

LONG-TERM THERMAL RESISTANCE DATA

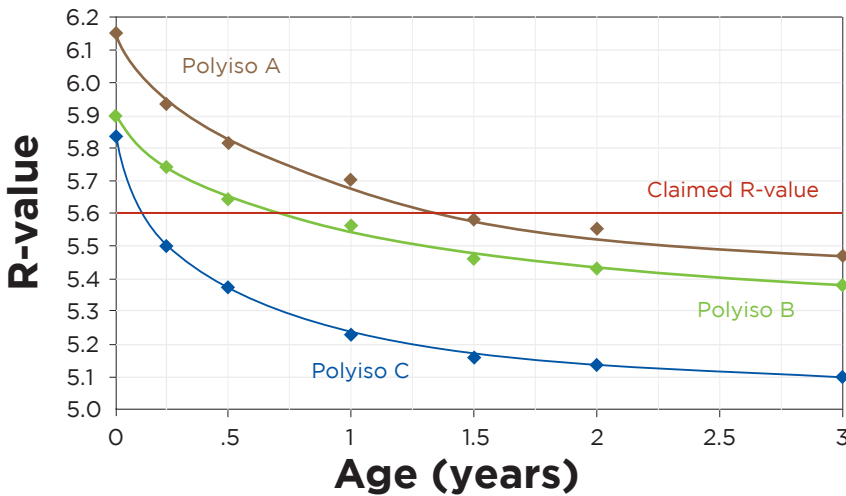
WHAT'S THE R-VALUE OF POLYISO AND XPS AFTER 3 YEARS



The polyisocyanurate (Polyiso) and extruded polystyrene (XPS) insulation industries publish R-values based on samples conditioned for a set period of time or based on an estimate of the long term thermal resistance (LTTR). Published R-values are useful, but Polyiso and XPS are affected by aging and temperature. Therefore, actual R-value testing data that considers aging time and in use temperature conditions is needed.

R-value data was obtained by tests conducted at an ISO 17025 accredited laboratory using ASTM C518, "Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus". Three 2" thick polyiso and two 2" thick XPS commercially available insulations were obtained from major industry suppliers. The insulations were tested immediately upon receipt and at regular intervals thereafter for 3 years. R-value data was obtained at mean temperatures of 75°F and 40°F.

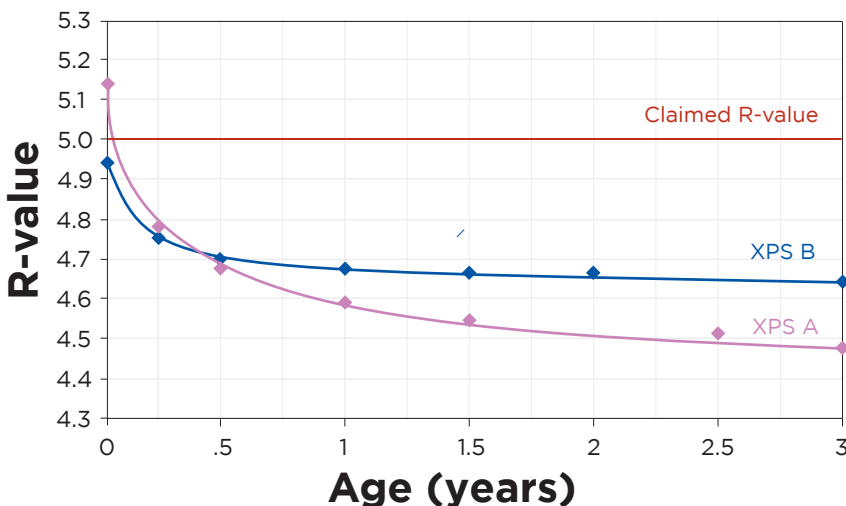
Polyiso @ 75°F



Polyiso manufacturers publish a long term thermal resistance LTTR of 5.6. The data shows performance below the published LTTR of 5.6 for all of the manufacturers within 1 1/2 years after the samples were obtained.

What will the R-value be in 5, 15, or 50 years?

