Below Grade Systems
by Dow
Build Value and Performance Into Your Home

Homes have one thing in common: Their foundations must come in contact with the earth. So wherever you build, moderating the effects of soil, water, temperature and air on the foundation can impact the performance and integrity of the total structure.

Continuous rigid foam insulation – from footing to sill plate and below concrete floors – is an effective way to reduce foundation energy loss and protect against moisture problems. In addition to offering exceptional, long-term thermal performance, STYROFOAM™ Brand Extruded Polystyrene (XPS) Foam Insulation from Dow:

- Enhances drainage (STYROFOAM™ Brand PERIMATE™ Insulation)
- Insulates the below-grade wall to reduce the potential for condensation
- Protects the waterproofing/damp-proofing
- Provides a more comfortable environment throughout the home

*A Strong Foundation*

Invented by Dow more than 75 years ago, STYROFOAM™ Brand XPS Foam Insulation continues to provide excellent moisture resistance because of its durable, closed-cell structure. This rigid foam insulation offers high R-value (R-5.0 per inch [RSI 0.88 per 25 mm]) and exceptional compressive strength.** Products and applications include:

- STYROFOAM™ Brand WALLMATE™ Insulation for crawl spaces and interior basement walls
- STYROFOAM™ Brand PERIMATE™ Insulation for exterior foundation walls
- STYROFOAM™ Brand SM Insulation for exterior foundation walls and basement floors

*Source: www.oee.nrcan.gc.ca

**R means resistance to heat flow. The higher the R-value, the greater the insulating power.
Reduce Energy Loss

Concrete is a highly heat-conductive material. In an uninsulated or poorly insulated basement, heat escapes primarily through two paths:

- Horizontally through the wall into the earth below grade
- Vertically through the concrete wall and into the air above the grade line

Insulating the exterior or interior of the foundation wall slows both vertical and horizontal heat flow through the wall, helping to mitigate conditions that cause energy loss.

In an uninsulated concrete wall, heat flows horizontally and vertically.

Insulating with rigid foam (exterior insulation shown here) slows heat loss from both directions.

Alone, concrete offers very little resistance to heat flow. For example, a 7" (18 cm) thick slab of poured concrete has the same R-value as a pane of glass (R-1.5 [RSI 0.3]).
Manage Moisture

Foundation walls exist in a typically wet environment caused by rain, melting snow or the water table. The concrete and cement block commonly used to build most foundation walls absorbs water from the soil and allows it to move through the wall.

Much of this movement is due to capillary action: Water moves from an area of high concentration to low concentration, often against gravity. Water can also pass directly through cracks in the basement wall.

Exterior Insulated Basement

When building a home, adding a continuous layer of STYROFOAM™ Brand Extruded Polystyrene Foam Insulation to the exterior of basement walls is one of the most important steps you can take to protect your home from the damaging effects of moisture.

Moisture-resistant STYROFOAM™ Brand XPS Foam Insulation:
- Protects the waterproofing or damp-proofing from damage caused by backfill
- Keeps the wall warm, reducing the potential for condensation on the interior surface of the wall
- Resists water absorption and compression from soil loads, retaining its thermal performance

![Figure 1: STYROFOAM™ Brand PERIMATE™ Insulation](image)

<table>
<thead>
<tr>
<th>STYROFOAM™ Brand PERIMATE™ Insulation</th>
<th>R-10 (1.76)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Value (RSI), min. (Btu/°F•ft2•h), per AST-MC518, measured at 75°F mean temperature</td>
<td>(for 2.13” thick product with drain channels)</td>
</tr>
<tr>
<td>Water Absorption, max. (% by vol.), per ASTM D2842</td>
<td>0.7</td>
</tr>
</tbody>
</table>

See CCMC 04888-L Evaluation Listing for verification of CAN/ULC S701 Type 4 compliance.

Regardless of the home's age, preventing water intrusion is critical to keeping a basement dry.
Handle a Heavy Load

Below grade, soil exerts a great deal of pressure on a basement foundation wall. As the soil weight presses downward, it also exerts a horizontal (lateral) pressure. Insulation or drainage material without sufficient compressive strength is unable to resist this pressure and compresses, reducing R-value and drainage capability.

