SPRAY FOAM Insulation and Subterranean Termites in Basements and Crawlspaces

This document is developed as a resource for professional contractors in the spray polyurethane foam insulation, and professional pest management fields primarily, and for other audiences secondarily. It is offered to addresses common issues regarding SPF insulation and subterranean termite inspections in crawlspaces. It provides basic information about termite identification, behavior, inspection and treatment methods, as well as discusses the importance of air-sealing and insulation of critical areas using SPF. It also presents potential options to address these concerns so energy efficiency and pest management can both be achieved.

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Spray Foam Insulation & Subterranean 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. 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 to improve thermal performance of a home.

Termites cause more than $5 billion in damage to structures each year across the United States. Annual subterranean termite inspections are performed due to a myriad of biotic and abiotic factors influencing termite protection. SPF is not known to attract or provide a food source for termites, but in some cases, it may require closer inspection or use of available advanced technology inspection methods, in addition to performing simple "visual" pest inspection. Use of superior materials, quality design and construction of the building envelope can be particularly important when it comes to meeting building code and investing in energy efficiency, but also important to controlling the damage caused by wood-destroying insects, such as subterranean termites.

First and foremost, according to many pest management companies, preventative treatment is the primary recommendation. According to North Fulton Pest Solutions of Georgia, even trained professionals *"can only physically inspect roughly 20-30% of a typical structure. That leaves 70-80% of your home inaccessible for visual inspection!"* Fulton accurately concludes "since no individual can see inside your walls or underneath floor coverings, your best option is to take preventative termite control measures."[1] The spray foam industry completely agrees.

It is, however, important for SPF contractors, pest management professionals, and building design professionals to have a basic understanding of building science, building code, subterranean termites and how to apply SPF insulation to facilitate termite inspection and control. This document provides:

- **A basic understanding of termite identification**
- **An overview 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.**

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[1] https://www.northfultonexterminating.com/termite-control/

I. Termite Identification

Subterranean termites are insects that are often hard to spot and identify by homeowners, SPF professionals, and even pest management professionals. Workers and soldier termites are small (3/8 inch) creamy-white colored insects. Termites spend nearly all of their lives underground or tunneling through cellulose food sources. Often, the only sign that termites are present are their shelter tubes and damaged wood. The most common type of termite encountered by homeowners are swarmers or winged termites (also termed alates). To the untrained eye, flying ants can be easily mistaken for swarming termites. Figure 1 shows a comparative diagram of flying ants and termite swarmers.

FIGURE 1. Comparative differences between flying ants and termites

TERMITE

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

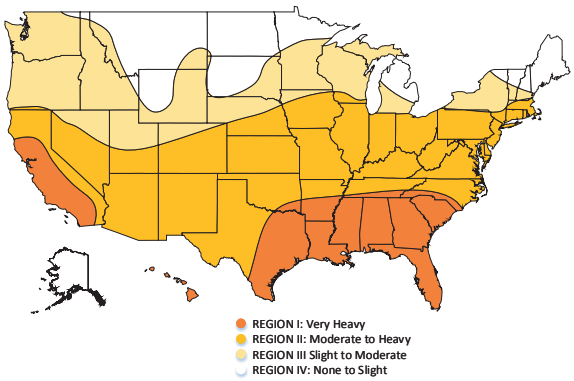
ANT

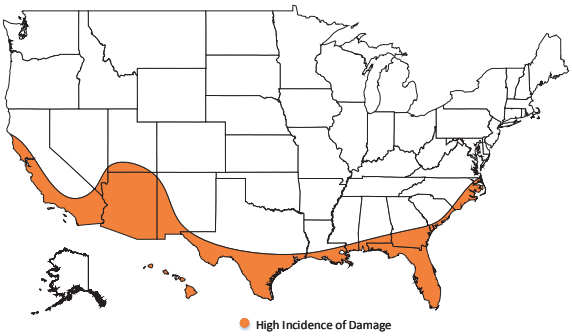
- Antennae 'elbowed'
- Middle part of body is very narrow
- Wings not alike in shape, size and pattern

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, cardboard, paper, 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 five are known to be serious pests of structures.[i] Figure 2 shows the probability of termite infestation (by type) across the entire US.[ii]

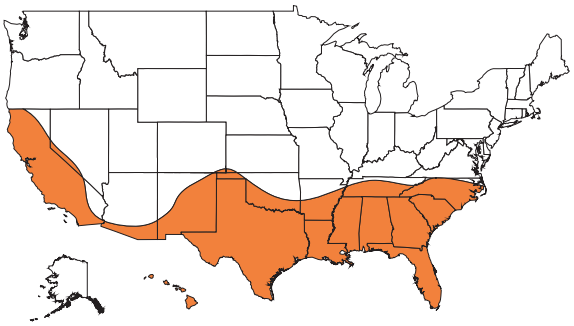
FIGURE 2. Probability of Subterranean Termite Infestation for the US





Native Subterranean Termites – The most common type of termite. Colonies typically live underground to maintain moisture levels in the colony, though colonies can survive without ground contact if moisture levels are sufficient. They construct protective shelter tubes (or mud tunnels) from the soil to food sources in a building.

