



STYROFOAM Brand Insulation Solves Your Crawl Space Problems

About 20% of the new homes in the U.S. are constructed with a crawl space. While the practice is most common in the southeastern states, it is found in most areas of the U.S. Improperly constructed crawl spaces can cause the rest of the home to be uncomfortable when moldy, smelly moist air from the crawl space is drawn into the living areas. With such widespread occurrence of crawl spaces and potential problems associated with them, it is important for builders and remodelers to know the best ways to insulate a home built over a crawl space. Because there are a number of ways to insulate crawl spaces, there is value in examining how STYROFOAM* brand insulation solves your crawl space problems.

Options available to insulate a new or older home's crawl space include the following:

- Using fiberglass batts between the floor joists
- Using rigid foam insulation nailed to the bottom of the joists
- Using foam in place insulation or expanded foam inserts inside the concrete blocks, if block foundation is the method of construction
- Using rigid foam insulation on the outside or the inside walls of the crawl space.

The easiest (i.e., least labor) way to insulate the interior side of a crawl space is to do it before the floor joists are installed. While it is not possible to use fiberglass or rigid sheets under the

floor before the joists are put into place, it is relatively easy to put rigid foam insulation on the interior walls of the crawl space. Instead of an installer lying on his back, pushing itchy fiberglass batts above his face into a cavity between the joists, picture a person being able to stand up and place rigid boards against the block or concrete wall. Since the rigid boards may be either nailed to the walls or glued with a compatible adhesive there are several possible avenues to install the foam, all relatively fast and simple.

While many studies have shown that a water resistant rigid insulation such as STYROFOAM brand Tongue and Groove insulation can be installed on either the inside or the outside wall of a crawl



space, it is less expensive to install it inside, since no coating has to be applied over the foam to protect it from UV degradation⁽¹⁾. Also, the insulation is slightly more effective when installed on the inside of the wall because moisture transfer from the footer to the interior of the crawl space is more effectively blocked.

Reducing moisture drive through the crawl space wall cannot easily be accomplished with insulation in the cavities of concrete masonry units because of the thermal and moisture shorts through the webs of the blocks. Not only are foam in place or expanded polystyrene foam inserts less resistant to moisture than extruded polystyrene foam insulation, they may not even fill the entire space between the webs. Thus, neither high insulating efficiency nor low moisture transmission through the blocks is possible by merely insulating the block cavities.

A vapor retarder, such as six mil polyethylene film, over the dirt floor of a crawl space is generally considered to be an important link in preventing crawl space problems. The soil

is a source of moisture, so having the film between a source of moisture and the area from which it must be excluded is vital. The vapor retarder can easily be adhered/taped to the foam insulation at the walls. The plastic film can stop much of the moisture rising up from the floor, but it is not the only cure for the problems. Proper drainage around the crawl space is also necessary to minimize water in the crawl space. If the water table is very high, a sump system may be needed to expel standing water.

The use of vents in crawl spaces has been subject to numerous studies. Although most building codes call for the installation of vents in a crawl space, studies in the last 15 years indicates they should not be vented^(2,3,4,5).

Some comments from authors on the subject of ventilated crawl spaces:

“There is no technical basis in the literature for current or past crawl space ventilation requirements.” William B. Rose, University of Illinois at Champaign-Urbana.⁽⁶⁾

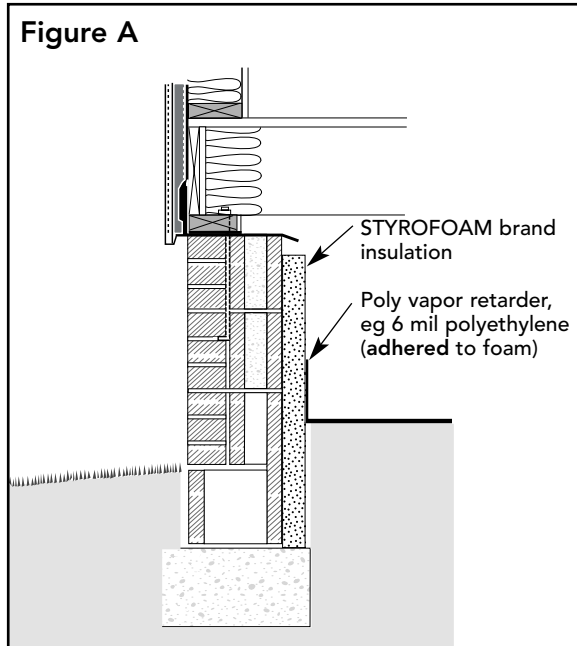
“Regarding crawl spaces with a ground cover, there is no known field evidence that shows that they need to be ventilated. On the contrary, the available research findings clearly indicate that ventilation is not necessary when a ground cover is used ... In certain humid climates, the introduction of outdoor air through crawl space vents during the summer may actually increase the moisture levels within a crawl space. George Tsongas, Portland State University.⁽⁷⁾

