

Neopor® GPS Moisture Management Under Extreme Environmental Conditions

Thermal Performance and Drying Potential

Neopor — the construction grade, graphite-enhanced polystyrene (GPS) insulation from BASF — is well known for its specially embedded graphite particles that reflect heat radiation like a mirror to reduce heat loss. More and more architects, contractors and builders have come to depend on Neopor GPS for greater energy and cost efficiencies.

The innovative rigid foam insulation is also known for its high performance in the critically important area of moisture management. Its exceptional breathability and permeability help reduce the risk of mold, rot and structural damage associated with moisture condensation and long-term water retention.

In order to confirm these essential properties of Neopor GPS under environmental extremes, BASF commissioned Intertek Testing Services NA Ltd., a respected independent test laboratory. Intertek conducted extensive tests using ASTM C1512, which is a standard test method for characterizing the effects of extreme temperature variations and exposure to moisture on the thermal performance of insulation products. Testing was conducted from October 21, 2014, through June 26, 2015, on Types I, VIII, II and IX Neopor.

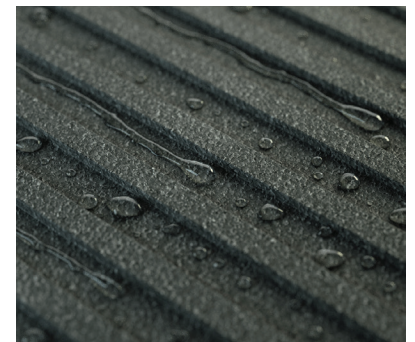
Preconditioning

In the first stage of the ASTM C1512 test, the Neopor GPS samples were subjected to conditioning in the ASTM C1512 chamber for 28 days to artificially increase moisture content due to vapor diffusion associated with a constant thermal gradient. The specimens were set up to divide two environments. The warm side was set at $75 \pm 3^\circ\text{F}$ and $90 \pm 5\%$ relative humidity, and the cold side was set at a constant $5 \pm 5^\circ\text{F}$ with uncontrolled ambient humidity. The intention of the extreme temperature and humidity gradient between the warm and cold side is to artificially accumulate moisture within the test specimens from vapor diffusion.

Key Net Takeaways

After undergoing severe third-party environmental testing, the study concluded that Neopor GPS:

- Holds its R-value over time
- Does not retain moisture
- Maintains its physical properties



Cycling Stage

After 28 days, the samples were removed and weighed, and then were returned to the ASTM C1512 chamber to undergo another 20 days of testing comprised of 12-hour cycles. In this stage, the upper chamber was still set at $75 \pm 3^\circ\text{F}$ and $90 \pm 5\%$ relative humidity. But, the lower chamber was cycled every 12 hours from $5 \pm 5^\circ\text{F}$ uncontrolled humidity to $59 \pm 5^\circ\text{F}$ uncontrolled humidity for 40 cycles. This rigorous testing was designed to determine the moisture management properties of the insulation under common field exposure conditions.

At the end of the conditioning cycles all of the Neopor® GPS samples were weighed again, dried and then differential moisture content was measured. The cycling stage is where the drying potential of the insulation under common field exposure conditions is measured.

The samples were subjected to ASTM D1621 (Compressive Strength) and ASTM C518 (Thermal Transmission Properties) testing to measure the effects of the extreme environmental exposure on the material's physical properties.

The next stage of the ASTM C1512 test subjects specimens to exposure conditions on the cold side of the test chamber cycling between 5°F (-15°C) and 59°F (15°C) at ambient relative humidity at 12-hour intervals for 20 days to simulate extreme field exposure conditions. The warm side of the test specimen stays at a constant 75°F (24°C) and 90% relative humidity for the 20-day period. The cycling stage is where the drying potential of the insulation under common field exposure conditions is measured.

BASF Corporation

1609 Biddle Avenue
Wyandotte, MI 48192 USA
Web: www.neopor-insulation.com
Phone: 1-800-543-1747
Email: neopor-us@basf.com

THE DESCRIPTIONS, DESIGNS, DATA AND INFORMATION CONTAINED HEREIN ARE PRESENTED IN GOOD FAITH, AND ARE BASED ON BASF'S CURRENT KNOWLEDGE AND EXPERIENCE. THEY ARE PROVIDED FOR GUIDANCE ONLY, AND DO NOT CONSTITUTE THE AGREED CONTRACTUAL QUALITY OF THE PRODUCT OR A PART OF BASF'S TERMS AND CONDITIONS OF SALE. BECAUSE MANY FACTORS MAY AFFECT PROCESSING OR APPLICATION/USE OF THE PRODUCT, BASF RECOMMENDS THAT THE READER CARRY OUT ITS OWN INVESTIGATIONS AND TESTS TO DETERMINE THE SUITABILITY OF A PRODUCT FOR ITS PARTICULAR PURPOSE PRIOR TO USE. IT IS THE RESPONSIBILITY OF THE RECIPIENT OF PRODUCT TO ENSURE THAT ANY PROPRIETARY RIGHTS AND EXISTING LAWS AND LEGISLATION ARE OBSERVED. **NO WARRANTIES OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, ARE MADE REGARDING PRODUCTS DESCRIBED OR DESIGNS, DATA OR INFORMATION SET FORTH HEREIN, OR THAT THE PRODUCTS, DESCRIPTIONS, DESIGNS, DATA OR INFORMATION MAY BE USED WITHOUT INFRINGING THE INTELLECTUAL PROPERTY RIGHTS OF OTHERS.** ANY DESCRIPTIONS, DESIGNS, DATA AND INFORMATION GIVEN IN THIS PUBLICATION MAY CHANGE WITHOUT PRIOR INFORMATION. THE DESCRIPTIONS, DESIGNS, DATA, AND INFORMATION FURNISHED BY BASF HEREUNDER ARE GIVEN GRATIS AND BASF ASSUMES NO OBLIGATION OR LIABILITY FOR THE DESCRIPTIONS, DESIGNS, DATA OR INFORMATION GIVEN OR RESULTS OBTAINED, ALL SUCH BEING GIVEN AND ACCEPTED AT THE READER'S RISK.

Neopor® is a trademark of BASF SE.

© 2016 BASF, Wyandotte, MI 48192.
All rights reserved. 01/16

Results

As the following chart clearly shows, Neopor GPS held its R-value, didn't retain moisture and maintained its physical properties after undergoing severe environmental testing.

Neopor GPS	Compression ASTM D1621	Moisture Content After Cycling (%)	% of R-value retained
Type I	12	0.03	99.7
Type VIII	16	0.02	100
Type II	18	0.04	100
Type IX	24	0.04	100

Conclusions

The series of tests conducted by Intertek was designed to see how Neopor GPS insulation responded to extreme environmental conditions in terms of thermal performance, moisture management and compressive strength. After eight months of rigorous testing, Neopor GPS proved itself in a number of key areas:

- Most importantly, Neopor GPS held its R-value after undergoing 48 days of extreme environmental testing that involved both a constant thermal gradient and cycling between large temperature and humidity variations.
- ASTM C1512 testing showed that Neopor GPS doesn't retain moisture, drying quickly after cycling from low to high humidity.
- Neopor GPS holds its physical properties after exposure to extreme environmental cycling, further confirming and quantifying what building professionals have observed in the field.