Thermablok® AEROGEL ENERGY CONSERVATION

ATSM E84 Class A Fire Rated

MADE IN USA

WORLDWIDE

100% Recyclable

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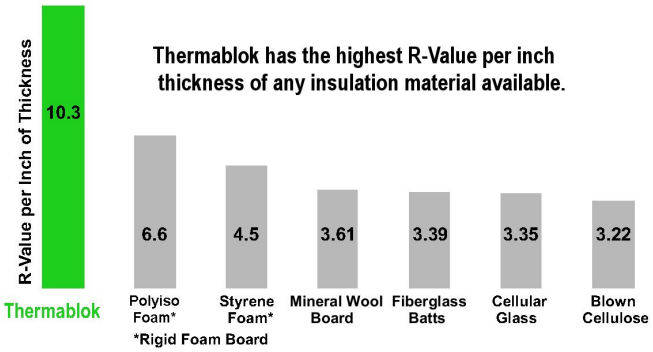
Thermablok Technical Data

Thermablok is a flexible, nanoporous aerogel blanket insulation that reduces energy loss while conserving interior space in residential and commercial building applications.

Thermablok's unique properties – extremely low thermal conductivity, superior flexibility, compression resistance, hydrophobicity, and ease of use – make it essential for those seeking the ultimate in thermal protection.

Using patented nanotechnology, Thermablok insulation combines a silica aerogel with reinforcing fibers to deliver industry-leading thermal performance in an easy-to-handle and environmentally safe product.

Thermablok is a proven, effective insulator in building applications, providing the highest R-value of any insulation material for maximum energy efficiency in walls, floors, roofs, framing, and windows.



Thermablok Advantages

Superior Thermal Performance
2 to 8 times better than competing insulation products

Reduced Thickness and Profile
Equal thermal resistance at a fraction of the thickness

Less Time and Labor to Install
Easily cut and conformed to complex shapes, tight curvatures, and spaces with restricted access

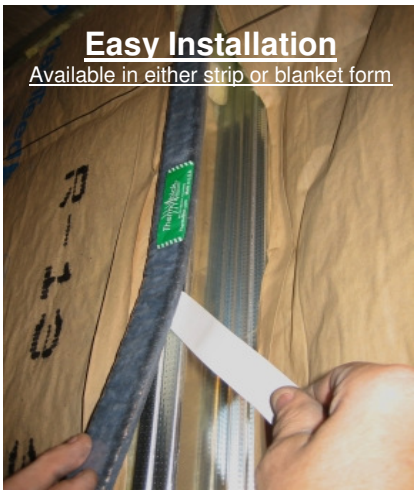
Physically Robust
Soft and flexible but with excellent spring back, Thermablok recovers its thermal performance even after compression events as high as 50 psi

Shipping and Warehousing Savings
Reduced material volume, high packing density, and low scrap rates can reduce logistics costs by a factor of five or more compared to rigid, preformed insulations

Simplified Inventory
Unlike rigid pre-forms such as pipe cover or board, the same Thermablok blanket can be kitted to fit any shape or design

Hydrophobic Yet Breathable
Thermablok repels liquid water but allows vapor to pass through

Environmentally Safe
Landfill disposable, shot-free, with no respirable fiber content



