

**TECHNICAL BULLETIN**  
EPS Below Grade Series 103

# 15-Year In-Situ Research Shows EPS Outperforms XPS in R-Value Retention

Studies show that as much as 25% of energy loss from a structure can be attributed to a lack of insulation on below-grade foundations, crawl spaces and under slabs. Insulation R-value is directly correlated to maximum energy efficiency in a building envelope; higher R-values translate into increased savings. In below grade applications, foam insulation is exposed to moisture and could lose R-value over time if this moisture is absorbed.

As shown in an independent, third-party test program expanded polystyrene (EPS) maintains its R-value even after long-term exposure in northern climates. A competing insulation material, extruded polystyrene (XPS), was shown to have lost R-value over time. The results of this test program demonstrate that EPS insulation is a perfect choice to reduce energy loss.

## IN-SITU TEST RESULTS

In August 2008, independent testing evaluated the field performance of EPS and XPS insulation in a side-by-side, below grade application following a continuous 15-year installation period. EPS Type I and XPS Type X test samples were excavated from the exterior of a commercial building in St. Paul, MN at a depth of approximately 6 feet below grade.

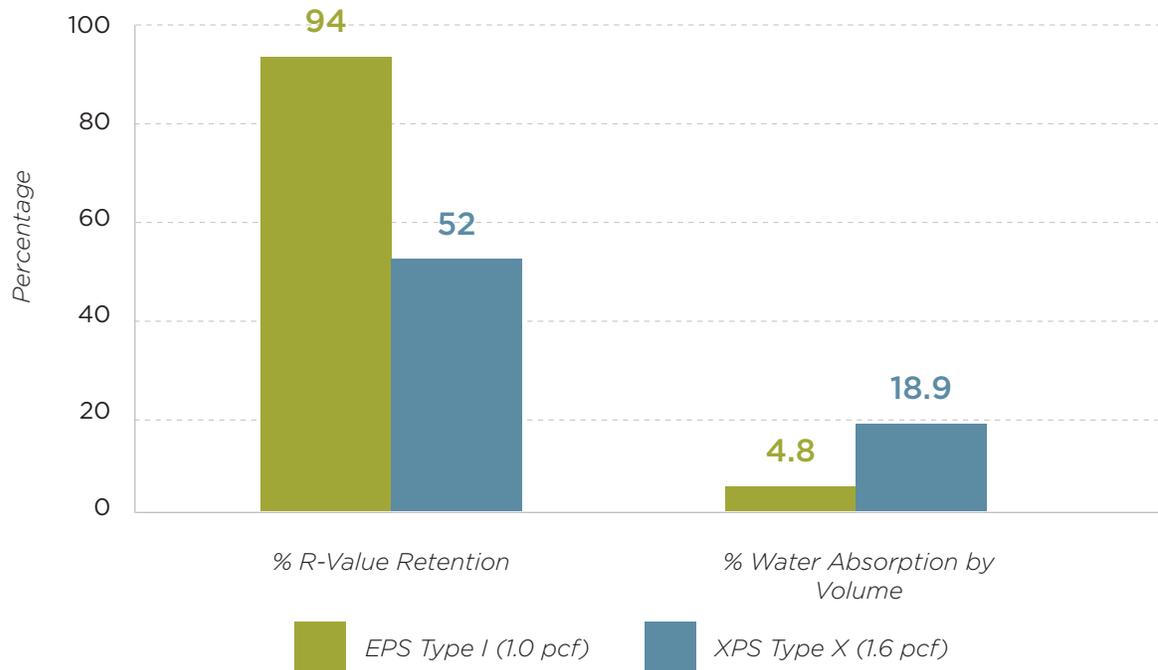
Specimens were tested for thermal resistance using ASTM C518 "Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Apparatus" immediately after excavation. Moisture content was determined by measuring the sample weight at the time of removal and again after being oven dried.

Left Image:  
Excavation Site  
St. Paul, MN

Right Image:  
Side-by-Side  
Installation



## In-Situ R-Value Retention & Water Absorbption



The results demonstrate that EPS Type I outperforms XPS Type X in both R-value retention and decreased water absorption. Further, whereas the in-service R-value of the XPS insulation is reduced by half, expanded polystyrene still delivers 94% of its specified R-value of 3.6 per inch after 15 years. These long term performance advantages make EPS insulation a preferred choice when compared its competition.

This testing further confirms that water absorption results determined using ASTM C272 “Standard Test Method for Water Absorption

of Core Materials for Structural Sandwich Materials” cannot be correlated to the in-service performance of foam insulation. The main reason is that the laboratory test procedures call for partial or full submersion conditions which are not encountered in field applications. In fact, laboratory test methods were not developed for predicting actual performance, but were intended for use in specifications as a means of comparing relative physical properties of different cellular plastics and for product evaluations and quality control.

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