



The Value of  
Residing With  
**STYROFOAM™**  
Brand XPS  
Insulation

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resists moisture

serves as drainage plane

maintains thermal performance

Residing is a great opportunity to increase a home's value with a fresh, new look. It's also an opportunity to increase energy efficiency and overall comfort with moisture-resistant, durable insulation.

For 60 years, BLUE™ STYROFOAM™ Brand Insulation has been a leading building insulation solution for residing contractors and homeowners alike. STYROFOAM™ Brand Extruded Polystyrene (XPS, ASTM C578 Type X) Insulation is valued for its exceptional insulation performance, excellent moisture resistance and the appropriate level of water vapor permeability under vinyl siding.

To appreciate the value of Dow's extensive portfolio of rigid insulated sheathings, Dow recommends comparison shopping STYROFOAM™ Brand XPS and the competition – white bead board or expanded polystyrene (EPS, ASTM C578 Type I).

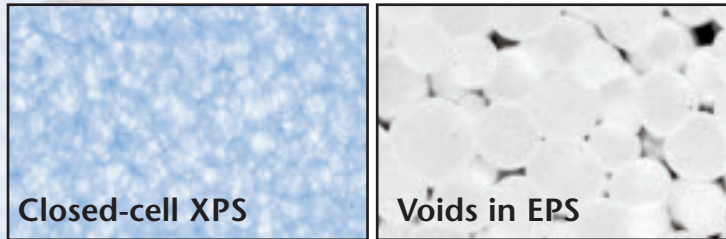
As part of a Type I foam-backed vinyl siding system, EPS is laminated or adhered to vinyl siding for ease of installation. When comparing STYROFOAM™ Brand XPS to this system, it is important to consider the following characteristics, including:

- Foam structure
- Compressive strength
- Thermal performance
- Moisture resistance
- Breathability
- Ability to block air infiltration

After you have learned more about – and compared – the key components of quality insulation, you will be in a better position to choose the right insulation for your application.

## Visual Comparison

The first comparison is simple. STYROFOAM™ Brand XPS is BLUE™. EPS is white. Then when you look under a microscope, it is easy to see the structural difference.



### STRENGTH AND DURABILITY

Proprietary formulations and manufacturing processes for STYROFOAM™ Brand XPS ensures a closed-cell, high-density structure, providing a compressive strength of 15 psi (ASTM C578 Type X). This means XPS stands up to pressure and abuse at the job site much better than white EPS, with a compressive strength of 10 psi (ASTM C578 Type I).

STYROFOAM™ Brand XPS also resists moisture and maintains R-value.

When the white EPS backing on vinyl siding becomes damaged, it can create gaps, which can increase the risk of water absorption. Moisture absorption significantly impacts the R-value, reducing the overall energy efficiency and performance of the EPS-backed siding. The excess moisture can also increase the risk of mold and mildew and other moisture-related problems.

Disposable cooler made from EPS Type I



### Side-by-Side Comparison

#### BLUE™ STYROFOAM™ Brand (XPS) Type X

- Average R-value of 5.0 per 1"
- Can serve as secondary drainage plane
- Closed-cell structure resists moisture
- Strong and durable
- Retains high R-value after repeated freeze-thaw cycles (seasonal changes)<sup>(1)</sup>
- Can serve as a water-resistive barrier (WRB), eliminating the need for a separate housewrap with taped seams

#### White Bead Board (EPS) Type I

- Average R-value of 3.6 per 1"
- Cannot serve as secondary drainage plane
- Voids in foam can absorb and hold water
- Less durable on job site
- Loses significant R-value after repeated freeze-thaw cycles (seasonal changes)<sup>(1)</sup>
- Cannot serve as a water-resistive barrier without a low-permeance facer or a separate housewrap with taped seams

(1) Not all climates experience freeze-thaw conditions, and not all applications are affected in the same manner.

