

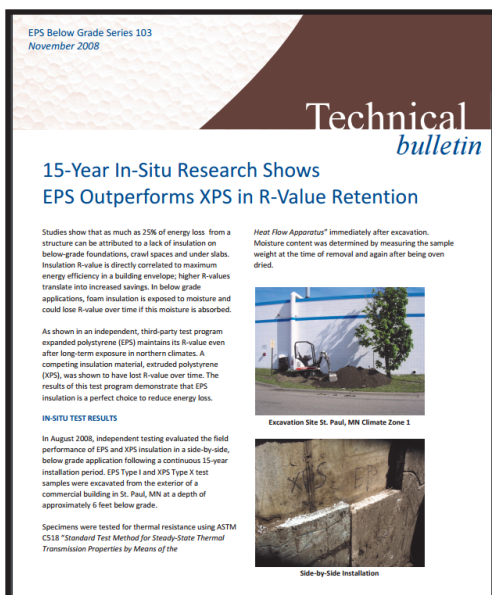
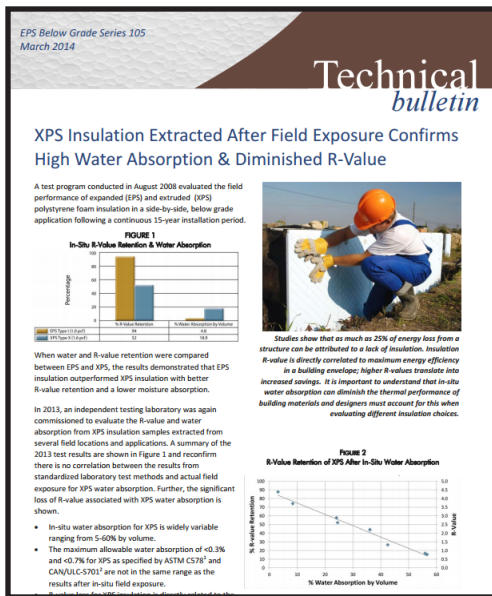
Halo rigid insulation products are made of Neopor EPS.

The insulation in a home is the biggest contributor to increasing energy efficiency - the higher the R-value of the insulation the greater the energy savings that can be expected. Over time, insulation can be exposed to moisture, especially below-grade, which can result in a reduction in R-value, and subsequent reduction in energy savings. So it's critical that the insulation chosen can retain its R-value even after long term exposure to moisture.

XPS and EPS are the main types of rigid insulation used for insulating the exterior of a building, including roofs, below slabs, crawl spaces and foundation walls. Both offer high R-values but differ in water absorption rates. Based on standards test methods¹, XPS absorbs less water than EPS. Because XPS absorbs less water than EPS one would expect XPS to retain a higher R-value. However, the standard test methods do not tell the whole story.

The standard test method requires a small sample size of 1" or 2" thick, 12"x12". The samples are submerged in water for up to 96 hours. Afterwards, the samples are measured for water absorption by volume. The test may indicate short term water absorption, but there is no test standard that accounts for long term water absorption and its effect on R-value – real end-use product performance.

As the standards note, these test methods are meant as a means to specify product performance, product evaluations and quality control – but not meant as a good indication for end-use product performance. Hence, the effect on R-value due to long term exposure to moisture should be considered.



Independent research² has shown that over time XPS will actually absorb and retain more moisture than EPS resulting in a significant decrease in R-value. One of the studies showed XPS retained 19% water absorption compared to 5% for EPS after being buried below grade for 15 years. As a result, the XPS samples only retained 52% of its initial R-value, whereas EPS retained 94% of its R-value. The reason for the higher R-value retention of EPS is likely due to the comparatively higher vapour permeance property, which allows moisture absorbed in the EPS to escape more readily than XPS – most of the moisture absorbed in XPS will be retained in the XPS reducing the R-value.

Ironically, a good demonstration of this is featured in an Owen Corning video "XPS vs EPS: Science Doesn't Lie." The video, available on Youtube, shows water injected into a sample of EPS and XPS. As expected, the EPS sample allowed the water to escape retaining its R-value, whereas the XPS sample showed little to no water escaping resulting in a reduction in R-value.

The XPS industry has long marketed XPS rigid insulation as having higher retained R-values than EPS because it has a lower water absorption property based on these standards. However, as these standards indicate, the water absorption properties do not reflect real end-use product performance. Just as the XPS insulation industry is required to provide long term thermal resistance values to consumers (due to its loss in R-value over time); it should also provide long term water absorption values, which also affects the long term R-value.

1. Minimum water absorption rates for XPS and EPS are set in accordance with ASTM C578, "Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation" and CAN/ULC S701, "Standard for Thermal Insulation, Polystyrene Boards and Pipe Covering".
2. EPS Industry Alliance, "15-Year In-situ Research Shows EPS Outperforms XPS in R-value Retention"
EPS Industry Alliance, "XPS Insulation Extracted After Field Exposure Confirms High Water Absorption & Diminished R-value"