Drywood Termites – These termites are not subterranean, but create colonies in structural lumber 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 carton nests in structures that retain moisture, thus no longer needing contact with the ground.

Reproduced from US Department of Agriculture Forest Service Maps

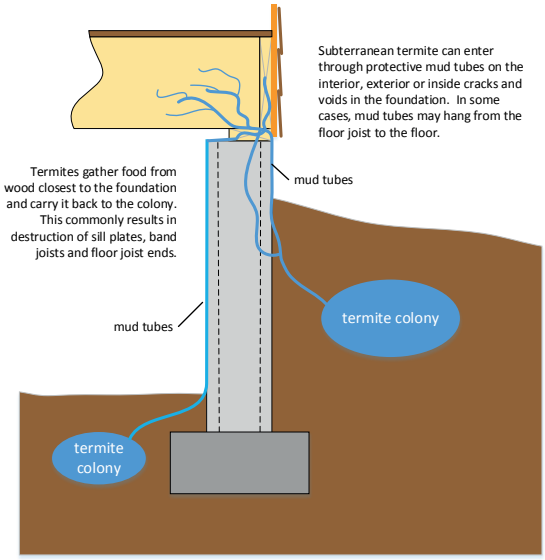
II. Termite Inspection and Treatment

Termite protection is not a singular event that begins and ends when a treatment is performed. Termite protection may be impacted by many factors including moisture intrusion, structural maintenance, and disruption of the treatment zones through landscaping, additions or other events. Termites can access the structure through gaps as small as 1/32 inch. Inspection for signs of termite activity is an integral part of the ongoing management process and is necessary to determine if treatment or corrective action is needed. The structural pest management industry's standard practice for determining the presence of termites in a building is visual inspection of accessible areas, both interior and exterior. During a typical termite inspection, a trained professional will visually inspect accessible areas of the foundation and substructure of the building for signs of infestation such as damaged wood, shelter tubes or termites (Figure 3). The trained pest professional will also be expected to inspect finished areas inside the home, including the basement, in a similarly non-destructive manner to SPF area inspection.

FIGURE 3. Visual termite inspection

Trained professionals inspect accessible areas where termite infestation is likely to occur, looking for visual signs or wood damage. Termite inspectors typically look for shelter tubes from subterranean termites that serve as protected pathways between the underground colony and their food source. Examples of shelter tubes are shown in Figure 4. Inspectors look for evidence of termites in parts of the structure that contact or are near the foundation (sill plates, band/rim joists and floor joists). An example of termite damage are shown in Figure 5.

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

According to the University of Georgia Entymology Department[2], since much of the wood in a structure is hidden from view, visual inspections for subterranean termites are cursory at best. Many construction types provide only a limited view of the multitude of areas termites might use to enter a structure. Inspecting as many wooden construction elements as possible (both visible and hidden) should therefore be the goal of any inspection. Inspection of visible wood is, of course, conducted with the naked eye. There are tools available for inspecting visually hidden areas. These tools include infrared cameras, microwave motion detectors, acoustic emission detectors, moisture detectors, and trained termite-detecting dogs.

Commercially available infrared (IR), or "thermal" cameras, are used to detect temperature or moisture anomalies on wall surfaces. Thermal imaging cameras have improved termite detection dramatically and changed the industry for the better, according to PestEx[3]. They have now even become part of the Australian standard **AS3660.2/2017** for termite management in and around existing buildings and structures.

A project to determine the efficacy of some non-visual inspection techniques was recently completed for the Georgia Department of Agriculture Structural Pest Section.[iii] This study investigated the use of moisture meters, IR cameras and a TermaTrac acoustic emission sensor to detect termites through SPF. This demonstration study shows that the TermaTrac device may be an effective non-visual method for termite detection through SPF. Additional research will be needed to verify these results.