## Proof in Numbers

STYROFOAM™ Brand XPS Insulation is built on sound scientific principles and the proof is in the test results. Insulation from Dow outperforms white bead board in the following categories based on ASTM C578.

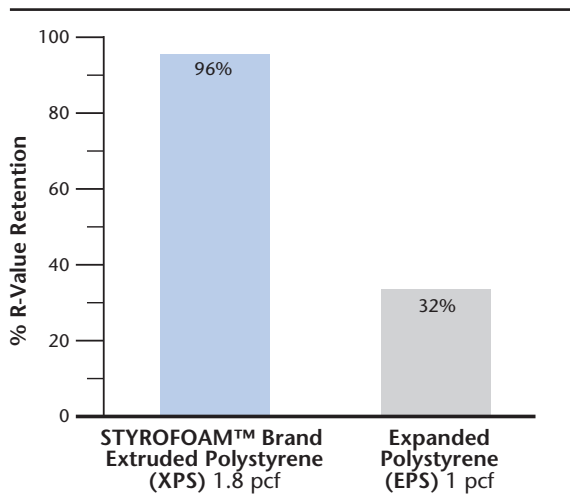
Physical Properties of STYROFOAM™ Brand XPS Insulation and Typical Bead Board		
Property and Test Method	Value	
	BLUE™ STYROFOAM™ (ASTM C578 Type X)	White Bead Board (ASTM C578 Type I)
Thermal Resistance <sup>(1)</sup> at 1", ASTM C518 @ 75°F mean temp., ft <sup>2</sup> •h•°F/Btu, min., R-value	5.0	3.6
Compressive Strength <sup>(2)</sup> , ASTM D1621, psi, min.	15	10
Density, ASTM D1622, lb/ft <sup>3</sup> , min.	1.3	0.9
Water Absorption, ASTM C272, % by volume, max.	0.3	4.0
Water Vapor Permeability <sup>(3)</sup> , ASTM E96, perm, max.	1.5	5.0
Flexural Strength, ASTM C203, psi, min.	40	25

(1) R means resistance to heat flow. The higher the R-value, the greater the insulating power. R-values are consistent with criteria of ASTM C578 and requirements of FTC R-value rule (16 CFR Part 460).

(2) Vertical compressive strength is measured at 10 percent deformation or yield, whichever occurs first.

(3) Based on 1" thickness.

### R-VALUE RETENTION



In a freeze-thaw cycle test of 414 cycles, STYROFOAM™ Brand XPS Insulation retained 96% of its R-value, while the EPS insulation decreased to 32%.

(Test method ASTM C666, Procedure B. Not all climates experience freeze-thaw conditions, and not all applications are affected in the same manner. Length of service for material cannot be determined using data from this test method.)

## The Value of Science

When it comes to R-value, the greater the number the better. BLUE™ STYROFOAM™ Brand XPS not only starts off with a greater value (5.0 per 1"), but its durable formulation and consistent thickness provide a long-term, stable R-value on the walls of a home. In contrast, EPS Type I has an R-value of 3.6 per 1".

Contoured vinyl siding adhered to contoured white bead board (EPS) may be a time-saver, but it comes at a cost: Contoured EPS foam has a significantly lower R-value when compared to the consistent thickness found in STYROFOAM™ Brand Extruded Polystyrene Insulation. For the best value, you cannot beat STYROFOAM™ Brand XPS for consistent and continuous protection around a building envelope.

The varying thickness in contoured EPS reduces the average R-value to 2.6 – well below the consistent 5.0 (per 1") for STYROFOAM™ Brand XPS.



The flat surface of XPS offers continuous protection and consistent R-value. It also provides an air space between the vinyl siding and insulation, allowing accumulated moisture to drain out of the wall assembly through the weep holes.