“Constructing vented crawl spaces is a bad idea ... Venting a crawl space with exterior, humid air during summer months leads to the wetting of crawl space assemblies, rather than drying, since crawl space surfaces will be cooler than the outside air. Crawl spaces should be constructed like mini basements. They should be heated during the winter and cooled during the summer.” Joe Lstiburek, Building Science Corporation.⁽⁸⁾

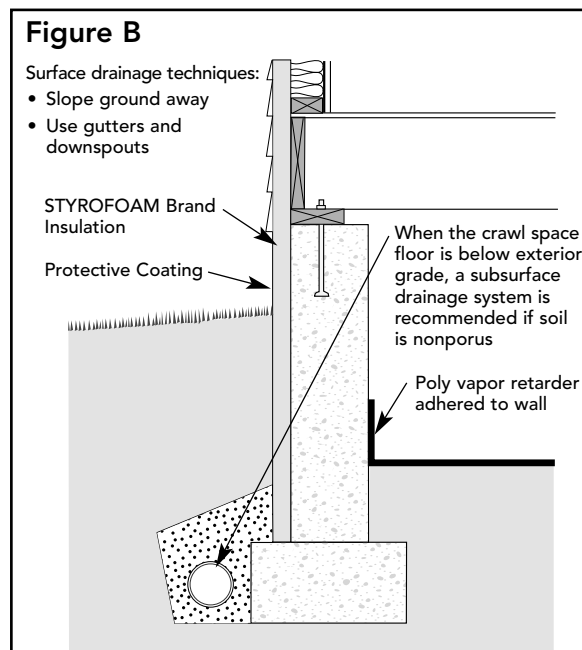
In conclusion, most current research supports that one of the most cost effective and performance effective systems for treatment of crawl spaces is the use of a vapor retarder

over the soil and STYROFOAM brand insulation on the interior walls, with the vapor retarder sealed to the foam (see Figure A).

The following reports from model code organizations allow STYROFOAM brand insulation uncovered on the inside of a crawl space wall when certain conditions are met: BOCA Research Report 2102, SBCCI Evaluation Report 9576C, ICBO Evaluation Report ER-2257. A good alternative is to use the STYROFOAM brand insulation on the exterior of the crawl space walls, with a protective coating above grade (see Figure B).



Crawl space with STYROFOAM brand insulation on the inside and a properly installed vapor retarder.



Crawl space with STYROFOAM brand insulation on the exterior side, with a properly installed vapor retarder.

Footnotes:

- 1) ORNL *Builder's Foundation Handbook*, J. Carmody, J. Christian, K. Labs, 1991, page 44.
- 2) "Factors Influencing the Moisture Conditions in Crawl Spaces," Stephen Quarles, *Forest Products Journal*, Vol. 39, # 10.
- 3) *Energy Design Update*, November 1988, pages 9-12.
- 4) *ASRAE 1997 Handbook of Fundamentals*, published by ASHRAE, Atlanta, GA.
- 5) *Energy Design Update*, October, 1997, page 2.
- 6) ASHRAE Transactions 1994
- 7) ASHRAE Transactions 1994
- 8) *Builder's Guide for Mixed-Humid Climates*, 1999

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WARNING: STYROFOAM brand insulation products are combustible and may constitute a fire hazard if improperly used or installed. Consult Dow for further information. The material contains a flame retardant additive to inhibit accidental ignition from small fire sources. During shipping, storage, installation and use, these products should not be exposed to open flame or other ignition sources.

STYROFOAM brand insulation has no food value to attract or support insects; however, if STYROFOAM brand insulation covers the exterior surface area of below grade walls and slabs, it may be difficult to detect termites. Building codes prohibit the use of plastic foam insulation on exterior foundations and crawl spaces in certain southern and western states. In other areas where termites may be a concern, construction techniques and industry practices that can reduce the potential for termite infestation should be considered. Consult a local building official for specific requirements in your area.

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