The use of task-appropriate IR on an inspection conducted by a trained and knowledgeable professional may indicate temperature/moisture conditions which could be caused by hidden termite infestations and suggest areas for a more focused visual inspection or other supplemental technologies, if needed. None of the supplemental technologies are typically relied upon as stand-alone inspection solutions and are used to provide additional information to guide a thorough visual inspection. It should be noted many states require an inspection for termites (check the rules in your state) and that not all pest management companies are skilled, trained or knowledgeable in ways to employ supplemental or advanced inspection technologies. The value of a home demands that a homeowner employs a reputable, well-trained and experienced pest management company, capable of delivering and effective array of inspection and treatment options. According to the University of Georgia[4], *"One of the most important challenges confronting anyone attempting to control termites is in locating and effectively treating the hidden area(s) where termites are entering or are established within the structure. This is a difficult task even for the most experienced professional."*

HOMEOWNERS SHOULD ALWAYS ASK THEIR PEST MANAGEMENT COMPANY ABOUT THEIR TREATMENT OPTIONS, INSPECTION REQUIREMENTS, CERTIFICATIONS, AND ESPECIALLY THEIR EXPERIENCE AND CAPABILITIES UTILIZING AVAILABLE ADVANCED DETECTION TECHNIQUES AND EQUIPMENT OF THE MODERN DAY.

Some states and certain home mortgage programs require visual termite inspections before conveyance of the property. 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 treatment, or retreatment program is usually initiated. Treatments may include application of termiticides to the soil adjacent to the foundation. Bait systems can be installed in the ground surrounding the structure.

[2] https://secure.caes.uga.edu/extension/publications/files/pdf/B%201241_5.PDF

[3] https://www.pest-ex.com.au/blog/thermal-imaging-cameras-australian-standard-termite-inspections/

[4] https://secure.caes.uga.edu/extension/publications/files/pdf/B%201241_5.PDF

III. Termites and the Model Building Code

For residential construction, the International Residential Code (IRC)[iv] specifically addresses pre-construction subterranean termite control methods in Section R318 for new construction, and measures depend upon the building location on the map in Figure 2. The International Building Code (IBC)[v], Section 2304.12 defines requirements to control termites by using preservative-treated or naturally durable termite resistant wood.

Pre-construction treatment measures detailed in the IRC Section R318 include:

- Borate treatment of select wood members (**Figure 6**)
- Termiticide application to soil under slabs, at potential termite entry points and adjacent to foundation walls (**Figure 7**)
- Termite baiting systems (**Figure 8**)
- Use of preservative treated wood or termite resistant wood (**Figure 9**)*
- Physical barriers beneath slabs and at termite entry points (**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*

Examples of pre-construction termite control are shown in Figures 6-10. The baiting system and termiticide treatment of the soil near the foundation may also be used in existing construction. 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. Certain buildings may have different requirements for termite control. For example, FHA and HUD do not recognize treated wood adjacent to the foundation. There are differences between termite shields and barriers. Shields, including sheet metal, do not always provide a continuous termite barrier, but can help with detection.

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 preservative treated wood near the foundation