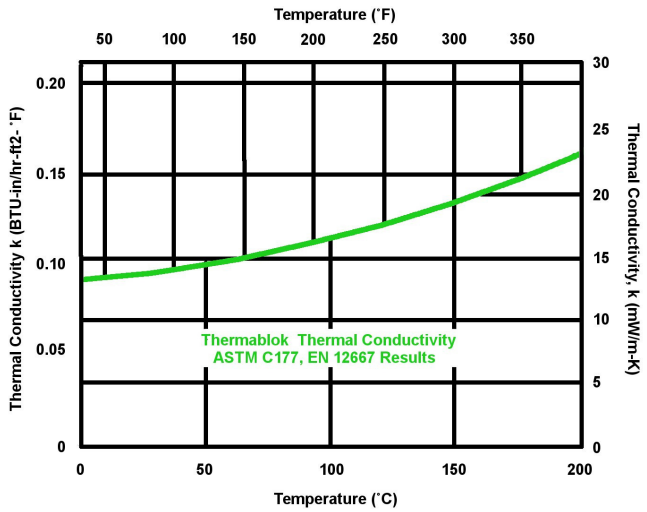
Physical Properties

Size*	**Strip Form** - 1/4in x 1 1/2in x 4ft 6.35mm x 38mm x 1.22m **Blanket Form** - 1/4in x 57in x 125ft 6.35mm x 1,450mm x 41.15m
Fire Rating ASTM E84	Class A Flame Spread 20 / Smoke Index 50
Application Temp Range	-328˚ F to +400˚ F -200˚ C to + 200˚ C
Color	White
Density*	9.4 lb/ft^3 (0.15 g/cc)
Hydrophobic	Yes

*Nominal values. 3/8" (10mm) before installation and 1/4" (6mm) when installed. **Information on this data sheet is subject to change without notice and should not be used for writing specifications.

Thermal Conductivity

ASTM C 177 Results



Mean Temp	˚C	0	25	50	75	100	125	150	175	200
	˚F	32	77	122	167	212	257	302	347	392
k	mW/m-K	13.1	13.6	14.3	15.3	16.4	17.7	19.3	21.0	23.0
BTU –in/hr- ft²-˚F		0.091	0.094	0.099	0.106	0.114	0.123	0.135	0.146	0.160

(Specifications are subject to change without notice.)

Thermablok Test Result Summary

Test Procedure	Property	Results
ASTM C 177	Thermal Conductivity via Guarded Hot Plate	13.1mW/m*K @ 10˚ C
EN 12667	Thermal Conductivity via Guarded Hot Plate	13.1mW/m*K @ 10˚ C
ASTM C 518	Thermal Conductivity via Heat Flow Meter	14.8mW/m*K @ 2˚ C (avg of 3 samples)
ASTM E 84	Flame and Smoke Spread	Class A: FSI <5, SDI 20
EN13501-1: 2007	Reaction to Fire Performance	Passed Euroclass C-s1,d0
ASTM C 165	Compressive Stress / Strain	8.0psi @ 10% strain, 30.5 psi @ 25% strain
Specific Heat	Specific Heat	1.00 J/g*K @ 40˚ C
ASTM E 96	Water Vapor Transmission Rate	1877 ng/Pa*s*m² (dry cup method)
ASTM E 228	Linear Coefficient of Thermal Expansion (@ 10˚ C)	X: 1.06 x 10^{-5} K^{-1}, y: 1.90 x $10^{-5}K^{-1}$
ASTM C 1104	Water Vapor Sorption	Mass Gain = 1.08%

Non-Combustibility & Fire Performance

EN 13501-1 – REACTION TO FIRE CLASSIFICATION

The reaction to fire performance of Thermablok was evaluated via BS EN 13501-1:2007. Thermablok (5-10 mm) achieved a reaction to fire classification of C-s1, d0 for construction applications as a suspended ceiling membrane. EN 13823 and ISO EN 11925-2 were carried out as part of this testing and all results were compliant for Class C classification.

ASTM E 84 – SURFACE BURNING CHARACTERISTICS

Thermablok was tested in accordance with ASTM E 84, the Standard Test Method for Surface Burning Characteristics of Building Materials. Thermablok satisfies the criteria for a Class A rating with a flame spread index of <5 and a smoke developed index of 20.

Mechanical and Dimensional Stability

ASTM C 165 – COMPRESSIVE RESISTANCE

Compressive stress was measured at both 10% and 25% compressive strain. The average compressive stress was 8.0 psi @ 10% strain and 30.5 psi @ 25% strain.