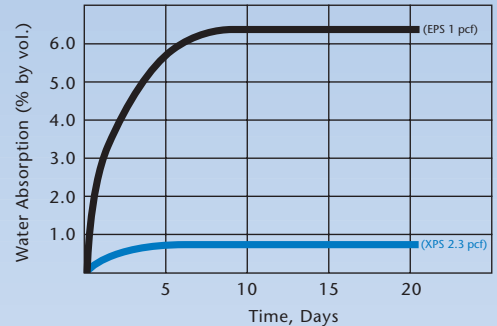


EPS bead board that is contoured to the siding profile offers inconsistent R-value, which is lower where the foam is thinner. At its thinnest point, EPS-backed siding is 7/16" with an R-value of 1.58. The typical Type I EPS-backed siding system has no air space, so there is no drainage path for accumulated moisture.

## RETAINING WATER

White bead board (EPS, ASTM C578 Type I) absorbs 13 times more moisture than STYROFOAM™ Brand XPS Insulation. Water retention can rob the insulation of R-value and provide the necessary elements for moisture-related problems such as mold and mildew.

Help keep damaging moisture out of a home with STYROFOAM™ Brand XPS.



Indicates how much water an insulation product absorbs when subjected to moisture in a liquid form. (Test method ASTM D2842)

Both EPS and STYROFOAM™ Brand XPS Insulation absorb water at lower rates in structural sandwich panel applications. From the ASTM report: Laboratory and Field Investigations of Moisture Absorption and its Effect on Thermal Performance of Various Insulations by Epstein and Dechow.

## MOISTURE ABSORPTION



BLUE™ STYROFOAM™ Brand XPS Resists Moisture Penetration



White Bead Board (EPS) Allows Moisture Migration

A water-based black dye solution was applied to samples of BLUE™ STYROFOAM™ Brand Extruded Polystyrene Insulation and white bead board expanded polystyrene insulation. After 24 hours, the bead board's voids enabled the dye to pass through the material. But STYROFOAM™ Brand XPS, with its non-porous, closed-cell structure, prevented water movement through the material.

Note: For demonstration purposes only.

## Let Moisture Escape

What happens when moisture, vapor and bulk water make their way into the siding/insulation system? If water in any form becomes trapped, it can potentially lead to mold, mildew and other moisture-related problems.

In a typical vinyl siding/adhered EPS system, water can become trapped on the one side by the vinyl siding. The only way out in this system is for the water to make its way into the EPS. And this EPS foam is typically applied directly against a relatively impermeable wood-based sheathing, increasing the potential for moisture damage.

As a separate layer, STYROFOAM™ Brand XPS provides an effective air space, which creates a drainage plane that allows water to drain to the bottom of the walls and escape from the building envelope through weep holes. This air space enhances the wall assembly's drying potential, which can contribute to a more comfortable home and reduce the potential for moisture-related problems.

Trapped moisture can cause mold and mildew and other moisture-related problems.



A STYROFOAM™ Brand XPS/vinyl siding system allows moisture and bulk water to escape.

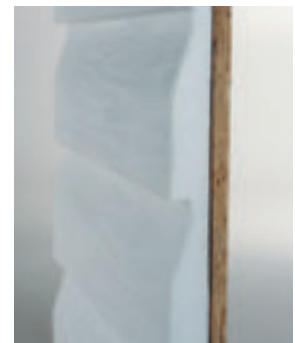
## Permeability

Think of permeability as a building material's ability to breathe (allowing moisture in the vapor state to pass through the material). EPS seems to have a higher permeability (5 perms at 1" thick), but when attached to vinyl siding the overall perm rating drops to 0.05. And drying toward the interior is also limited because the typical wood-based sheathing has a perm rating of 0.88.

Bottom line – When looking at an EPS-backed system, the permeability of the overall offering is determined by the siding itself, not the EPS. Therefore, both XPS and EPS-backed vinyl siding systems have similar, if not identical, overall permeability ratings.