FIGURE 10. Termite shields

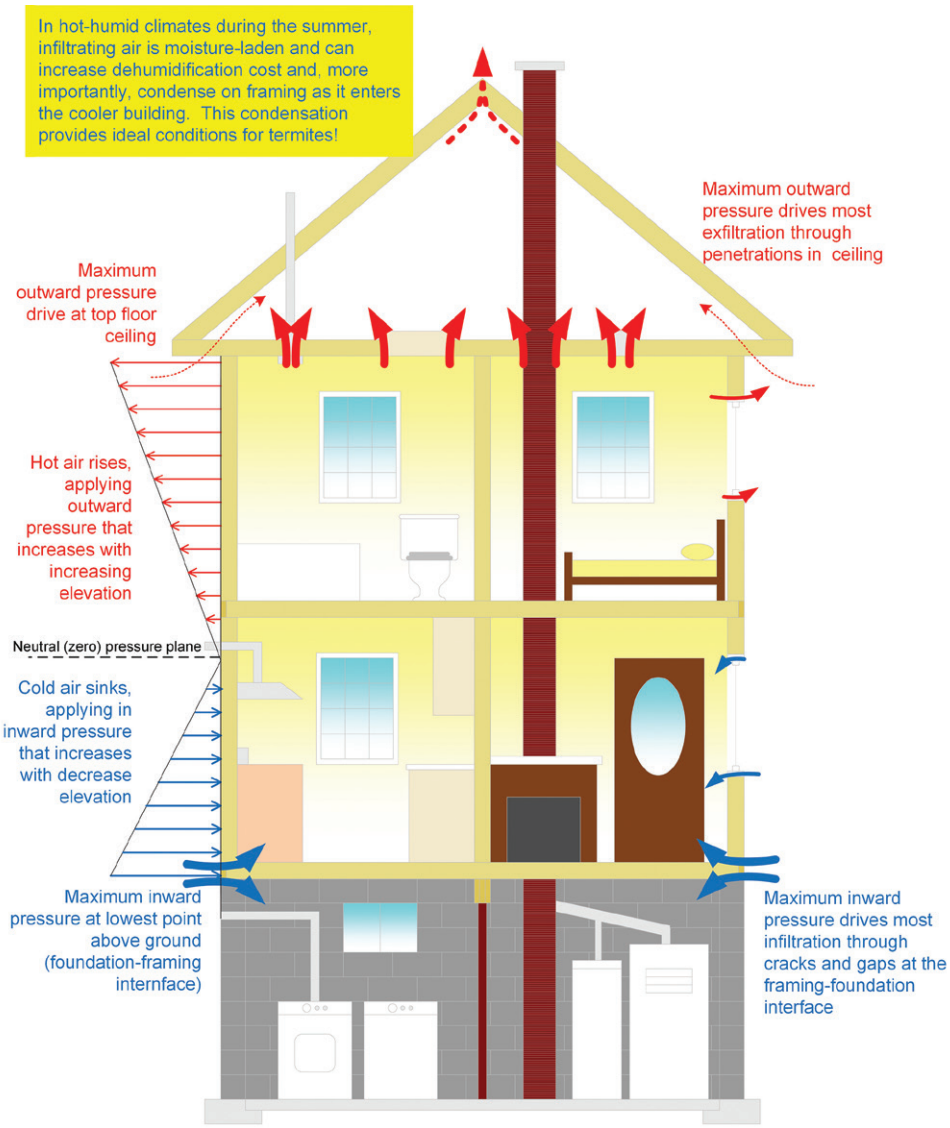
Courtesy of New Prairie Construction

IV. Energy Efficiency and Visual Termite Inspection

Recent changes to many 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 occurs 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 compared to today's practices.

FIGURE 11. Stack effect and air infiltration paths near the building foundation



Stack Effect in Residential Buildings

Courtesy of SPFA

SPF can be used to insulate basements and crawlspaces using two common methods. The first method insulates the underside of the floor above an unconditioned basement or vented crawlspaces with SPF to a minimum floor R-value specified by the building code. This method may reduce visual accessibility to the foundation-framing interface for termite inspections. The second method insulates the conditioned basement or crawlspace wall area with SPF from the underside of the subfloor, over the band/rim joist, sill plate and wall, down to the slab/vapor retarder on the floor. This creates a continuous layer of insulation and air barrier, to a minimum below-grade wall R-value specified by the building code, and may reduce visual accessibility to the foundation-framing interface for termite inspections.

ACCORDING TO THE PEST MANAGEMENT INDUSTRY, IT IS RECOMMENDED THAT ANY CONSTRUCTION CONTRACTOR ADVISE THE HOMEOWNER/CUSTOMER TO SEEKCLARIFICATION FROM THEIR PEST MANAGEMENT CONTRACTOR WHEN ANY SUBSTANTIAL CHANGES TO THE WARRANTED INSPECTION AREAS ARE TAKING PLACE THAT MAY AFFECT ACCESSIBILITY FOR VISUAL INSPECTIONS.

Traditional Unconditioned Basements and Ventilated Crawlspaces

INSULATING THE UNDERSIDE OF THE FLOOR

Insulation of the floors includes application of insulation to the underside of the subfloor, in contact with the band/rim joists. This is an important target area warranting effective moisture and energy control strategies utilizing advanced materials such as spray foam to resist air infiltration from the 'stack effect'. Using closed-cell SPF helps to avoid condensation within the subfloor materials and minimize air infiltration into the rooms above.

In these under-floor applications, use of a Class 1 vapor retarder (commonly 0.1 perm or less) has been installed below the concrete slab in these basements, or over the gravel/sand on crawlspace floor. Typically, this vapor barrier is a polyethylene membrane that is 6 mils or greater in thickness. Use of this vapor barrier helps to reduce moisture levels in these unconditioned basements and vented crawlspaces.

FIGURE 12. Under floor insulation examples showing fiberglass batts in a vented crawlspace (left) and closed-cell SPF in an unconditioned basement (right).

Courtesy of Energy Vanguard

Courtesy of SPFA

Modern Conditioned Basements and Unvented Crawlspaces

INSULATING THE BASEMENT/CRAWLSPACE WALLS

Insulation of the walls in conditioned basements and unvented crawlspaces includes application of insulation from the subfloor to the basement/crawlspace floor. Using closed-cell SPF can help to avoid moisture movement and damage to the insulation in the event of flooding. Closed-cell SPF is the only cavity insulation approved by FEMA as a flood damage-resistant material.[5]

FIGURE 13. Below-grade wall insulation examples in a conditioned basement (left) and closed-cell SPF in an unvented crawlspace (right).

In these wall applications, use of a Class 1 vapor retarder (commonly 0.1 perm or less) has been installed below the concrete slab in these basements, or over the gravel/sand on crawlspace floor. Typically, this vapor barrier is a polyethylene membrane that is 6 mils or greater in thickness. Use of this vapor barrier helps to reduce moisture levels in these conditioned basements and unvented crawlspaces.