ASTM C 1101 – FLEXIBILITY AT AMBIENT TEMPERATURE

Thermablok was classified as flexible at room temperature according to ASTM C 1101 test results.

ASTM E 228 – LINEAR COEFFICIENT OF THERMAL EXPANSION

The coefficient of thermal expansion of Thermablok was tested via ASTM E 228 from -170°C to 100°C with a reference temperature of 20°C. The results at 10°C are: x = 1.06 x 10^{-5} K^{-1}, y = 1.90 x 10^{-5} K^{-1}.

Thermal Measurements

ASTM C 177 – THERMAL CONDUCTIVITY VIA GUARDED HOT PLATE, FULL CURVE

Third-party validation of the thermal conductivity of Thermablok was acquired at mean temperatures ranging from -160° to 150°C (-256° to 302°F) under a compressive load of 2 psi.

ASTM C 177 – THERMAL CONDUCTIVITY VIA GUARDED HOT PLATE, 10°C

Third-party validation of the thermal conductivity of Thermablok was acquired at a mean temperature of 10°C under a compressive load of 2 psi.

Thermal Measurements (cont'd)

EN 12667 – THERMAL CONDUCTIVITY VIA GUARDED HOT PLATE, 10°C
Third-party validation of the thermal conductivity of Thermablok was acquired at a mean temperature of 10°C under a compressive load of 2 psi.

ASTM C 518 – THERMAL CONDUCTIVITY VIA HEAT FLOW METER
The average thermal conductivity result from three samples, tested via ASTM C518 was 14.8 mW/m*K at a mean temperature of 2°C.

Specific Heat
The specific heat of Thermablok was measured from -60°C to 150°C.

EN ISO 8497 – DECLARATION OF CONFORMITY
The values declared (λ90, 90) and reported on the product's labels are determined according to the rule ISO 10456 and represent 90% of the production and with 90% of reliability. λ90, 90 = 0.014 W/m*K.

Water Resistance

ASTM C 1104 – WATER VAPOR SORPTION
The average weight gained during the ASTM C 1104 testing was 1.08%.

ASTM C 1511 – WATER RETENTION, REPELLENCY
The average weight gained during the ASTM C 1511 testing was 3.9%.

ASTM E 96 – WATER VAPOR TRANSMISSION RATE
Both water and desiccant method were tested via ASTM E 96. The results for Thermablok are 2319 ng/Pa*s*m2 (water method), 1877 ng/Pa*s*m2 (desiccant method).

EN ISO 15148 – Determination of Water Absorption Co-efficient by Partial Immersion
A series of tests was conducted at the Frauenhofer Institute to demonstrate the application suitability of Thermablok in external thermal insulation composite systems. These tests include DIN 52275-2, EN ISO 15148, EN ISO 12571, EN ISO 12572, and DIN 52103.
Results: The water absorption coefficient measured for Thermablok is 0.0072 kg/m2*h0.5.

EN ISO 12571 – Determination of Hygroscopic Sorption Properties
A series of tests was conducted at the Frauenhofer Institute to demonstrate the application suitability of Thermablok in external thermal insulation composite systems. These tests include DIN 52275-2, EN ISO 15148, EN ISO 12571, EN ISO 12572, and DIN 52103
Results: Saturated salt solutions were prepared to give conditions of 33.0%, 53.0%, 79.5%, and 94.0% RH. The moisture content of the Thermablok was measured at each humidity condition.

EN ISO 12572 – Determination of Water Vapor Transmission Properties
A series of tests was conducted at the Frauenhofer Institute to demonstrate the application suitability of Thermablok in external thermal insulation composite systems. These tests include DIN 52275-2, EN ISO 15148, EN ISO 12571, EN ISO 12572, and DIN 52103.

Results: Two methods were used to determine the water vapor transmission properties of Thermablok. The average dry cup and wet cup; results were 0.337 MNs/g and 0.275 MNs/g r