the path between the sill plate and foundation, and caulking may be needed at this location to enhance the air leakage resistance of the sill sealer.

As an alternative to encapsulated or conditioned crawlspaces, with the interior of the stem walls covered in foam as shown in Figure 16, SPF can be applied directly below the subfloor and leaving the crawlspace vented. This installation is shown in Figure 17. While this application will typically require more insulation than a conditioned crawlspace, it enables complete access to the band joist and sill plate areas for termite inspections. Application of SPF to the subfloor will help provide air sealing and insulation of the floor assembly, but can limit access to wiring and plumbing. Insulation may need to be added to ductwork and piping located in the vented, unconditioned crawlspaces. Additionally, a vapor retarder may be needed between the SPF and vented crawlspace to help control moisture condensation in hot-humid climates if open-cell SPF is used.

FIGURE 17. **Installation of SPF below the subfloor allows complete access to the band joist and sill plate for inspection.**

Courtesy of Bob Duke, Applied Energy Savings Systems (AESS)



Courtesy of SPFA

Useful Practices for SPF Installation for Termite Control (New Construction)

1. For all new construction, follow the requirements of the building code for termite control. Always check with the local building code official regarding termite-resistant construction requirements. These requirements may include treatment of wood and soil, use of termite resistant lumber and installation of termite barriers.
2. Always check local building codes to determine if termite inspection strips are required. Even if not required by code, discuss this option with the builder, as it may impact a continuing pest control program, especially in areas where termites are a concern.

Useful Practices for SPF Installation for Termite Control (Existing Buildings)

These practices primarily address infestation by subterranean termites, which are prevalent across most of the United States.

1. For existing buildings, install SPF according to the local building codes, even if the installation is not subject to inspection by a local code official.
2. Always check local building codes to determine if termite inspection strips are required. Even if not required by code, discuss this option with the building owner, as it may impact existing pest control programs, especially in areas where termites are a concern.
3. It is a good idea to have a termite inspection performed before installation of SPF. If there is any sign of termite damage, consider advising the building owner and waiting to proceed with the work until repairs are complete and a termite management program is initiated.
4. Discuss SPF application with prospective pest management contractors in the area.

Builders and homeowners should also consider the need to construct and maintain buildings and surrounding areas. These measures can include:

- Removing the conditions that termites need to survive – food and water
- Diverting water by grading the landscape away from the house. Installing properly functioning gutters, downspouts and splash blocks
- Repairing any water leaks into the crawlspace
- Reducing humidity in crawlspaces with moisture barriers, proper ventilation and dehumidification
- Preventing shrubs, vines and other vegetation from growing over and covering crawlspace vents
- Removing old wood boards and grade stakes that were used during building construction
- Removing old tree stumps and roots around and beneath the building
- Separating the soil and wood portions of the building (e.g., 18" gap or more)
- Routinely inspecting the foundation for termite activity or damage

References

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[viii] TermaTrac t3i Termite Detection System http://termatrac.com/products/termatrac-t3i/

[ix] 2015 International Residential Code, Section R318.

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[xi] 2012 North Carolina State Building Code, Appendix E-2.2, N1102.2.9 Closed crawl space walls. Insulation illustrations https://codes.iccsafe.org/public/document/details/toc/807

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[xiii] Alabama Building Code http://bc.alabama.gov/buildingcode.htm