STYROFOAM™ Brand XPS Foam Insulation has the necessary compressive strength to fully resist soil pressures over the life of the building.

Stand Up Under Pressure

A typical basement wall is bombarded with pressure from nonmoving water, and this hydrostatic pressure increases at greater depths. Without proper drainage, water can pool at the lowest point on the wall. Pressure builds up, and the water seeks a path right through cracks in the foundation.

Waterproofing can resist hydrostatic pressure, but waterproofing and damp-proofing should be complemented with a means to drain water away from the foundation, such as STYROFOAM™ Brand PERIMATE™ Insulation. It has drainage grooves to direct water down to the drainage tile and away from the foundation, which reduces hydrostatic pressure against the wall (Figure 2).
Keep Crawl Spaces Drier

The practice of adding vents to crawl space walls is meant to help dry out the crawl space area. However, vents actually allow moisture to enter the crawl space, and do little to help it dry out.

Moisture that enters through these vents clings to floor joists, batt insulation, HVAC equipment and plumbing fixtures. In this moist environment, mold and mildew can quickly degrade the space’s contents, as well as compromise indoor air quality. In addition, wood-eating insects, dust mites and small creatures can enter through the vents to take up residence.

A popular alternative to the vented crawl space is the unvented, properly insulated crawl space. Rigid foam insulation serves an important role in an unvented crawl space, helping keep the area dry and the home more energy efficient. STYROFOAM™ Brand WALLMATE™, STYROFOAM™ Brand SM or STYROFOAM™ Brand CLADMATE™ Insulations can be used for this application.

Moist air in a vented crawl space can migrate to the interior of the home, increasing indoor humidity levels. One consequence of increased humidity is wood components and furnishings absorbing moisture, which can cause warping and swelling.

Building codes require that a foundation extend below the local frost line. In cold climates, this can mean a foundation is more than 5’ below grade. However, as part of a frost-protected shallow foundation, STYROFOAM™ Brand SM Insulation allows the construction of a much shallower foundation, which saves on building costs. The insulation protects the ground from freezing at shallower depths than the prescribed local frost line.

Frost Protected Shallow Foundations

At 8’ (2.4 m) below grade, lateral soil pressure against the basement wall can be as much as 1,000 lb/ft² (48 kPa). Photos courtesy of Jeff Tooley, owner of The Healthy Building Company.
The Steps to Insulated Stairwells

A concrete exterior stairwell (block, precast or poured-in-place) can be subjected to freeze-thaw cycles. These may result in heaving and cracking, causing damage to both the stairwell and the basement wall.

Placing STYROFOAM™ Brand SM Insulation beneath and on the exterior sides of the stairwell can minimize frost penetration and reduce the potential for frost damage.

Interior Insulated Basements

STYROFOAM™ Brand WALLMATE™ Insulation can be installed on the interior of masonry walls with no need for studs or a vapour barrier, providing moisture-resistant insulating comfort. This insulation has slotted vertical edges that accommodate furring strips. The furring strips are used to attach the insulation to the wall and provide a nail base for drywall.

Slab-on-Grade

In a slab-on-grade radiant floor heating design, concrete disperses hot water heat from radiant heat tubes. Without adequate insulation, this heat can be lost as it moves toward the slab’s edges or downward to the soil. STYROFOAM™ Brand SM Insulation at floor edges and under the slab helps:

- Keep heat in the house
- Reduce the potential for condensation on the floor surface, especially at the outside perimeter
- Maintain a comfortable floor temperature
FROTH-PAK™ Foam Sealant

FROTH-PAK™ Foam Sealant is a two-component, quickcurcure polyurethane foam that fills cavities, penetrations and cracks. The self-contained kits do not require an external power source.

