

Product Information Bulletin

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Drying Potential of EPS & XPS Insulation Exposed to Environmental Cycling

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Changes in moisture content within insulation materials used for below grade applications will impact their thermal performance. For this reason, it is important to evaluate their ability to resist moisture intrusion as well as drying potential when exposed to long term environmental conditions that will determine long term thermal integrity.

The EPS Industry Alliance commissioned a test program by Intertek Testing Services NA Ltd., an independent test laboratory, to evaluate expanded polystyrene (EPS) insulation and extruded polystyrene (XPS) insulation using ASTM Test Method C1512-07, **Standard Test Method for Characterizing the Effect of Exposure to Environmental Cycling on Thermal Performance of Insulation Products**. ASTM C1512 evaluates building insulation performance when exposed to moisture and environmental cycling.

The EPS-IA test program evaluated 1" (25 mm) thick insulation specimens meeting ASTM C578. EPS insulation meeting ASTM C578, Types I, II and IX (equivalent to CAN/ULC-S701, Types 1, 2 and 3) and XPS insulation meeting ASTM C578, Type X were tested. This bulletin provides a summary of the moisture results measured during the ASTM C1512 testing.

ASTM C1512 Test Method

The test method includes a **conditioning stage** intended to artificially accumulate moisture within test material by vapor diffusion and a **cycling stage** where the ability of the test material to exhibit drying potential under common field exposure conditions can be seen.

C1512 Test Method Test Stages

Conditioning Stage:

During this stage specimens are exposed to 75 °F (24°C) @ 90% RH on the warm side and 5 °F (-15 °C) @ ambient RH on the cold side for 28 days.

Cycling Stage:

During this test stage the temperature on the cold side of specimens varies between 5 °F (-15 °C) and 59 °F (15 °C) @ ambient RH in 12 hour cycles while maintaining a constant 24 °C (75 °F) @ 90 % RH for 20 days on the warm side.

Table 1 - ASTM C1512 Test Results

ASTM C578 Insulation Type ^{1, 2}	Moisture Content, % by Volume		After Cycling Stage		Drying Potential Observed?
	After Conditioning Stage	After Cycling Stage	Moisture Retained	Moisture Loss	
EPS Type I	4.7	2.7	57%	43%	YES
EPS Type II	3.2	1.7	53%	47%	YES
EPS Type IX	2.1	1.6	76%	23%	YES
XPS Type X	0.8	0.8	100%	0%	NO

Notes:

1. ASTM C578, *Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation*.
2. CAN/ULC-S701, *Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering*, Types 1, 2 and 3 are equivalent to ASTM C578, Types I, II and IX, respectively.

Summary of Test Findings:

The test provides information on the wetting and drying performance of EPS and XPS insulation under severe conditions demonstrate:

- Both EPS and XPS insulation retained a very low percentage of moisture by volume after the cycling is completed.
- All EPS insulation types dried significantly during the environmental cycling stage demonstrating long term drying potential.
- The XPS insulation did not lose any moisture during the cycling stage. Therefore, XPS insulation did not demonstrate long term drying potential.

Conclusion

When exposed to the extreme conditions of the ASTM Test Method C1512, expanded polystyrene (EPS) insulation exhibited drying potential under severe exposure conditions while extruded polystyrene (XPS) insulation did not exhibit drying potential when exposed to the same conditions. The drying potential for thermal insulation is critical to maintaining thermal resistance (R-value) under severe long term exposure conditions.