## A CLOSER LOOK

XPS System	EPS System
Vinyl (0.05 perm) + 1" XPS (1.5 perms) = 0.05 perm	Vinyl (0.05 perm) + 1" EPS (5 perms) = 0.05 perm





## Stop Air Infiltration

Air infiltration is one of a home's biggest enemies. It enters a home through countless gaps and cracks, contributing up to 40 percent of a home's energy loss. That means a typical 2,500 ft<sup>2</sup> home can have over 1/2 mile of gaps and cracks.\* And to make matters worse, air infiltration also increases the likelihood of moisture intrusion in the form of water vapor.

It takes a WRB to reduce moisture and air intrusion. Several STYROFOAM™ Brand Extruded Polystyrene Insulation products qualify as a WRB, eliminating the need for a separate housewrap, and saving material and installation costs.

White EPS products, however, require a facer with a low perm rating or a separate housewrap with taped seams to claim WRB properties. This adds time, money and material to the bottom line.

## WRB Solutions

When installed properly, nearly all rigid foam insulations from Dow qualify as a WRB according to the International Residential Code. Examples include:

- STYROFOAM™ Brand DURAMATE™ Insulation – Plus
- STYROFOAM™ Brand Insulation – Tongue and Groove
- STYROFOAM™ Brand Insulation – Residential Sheathing
- STYROFOAM™ Brand Insulation – Residing Board
- STYROFOAM™ Brand Insulation – Square Edge
- STYROFOAM™ Brand Insulation – HPU

## Enhanced Protection

For the highest level of protection against moisture and air infiltration, select from Dow's extensive portfolio, including:

- STYROFOAM™ Brand Extruded Polystyrene Insulation

- Dow polyisocyanurate insulation
- STYROFOAM™ Brand Spray Polyurethane Foam (SPF) Insulation – RS
- WEATHERMATE™ Housewraps
- WEATHERMATE™ Construction Tape
- WEATHERMATE™ Straight and Flexible Flashings
- WEATHERMATE™ Sill Pan
- FROTH-PAK™ FS Foam Insulation Kits and FROTH-PAK™ Foam Sealant Kits
- GREAT STUFF PRO™ Gaps & Cracks Insulating Foam Sealant\*\*
- GREAT STUFF PRO™ Window & Door Insulating Foam Sealant\*\*
- DOW™ Window & Door 1000 Sealant



## : You've Got Our Word

Dow doesn't just promise quality and long-term performance, it backs up the claim in writing with a 15-year limited thermal warranty on nearly all of its rigid foam insulations and a 10-year limited warranty on its WEATHERMATE™ Weather Barrier Solutions.



## Proven Performance and Lasting Value ... A Sound Investment

For long-lasting, dependable insulation that adds value to a home, put Dow on your side. Backed by 60 years of building science, STYROFOAM™ Brand Extruded Polystyrene Insulation delivers optimal performance behind siding, providing long-term thermal protection. So when you reside, use the product that will last the life of your home ... put Dow on your side.

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NOTICE: Changes to the International Residential Code require the installation of a water-resistive barrier (WRB) within most exterior wall assemblies in residential construction. The following Dow insulated sheathing products qualify as a WRB when installed according to the installation instructions developed for "installation of foam sheathing as a water-resistive barrier": STYROFOAM™ DURAMATE™ Plus, STYROFOAM™ Residential Sheathing, STYROFOAM™ Tongue and Groove, STYROFOAM™ Square Edge, STYROFOAM™ Residing Board, STYROFOAM™ HPU, STYROFOAM™ SIS™, THERMAX™ Sheathing, TUFF-R™ and Super TUFF-R™ and therefore do not require the use of a building paper or a housewrap as a WRB. When a WRB is not needed, these Dow foam sheathings may be installed according to standard installation instructions for foam sheathing from Dow. Be sure products and installation instructions meet code requirements for your particular location. Note: WEATHERMATE™ and WEATHERMATE™ Plus housewraps have already qualified as water-resistive alternatives to the prescribed felt (see Evaluation Reports NER-593 and NER-640 for approved alternative).

COMBUSTIBLE: Protect from high heat sources. Local building codes may require a protective or thermal barrier. 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.

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

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