

# Water Absorption Facts

## Superior moisture resistance and stable R-Value from Tru-R insulation to protect your insulation integrity.

Architects, Engineers, Contractors, and Building owners are all concerned with the performance of their insulation. The long-term performance of insulation is critical to ensuring the energy savings the insulation was specified to provide. The most common issue surrounding the long-term performance of below grade insulation is loss of R-value over time.

The two primary mechanisms for the loss of R-value of insulations are water absorption and loss of blowing agents.

### Water Absorption.

It is well understood that water is not a good insulator compared to foam insulations. This means that the absorption of water into insulations will degrade their R-value. This leads the user to determine how much water will be absorbed and what is the effect on R-value?

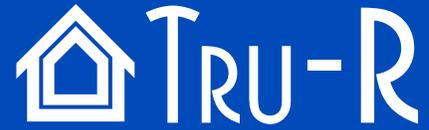
Tru-R<sup>®</sup> insulation is manufactured in compliance with ASTM C578, "Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation." The C578 standard identifies various material properties, including strengths, R-value, and water absorption requirements. Tru-R insulation will absorb a maximum of 2-4% by volume when exposed to the testing specified by ASTM C578.

The ASTM C578 water absorption requirement is determined by submerging a 12" x 12" x 1" piece of insulation in water for 24 hours. After 24 hours the sample is removed, and the moisture absorption of the sample is determined. This test is an indicator of possible water absorption and is not a design value or the actual value expected in long-term duration testing.

### Independent Testing.

Recent Independent testing of below grade insulation has determined the water absorption of Tru-R insulation and an extruded polystyrene (XPS) product. Samples of molded polystyrene and XPS were excavated from the exterior foundation of a building in St. Paul, MN. The insulation was placed into service in 1993 and had 15 years of use as vertical wall insulation separating the heated building foundation from soil.

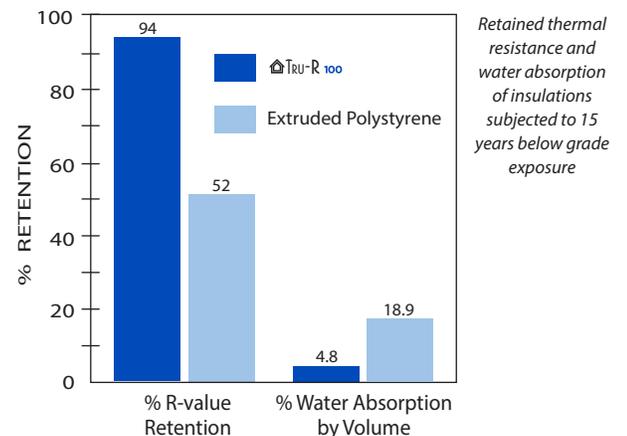
Samples were tested immediately upon excavation for R-value. The samples were subsequently conditioned in a laboratory (72° F, 50% RH) for four weeks to determine a conditioned R-value. In addition, the moisture content of the samples was measured.



## FOAM FACTS:

### Tru-R Insulation and below grade water absorption

#### WATER ABSORPTION AND R-VALUE RETENTION<sup>1</sup>



<sup>1</sup> Testing was conducted by Element, an independent, accredited Third Party Laboratory.

**Independent Testing Results  
After 15 Years of Below Grade Exposure.**

Thermal Resistance		
Sample	R-Value/in. upon removal	Conditioned <sup>1</sup> R-Value/in.
 TRU-R	3.4	3.7
XPS	2.6	2.8

Moisture Content		
Sample	Moisture Content volume% upon removal	Conditioned <sup>1</sup> Moisture Content volume%
 TRU-R	4.8	0.7
XPS	18.9	15.7

<sup>1</sup> After four weeks in a laboratory at 72° F, 50% RH.

The results of the independent testing are dramatic. The Tru-R 100 insulation maintained 94% of its stated R-value of 3.6 after the 15-year time period and had a moisture content of 4.8%. However, the XPS retained only 52% of its stated R-value of 5.0. The loss in R-value for the XPS is quite dramatic and can be explained very simply by the 18.9% of moisture absorption over the 15 years of use.

These results suggest very clearly that short term laboratory tests of water absorption for XPS do not necessarily reflect the long-term below grade performance of these materials.

**Moisture Accumulation.**

How is the high moisture absorption within the XPS possible since the ASTM C578 water absorption requirement for XPS is less than 0.3%? It is apparent that moisture that migrates through the soil, insulation, and foundation system is trapped in the cell structure of XPS.

In contrast to the XPS, Tru-R 100 is maintaining an equilibrium condition with the adjacent soil and is not accumulating water over the life of the building.

**Loss of Blowing Agent.**

The loss of blowing agents in the XPS also contributes to poor R-value performance. The blowing agents in XPS slowly diffuse out of the foam over time. It is much like losing the refrigerant in an air conditioner – it just does not perform as well as when originally manufactured.

**Ready to take control? Start here.**

If you're ready to have Tru-R contribute to your next project, just contact your nearest Tru-R manufacturer and Technical Sales Representative. They will be happy to give you design consultation, information about Tru-R products, pricing, and answers to all of your questions.



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