



INSULATED SWIMMING POOL COVER SYSTEMS

Explanation of 'R' value

'R' Value is a term used to measure a materials resistance to heat flow. It is commonly seen on packages of insulation at home improvement stores. The higher the 'R' value the greater the insulation; R19 is greater than R12 for example. The 'R' value is based on a mathematical term known as 'R' factor and is related to thermal conductivity of a particular material. The thermal conductivity is determined by a standardized test. The material manufacturer usually performs the test, however, lists of values for common materials are readily available.

The 'R' factor for a particular material can be calculated from the formula

$$R = x/k \quad \text{where} \quad \begin{array}{l} x = \text{thickness of material} \\ k = \text{thermal conductivity} \end{array}$$

For products containing multiple materials such as a pool cover the formula changes to

$$R = x_1/k_1 + x_2/k_2 + x_3/k_3 \quad \text{where} \quad \begin{array}{l} x_1 = \text{thickness of material \#1} \\ k_1 = \text{thermal conductivity of material \#1} \\ x_2 = \text{thickness of material \#2} \\ k_2 = \text{thermal conductivity of material \#2} \\ x_3 = \text{thickness of material \#3} \\ k_3 = \text{thermal conductivity of material \#3} \end{array}$$

For our 1010 Standard ThermGard® the calculation looks like this

$$R = x_1/k_1 + x_2/k_2 + x_3/k_3 \quad \text{where} \quad \begin{array}{l} x_1 = \text{thickness of top layer, woven polyethylene} = .007 \text{ inches}^* \\ k_1 = \text{thermal conductivity of material \#1} = 2.28^* \\ x_2 = \text{thickness of middle layer, polyethylene foam} = 0.140 \text{ inches}^* \\ k_2 = \text{thermal conductivity of material \#2} = 0.25^* \\ x_3 = \text{thickness of bottom, layer woven polyethylene} = .007 \text{ inches}^* \\ k_3 = \text{thermal conductivity of material \#3} = 2.28^* \end{array}$$

*Published values provided by material manufacturer or industry literature.

$$R = 0.007/2.28 + 0.140/0.25 + 0.007/2.28$$

$$R = 0.003 + 0.56 + 0.003$$

$$R = 0.566$$

The 'R' Value Myth

At some point, a manufacturer published specifications stating that their pool covers 'R' value was 4. This is an error that stems from a misunderstanding for 'R' factor formula listed above. Sometimes the formula is written $R = 1/k$. This is only true when the thickness of the material in question is 1 inch. The polyethylene foam used in pool covers has a published thermal conductivity of 0.25 Btu/(hr.)(ft.²)(°F/in.). When this value is used in the $R = 1/k$ formula the result is $R = 1/0.25 = 4$. Since the common thickness specification for pool covers is 1/8" (0.125") the $R = 1/k$ formula cannot be used.



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