INSULATION AND AIR SEALING THE FRAMING-FOUNDATION INTERFACE

There are traditionally three common methods to insulate and air seal the framing-foundation interface: closed-cell SPF, foam insulation board used with sealants, and fiberglass batts used with sealants.

The first method often used by builders of new homes and weatherization contractors in existing homes is the application of SPF at the framing-foundation area. This method is often regarded as an especially reliable method to provide long-lasting insulation, air sealing and moisture control for these critical areas with a single product; however, this method may impair simple visual inspection of the sill plate, rim joist or ends of floor joists (Figure 13, & Table 1).

The use of cut foam insulation board sealed along its perimeter with caulk or polyurethane foam sealant is the second method. 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 an especially difficult application in tight areas and will require extra cutting to fit around engineered wood I-joists. Like SPF, this application provides long-lasting insulation, air sealing and moisture control. Note that this method, unlike SPF, does not always provide sealing of the gap between the sill plate and foundation and may impair access for simple visual inspection (Table 1).

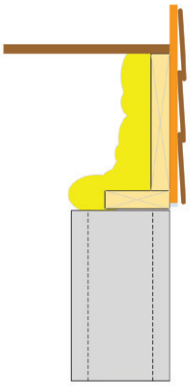
A third method of insulating and air sealing of the framing near the foundation involves application of caulk or sealant around the perimeter of each cavity, followed by installation of insulation batts. Like the use of foam board insulation, it requires labor-intensive sealing. It should be noted that unlike SPF and boardstock, this is not a semi-permanent, long-lasting installation and may not provide desired levels of moisture condensation control. However, fiberglass batts can be removed for easier access to the band/rim joist and sill plate to facilitate termite inspection but must be carefully replaced to avoid compression (Table 1), and resulting substantial loss of energy performance.

These options for insulation and air sealing the framing-foundation interface are shown in Table 1, which includes some information on their installation, energy efficiency, condensation control and the ability to perform termite inspection. These performance factors represent trade-offs which should be considered when selecting acceptable options.

[5] FEMA Technical Bulletin 2, Flood Damage-Resistant Materials Requirements (2008)

TABLE 1. Traditional Insulation and Air-Sealing Options for the Foundation-Framing Interface

Spray Polyurethane Foam



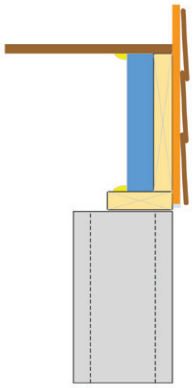
Installation:
SPF covers and seals cracks and gaps along walls parallel and perpendicular to floor joists.

Energy Efficiency and Air Sealing:
SPF provides high R/inch insulation and air seal on cracks, gaps and penetrations.

Condensation Control:
SPF provides an integral Class II vapor retarder at thicknesses greater than 2".

Termite (WDO) Inspection
SPF is not easily removable and encapsulates the band/rim joist and sill plate, possibly impairing simple visual i nspection for termites, if unaided by advanced detection equipment.

Foam Board with Caulk/Sealant



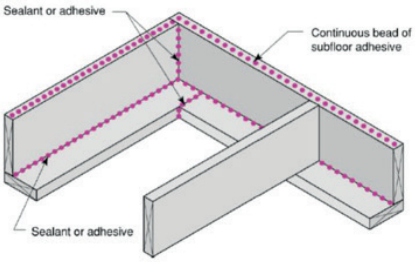
Installation:
Requires precision cutting and installation of caulk and sealant in tight spaces.

Energy Efficiency and Air Sealing:
Foam board and caulk/sealant insulates and air seals gaps except that between the sill plate and top of foundation.

Condensation Control:
Most foam board insulations provide an integral Class II vapor retarder. Check water vapor resistance of unfaced foams.

Termite (WDO) Inspection
Sealed foam board is not easily removable and encapsulates the band/rim joist possibly impairing simple visual inspection of the band joist, but does allow inspection of the front of the sill plate.

Fiberglass with Caulk/Sealant



Installation:
Requires precision cutting and installation of caulk and sealant in tight spaces.

Energy Efficiency and Air Sealing:
Fiberglass and caulk/sealant insulate with a lower R/inch. May not be possible to caulk/seal all cracks and gaps.

Condensation Control:
Fiberglass is moisture permeable and may lead to condensation and subsequent mold, mildew and rotting.

Termite (WDO) Inspection
Fiberglass is removable, allowing for simple visual termite inspection but it is important to re-install the batt insulation to RESNET Grade I standard or original condition.

