

## EPS NO. 1016

**SUBJECT: WATER ABSORPTION**

**DATE: OCTOBER 2008 (REVISED JANUARY 2019)**

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.

R-Shield® insulation has been subjected to a 15 year moisture absorption study to demonstrate the performance of expanded polystyrene in a below grade application. The basic premise of the study was that R-Shield insulation be subjected to a real world application and not a short term laboratory test.

Samples of R-Shield insulation were installed as perimeter below grade insulation on a building in St. Paul, MN. The insulation was placed below grade in 1993 (15 years of exposure as vertical wall insulation separating the heated building foundation from soil). Samples were removed from the exterior foundation of a St. Paul, MN building in the summer of 2008 (see Figures 1 and 2).

In addition to the removal of the R-Shield expanded polystyrene samples, extruded polystyrene (XPS) samples were removed. The XPS samples were immediately adjacent to the R-Shield expanded polystyrene and were also on the foundation wall for 15 years (see Figure 3). At the time of excavation the soil in contact with the insulation was dry and no abnormal conditions were observed.

The samples were brushed clean (see Figure 4) and tested immediately upon removal from the foundation wall for R-value. The results of the R-value testing at the time of removal and after an additional 28 days of conditioning at 72F/50% RH are shown in Table 1. In addition to R-value, the water absorption of the samples was measured and are shown in Table 2.

**TABLE 1**

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

<sup>1</sup>Four weeks after removal and in a laboratory at 72° F, 50% RH conditioning.

**TABLE 2**

Moisture Content		
Sample	Moisture Content volume% upon removal	Conditioned <sup>1</sup> Moisture Content volume%
Expanded polystyrene	4.8	0.7
XPS	18.9	15.7

<sup>1</sup>Four weeks after removal and in a laboratory at 72° F, 50% RH conditioning.

The results of the independent testing are dramatic. The expanded polystyrene 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.

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, expanded polystyrene is maintaining an equilibrium condition with the adjacent soil and is not accumulating water over the life of the building.

A letter from Stork Testing concerning this testing is attached to this bulletin.

**Figure 1. Excavation of insulation samples after 15 years**



**Figure 2. XPS and expanded polystyrene below grade insulation**



Figure 3. XPS and expanded polystyrene were in-



Figure 4. Samples cleaned and ready for testing



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November 14, 2008

To Whom It May Concern:

Stork Twin City Testing has recently completed below grade insulation testing for AFM Corporation of Burnsville, MN. The results from the testing are documented in a Stork project report 95863.5 dated October 31, 2008 provided to AFM Corporation.

Stork has reviewed the Foam-Control EPS Water Absorption Facts literature provided by AFM Corporation with control number FC09 dated 10/08 and the Foam-Control EPS Technical Bulletin no. EPS 1016 dated October 2008. The results tabulated in these publications are consistent with the results contained in the proprietary report prepared by Stork for AFM Corporation.

Stork has no comment, implied or otherwise, on the other claims contained in the above reference publications.

Regards,



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