XPS @ 75°F

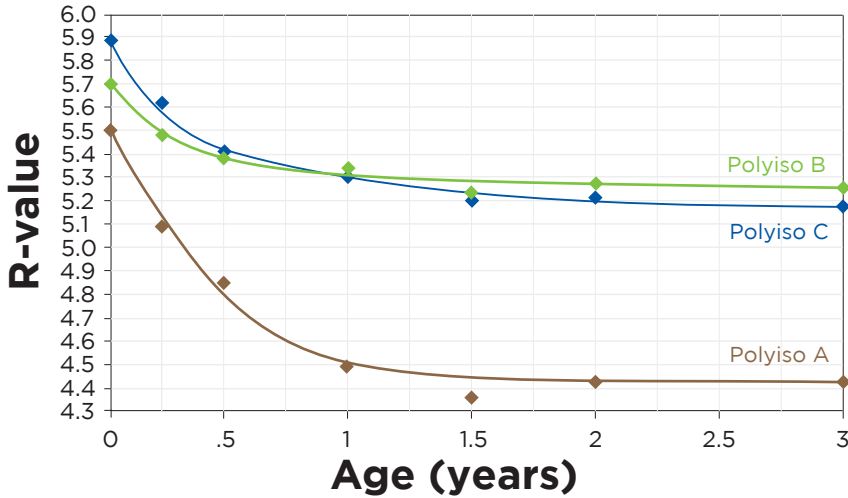


XPS manufacturers publish an R-value of 5.0. The data shows performance below the published R-value of 5.0 for both of the manufacturers within 1 month after the samples were obtained.

What will the R-value be in 5, 15, or 50 years?

In cold climate regions of the US, the insulation used in a building envelope must perform at temperatures well below 75°F. Test data was obtained on Polyiso and XPS insulations at a mean temperature of 40°F to investigate the impact of temperature.

Polyiso @ 40°F

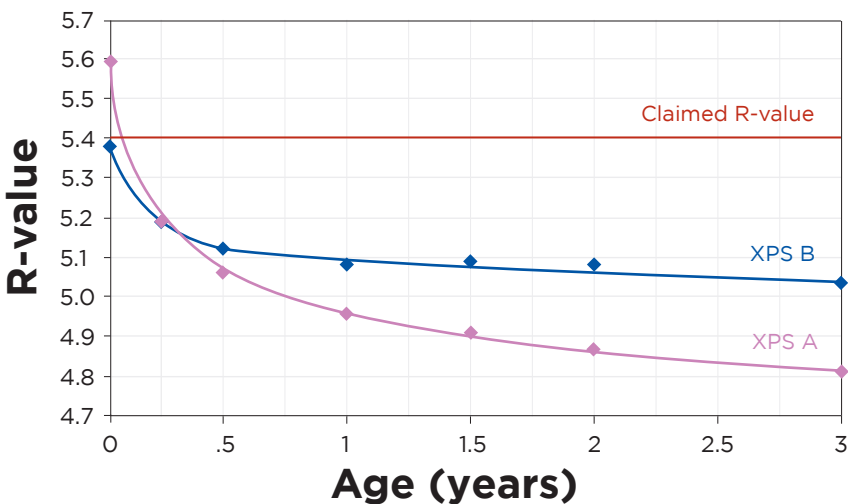


Polyiso manufacturers do not publish a long term thermal resistance at a mean temperature of 40°F. The data shows performance as low as a R-value 4.5 within 1 1/2 years after the samples were obtained.

Cold temperatures clearly reduce the R-value of Polyiso insulation.

What will the R-value be in 5, 15, or 50 years?

XPS @ 40°F



XPS manufacturers publish an R-value of 5.4 at a mean temperature of 40°F. The data shows performance below the published R-value of 5.4 for both of the manufacturers within 1 month after the samples were obtained.

What will the R-value be in 5, 15, or 50 years?

Summary.

The R-value data obtained raises questions on the performance of Polyiso and XPS as they age and when used in cold climates.

Additional findings similar to the results in this document are available from these trusted industry sources:

1. Building Science Corporation, "BSC Information Sheet 502-Understanding the Temperature Dependence of R-values for Polyisocyanurate Roof Insulation", www.buildingscience.com, April 2013.
2. Graham, M., "R-value concerns", Professional Roofing, May 2010.
3. Graham, M., "Testing R-values", Professional Roofing, March 2015.



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FC46-12/17



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