GREAT STUFF PRO™ Gaps & Cracks Insulating Foam Sealant

Designed to fill gaps up to 3”, GREAT STUFF PRO™ Gaps & Cracks Insulating Foam Sealant forms a permanent, airtight and water-resistant bond when applied properly. Recently, Dow conducted a study of existing homes to help quantify the energy savings of GREAT STUFF PRO™ Gaps & Cracks Insulating Foam Sealant. Application of the foam took 2 hours and 8 minutes on average. The average return on investment ranged from 145 percent to 2,300 percent in one year. Results varied depending on the air leakage location, amount of air sealing and individual home characteristics.

For more information on how to build performance and value into your home, call a Dow representative today.

In the U.S.
For Technical Information:
1-866-583-BLUE (2583) (English)
1-800-363-6210 (French)

For Sales Information:
1-800-232-2436 (English)
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For Sales Information:
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www.insulateyourhome.com

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STYROFOAM™ Brand Extruded Polystyrene Foam Insulation

CAUTION: This product is combustible. Protect from high heat sources. A protective barrier or thermal barrier may be required as specified in the appropriate building code. For more information, consult (Material) Safety Data Sheet (MSDS), call Dow at 1-866-583-BLUE (2583) or contact your local building inspector. In an emergency, call 1-989-636-4400 in the U.S. or 1-519-339-3711 in Canada. WARNING: Rigid foam insulation does not constitute a working walkable surface or qualify as a fall protection product.

Dow Polyurethane Foam Insulation and Sealants

CAUTION: When cured, these products are combustible and will burn if exposed to open flame or sparks from high-energy sources. Do not expose to temperatures above 240°F (116°C). For more information, consult (Material) Safety Data Sheet (MSDS), call Dow at 1-866-583-BLUE (2583) or contact your local building inspector. In an emergency, call 1-989-636-4400 in the U.S. or 1-519-339-3711 in Canada. When air sealing buildings, ensure that combustion appliances, such as furnaces, water heaters, wood burning stoves, gas stoves and gas dryers are properly vented to the outside. See website: http://www.epa.gov/iaq/homes/hip-ventilation.html. In Canada visit: http://archive.epa.gov/eng/ibp/irc/bsi/83-house-ventilation.html.

FROTH-PAK™ Spray Polyurethane Foam contains isocyanate, blowing agent and polyol. Contents under pressure. Read the instructions, review safe handling presentations, and read (Material) Safety Data Sheet (M) SDS carefully before use. Wear protective clothing to cover all skin (including long sleeves and hood), gloves, goggles or safety glasses, and proper respiratory protection. Do not breathe vapor or mist. Use only with adequate ventilation per use instructions. The spray foam applicator and anyone within 25 feet of the applicator must use an approved air purifying respirator equipped with an organic vapor sorbent and a particle filter at a minimum. Increased ventilation significantly reduces the potential for isocyanate exposure; however, supplied air or an approved air-purifying respirator equipped with an organic vapor sorbent and a particulate filter may still be required to maintain exposure levels below ACGIH, OSHA, WEEL or other applicable limits. For situations where the atmospheric levels may exceed the level for which an air-purifying respirator is effective, use a positive-pressure, air-supplying respirator (air line or self-contained breathing apparatus). Spraying large amounts of foam indoors may require the use of a positive pressure, air-supplying respirator. Follow all applicable federal, state, local and employer regulations.

GREAT STUFF PRO™ sealant and adhesive products contain isocyanate and a flammable blowing agent. Read all instructions and (Material) Safety Data Sheet (MSDS) carefully before use. Eliminate all sources of ignition before use. Cover all skin. Wear long sleeves, gloves, and safety glasses or goggles. Provide adequate ventilation or wear proper respiratory protection. Contents under pressure. Not to be used for filling closed cavities or voids such as behind walls and under tub surrounds. CAUTION: When cured, these products are combustible and will burn if exposed to open flame or sparks from high-energy sources. Do not expose to temperatures above 240°F (116°C). For more information, consult MSDS, call Dow at 1-866-583-BLUE (2583) or contact your local building inspector. In an emergency, call 1-989-636-4400 in the U.S. or 1-519-339-3711 in Canada.

Building and/or construction practices unrelated to building materials could greatly affect moisture and the potential for mould formation. No material supplier including Dow can give assurance that mould will not develop in any specific system.

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