

Rigid Foam Insulation in Concrete Sandwich Panel Applications

SYSTEM OVERVIEW

General Information

The unique properties of DuPont™ Styrofoam™ Brand SM insulation and Styrofoam™ Brand Perimate™ insulation give them exceptionally good qualities for a wide variety of uses. In particular, Styrofoam™ Brand insulation products outperform all other products in exterior foundation applications.

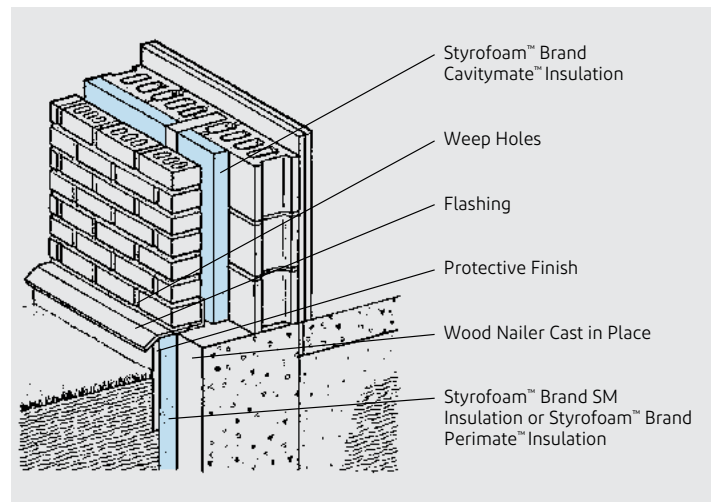
Advantages

There are several advantages to insulating the exterior surface of foundation walls. The block or concrete wall insulated on the exterior surface is not subjected to large temperature differences and so will not act as a thermal bridge. Block walls insulated on the exterior undergo less air convection in block cavities. At nearly room temperature, the basement walls act as a heat reservoir, buffering interior temperature fluctuations. In some instances, adfreezing forces are prevented from acting directly on the basement wall. And finally, unlike interior applications, no living space is lost.

Design Considerations

Insulation

The use of Styrofoam™ Brand SM insulation meeting CAN/ULC S701 Type 4 is recommended. Where additional drainage is required, Styrofoam™ Brand Perimate™ insulation meeting CAN/ULC S701 Type 4 should be considered. The insulation boards are applied vertically to the wall (horizontally for slab on grade or shallow foundation applications) and are secured at the top with a compatible adhesive or by nailing to the wall. Backfilling against the insulation will hold the lower portion of the boards in place. The insulation should extend from the top of the foundation wall to the top of the footing. Styrofoam™ Brand Perimate™ insulation is a CCMC Class A Type 2 drainage layer.



Waterproofing and Damp-Proofing

Waterproofing and damp-proofing materials should not be used for adhering the insulation. The insulation should be installed once the damp-proofing has cured sufficiently, as the solvents in some of these materials may attack polystyrene insulation.

Protective Covering

It is important that the above-grade portion of Styrofoam™ Brand SM insulation be protected from physical damage and direct exposure to sunlight (i.e., ultraviolet degradation). Depending on the extent of protection needed, your options include a cementitious or thin stucco coating, application of a fiberglass reinforced plastic or vinyl sheet, or a metallic covering. Flashing should be installed over the top edge of the insulation and protective covering.

TABLE 1: Physical Properties of Styrofoam™ Brand SM Insulation and Styrofoam™ Brand Perimate™ Insulation

Property and Test Method	Value
Thermal Resistance ⁽¹⁾ per in. (25 mm), ASTM C518, C177, 75°F (24°C) mean temp., ft ² ·h·°F/Btu (m ² ·°C/W), R-value (RSI), min.	5.0 (.87)
Compressive Strength ⁽²⁾ , ASTM D1621, psi (kPa), min.	30 (210)
Water Absorption, ASTM D2842, % by volume, max.	0.7
Maximum Use Temperature, °F (°C)	165 (74)
Coefficient of Linear Thermal Expansion, ASTM D696, in/in·°F (mm/mm·°C)	3.5 x 10 ⁻⁵ (6.3 x 10 ⁻²)

⁽¹⁾ Values are consistent with criteria of ASTM C578.

⁽²⁾ Vertical compressive strength is measured at 10 percent deformation or at yield, whichever comes first. Since Styrofoam™ Brand extruded polystyrene insulations are visco-elastic materials, adequate design safety factors should be used to prevent long-term creep and fatigue deformation. For static loads, 3:1 is suggested. For dynamic loads, 5:1 is suggested.

INSTALLATION

Slab On Grade Insulation

The use of DuPont™ Styrofoam™ Brand SM insulation is recommended. The insulation boards are applied vertically to the inside of the foundation wall and are initially secured at the top with an adhesive compatible with polystyrene insulation based on CGSB specification #71- GP-24M. Backfilling against the insulation will hold the boards firmly in place. The insulation should extend from the bottom of the floor slab to the top of the footing.

Vapour Barrier

The vapour barrier, if used, should be installed along the underside of the floor slab and over the top edge of the insulation.

Under Slab

The use of Styrofoam™ Brand SM insulation is recommended except where the slab will be expected to sustain very high loading (from mechanical equipment, etc.). In that case, a higher-compressive strength insulation should be considered, such as Styrofoam™ Brand Highload 40, 60 or 100 insulation.

The insulation boards should be placed snugly around the perimeter of the foundation wall and laid directly over the well-compacted porous fill. The insulation is laid loose with

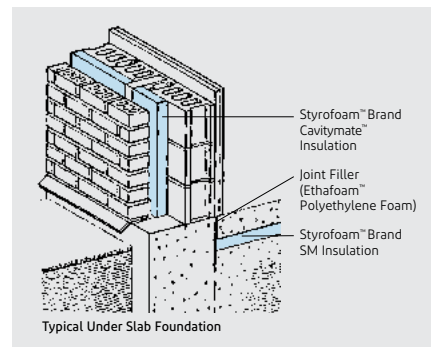
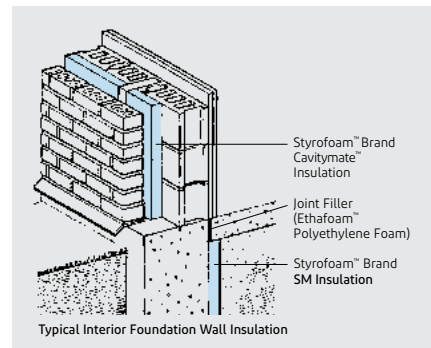
the edges butted tightly together. However, if wind uplift may be a problem before the concrete slab is poured, secure the insulation boards to the ground with 6 mm (1/4") diameter wood skewers which should be at least 75 mm (3") longer than the thickness of the Styrofoam™ Brand insulation.

Vapour Barrier

The vapour barrier, if used, is laid over the top of the insulation and under the entire floor slab area.

Weepers

Weepers should be included on the inner face of the foundation wall if the soil conditions do not provide sufficient drainage.



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