INSPECTION CONSIDERATIONS FOR TERMITES AND WOOD-DESTROYING ORGANISMS (WDO)

Some states including North Carolina[vi], Georgia[vii] and Alabama[viii] have modified the model code to include a termite inspection strip at the top and bottom 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.

These designs facilitate various degrees of visual inspection of modified, semi-permanent applications of foam plastic in the framing-foundation interface.

MODERN OPTIONS FOR SPF INSTALLATION IN KNOWN TERMITE INFESTATION AREAS

There are several modern, pest inspection-compliant options for installing SPF insulation below floors or on below-grade interior walls that can increase accessibility of visual inspection of these areas.

Selection of closed-cell or open-cell foam, as well as the use of vapor retarders in foundation-framing applications should consider moisture conditions and susceptibility to flooding and water intrusion. Consult with sources such as the SPF manufacturer, SPFA TechDocs or the applicable building codes for more information on SPF type and vapor retarder requirements for this application.

For SPF insulation below floors, Figure 14 shows installation Option F1 of SPF beneath the entire subfloor, in contact with the top of the band/rim joist. This configuration allows for visual inspection of most of the band/rim joist and all of the sill plate. If the entire band/rim joist needs to be inspected, As with all the options presented in this document, readers may need to adapt their selected approach based on individual conditions and other specific circumstances.

FIGURE 14. SPF Option F1 – Application of SPF Under Floor

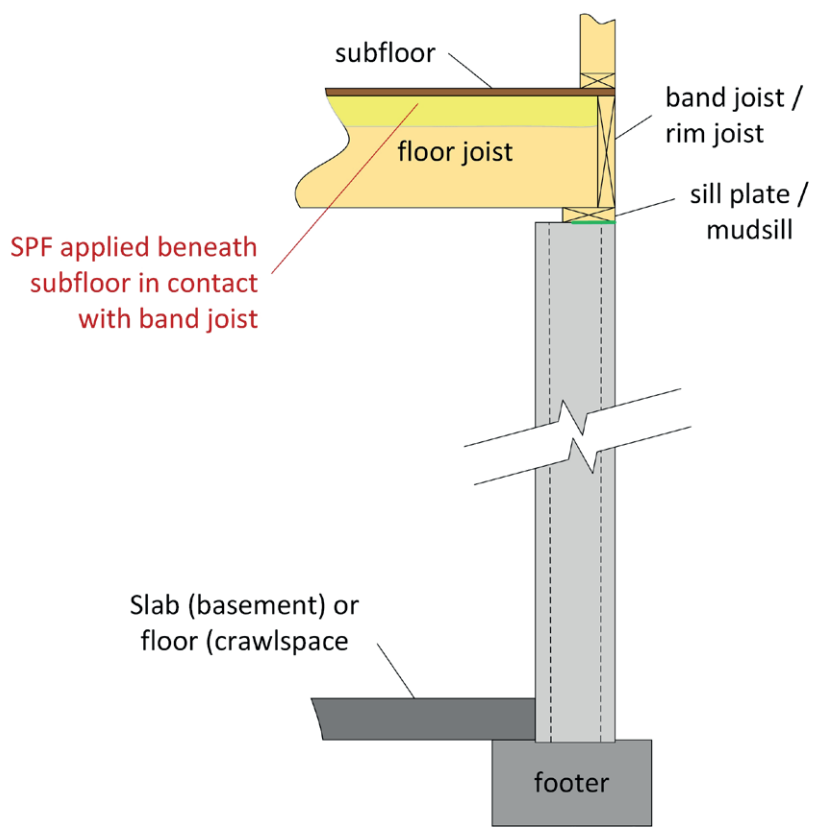
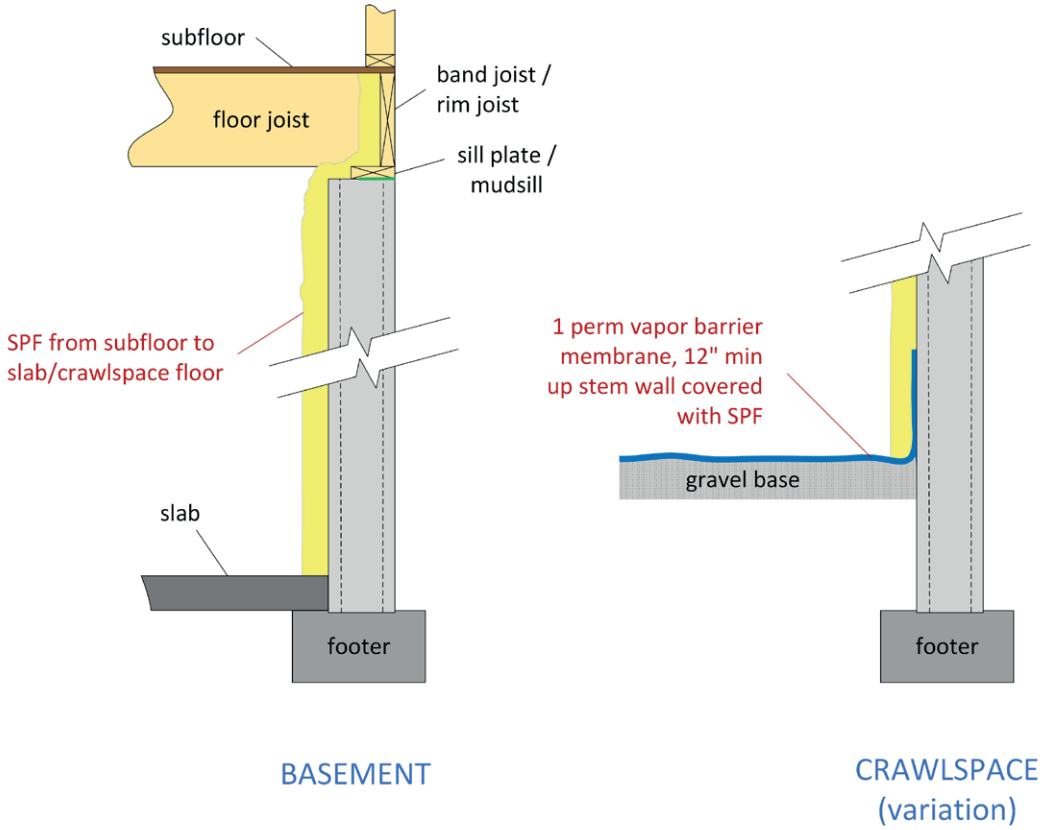


FIGURE 15. SPF Option W1 – Application of SPF Over Sill Plate and Band/Rim Joist

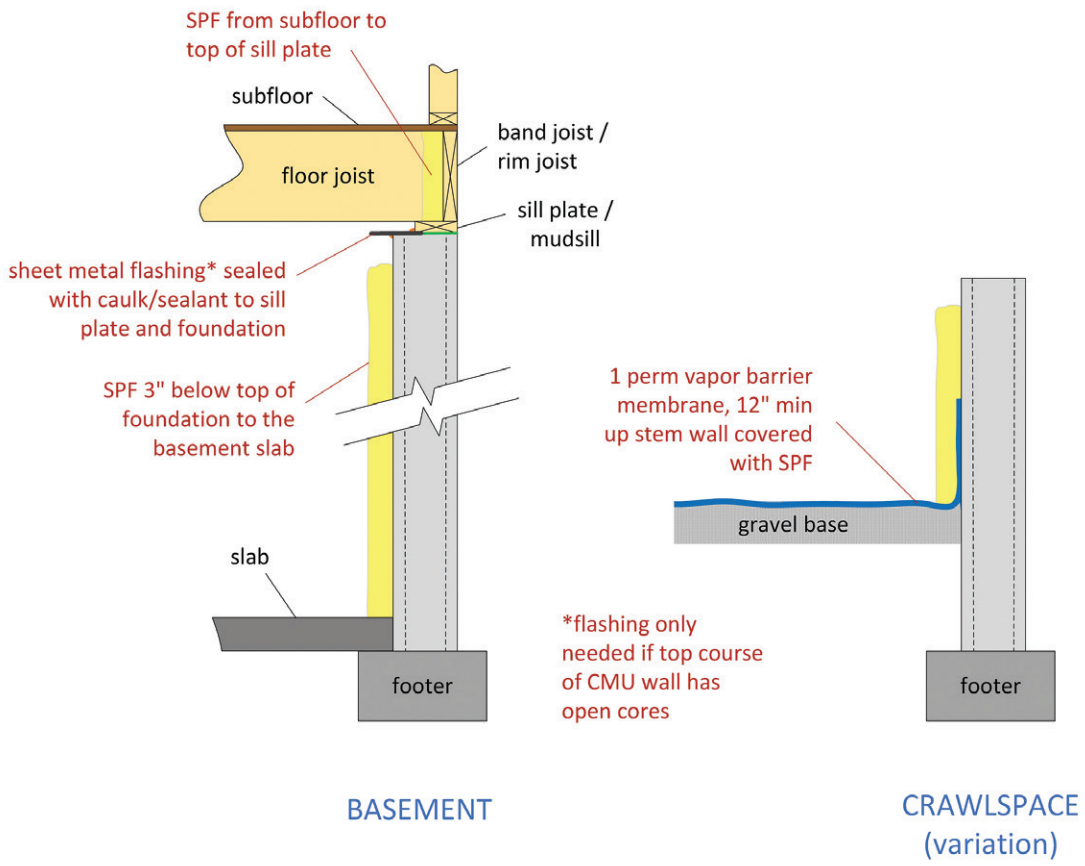


For SPF insulation of below-grade walls and the framing foundation interface, Figure 15 shows installation Option W1, where closed-cell SPF installed from the sub-floor to the basement/crawlspace floor. While this provides a highly effective solution for insulation and air sealing, it may impair simple visual inspections for termites.

Figure 16 shows installation Option W2, with inspection gaps at the top of the foundation, compliant with many state building codes. Option W2 will insulate and air seal the rim joist but leaves the front face of the sill plate exposed for improved visual inspection.

Note that W2 shows an optional installation of sheet metal flashing between the sill plate and foundation, with a bead of caulk or sealant between the sill plate and flashing to improve air tightness when the top course of the CMU block wall has open cores.

FIGURE 16. **SPF Option W2 – Application of SPF Over Band/Rim Joist and Optional Sealed Flashing**



Prior to installation of SPF insulation, SPF professional contractors should consult with the homeowner/customer to discuss which option in Figures 14 to 16 may be desired to avoid exceeding the capabilities of their chosen pest management company's inspection protocols, or warranty criteria.

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

1. For all new construction, follow the requirements of the building code at the time of construction for termite control. The SPF professional, pest management company, and/or homeowner/builder should 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. Homeowner/builder 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.
3. Homeowner/builder consult with a capable, reputable and experienced professional pest management company to get their input on insulation/construction solutions that are supported by their professional services. If SPF is not acceptable or serviced by the pest management company, we recommend finding a different, more capable pest company in the area.

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

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

1. For existing buildings, install SPF according to the local building codes at the time of installation, 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 recommended to have a thorough termite inspection performed by a competent, qualified pest management professional before installation of SPF. If there is any sign of termite damage, advise the building owner and wait to proceed with the work until repairs are complete and a termite management program is initiated.
4. Ask the customer/homeowner if the structure is currently under warranty/bond for termite control and recommend they discuss the SPF application with a professional pest management contractor. Discuss SPF installation options with a professional pest management contractor and agree upon what installation options are acceptable to all parties.

Useful Tips for Hiring/Working with a Pest Control Company[6]

Checklist for Working with a Pest Control Company

1. **Identify the pest and do some research about how to control it.**
2. **If you decide to hire a professional, obtain recommendations from neighbors, friends, or family about pest control services they have used.**
   - Call at least three companies and consider their methods as well as their customer service policy.
   - Find out what types of services the company offers.
   - Find out if least-toxic alternatives are available to control the pest.
   - Make sure the company has the required licenses, certificates, and insurance.
3. **Ask the company to inspect the site.**
4. **Review the solutions.**
   - Consider long-term solutions to the problem.
   - Consider your chemical tolerance.
   - Ask how the pesticide will be applied and where.
   - Avoid companies that offer automatic monthly or quarterly sprays.
5. **Review the contract.**
6. **Stay in touch with the pest control company.**
   - Verify that the company, as agreed in the contract, is monitoring pest populations.
   - Communicate to the company the levels of pests that are tolerable.
   - Inform the company of any changes in pest populations.
7. **Do your part to help manage the pest.**
   - Clean up food sources.
   - Fix plumbing leaks, or repair structures.

According to the University of Georgia's *Termite Control Services: Information for the Georgia Property Owner*[7], "when hiring a termite control company, it is advisable that property owners take their time and acquire the services of a company committed to customer service. Word-of-mouth and reputation are likely the most reliable means of selecting an exceptional termite control company. Since termites usually do not damage wood very quickly, property owners should never let a salesperson pressure them into signing a contract without understanding the terms and conditions offered.

[6] University of California Agriculture & Natural Resources Statewide Integrated Pest Management Program

[7] https://secure.caes.uga.edu/extension/publications/files/pdf/B%201241_5.PDF

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[iv] "Defeating Pests at Hide-and-Seek with Thermal Imaging Cameras", 2014 FLIR whitepaper https://www.flir.com/discover/instruments/building-diagnostics/defeating-pests-at-hide--seek-with-flir-thermal-imaging-cameras/

[v] Lewis, V.R., C.F. Fouche, R.L. Lemaster. 1997. Evaluation of dog-assisted searches and electronic odor devices for detecting the western subterranean termite Forest Products Journal. 47: 79-84

[vi] Georgia Department of Agriculture Report: "Spray Polyurethane Foam / Termite Detection Demonstration Project (July – August 2019). Presented November 12, 2019.

[vii] 2018 International Residential Code, Section R318.

[viii] 2018 International Building Code, Section 2304.

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