

2.5 R-VALUE

What is the R-Value of Greenblock ICF's?

With increasing energy costs and a renewed interest in energy-efficiency and green building, R-Values have become a major focus of homeowners as well as building professionals. Traditionally, R-value has been measured as the resistance to heat flow of a given material, in a steady state. Of course, the real world has more variable temperatures and to test the true effectiveness of an ICF wall assembly, three factors must be considered:

- 1. R-value**
- 2. Reduced air infiltration**
- 3. Thermal mass**

R-Value:

The EPS foam in a Greenblock ICF has an actual, consistent and stable R-Value of approximately 4.4/inch of foam. In our Fixed Web and GBLOX products this equates to approximately R-23, and in our 2-4-2 product approximately R-18. The concrete used in an ICF wall has an R-Value of .1/inch.

Reduced Air Infiltration:

Over half the energy loss in a stick built home is due to the amount of air that is allowed to infiltrate the walls through gaps between the insulation and the studs. This air must then be heated/cooled thus increasing energy use. The solid, monolithic concrete core in a Greenblock ICF wall creates an air tight barrier. Any penetrations, i.e. doors and windows, are readily identifiable and easily sealed thus reducing the rate of air exchanged which results in less energy use.

Thermal Mass:

Studies conducted by the Department of Energy (DOE), the U.S. Department of Housing and Urban Development (HUD), and the National Institute of Standards and Technology (NIST) have confirmed that concrete mass in exterior walls reduces annual energy costs in structures. This data has been incorporated into the International Energy Code (IECC), as reduced R-values required for mass walls.

Greenblock ICF walls demonstrate these characteristic thermal mass qualities including heat absorption and thermal lag, the delay in the distribution of heat energy throughout a system. The additional insulation on the interior of an ICF wall further delays the transfer of heat to the inside of the building which serves to moderate indoor temperature swings and reduce the amount of heating/ cooling needed.

Studies conducted by the Portland cement Association have concluded that homes built with ICF exterior walls require an estimated 44% less energy to heat and 32% less energy to cool than comparable wood frame or concrete block structures. When built with the proper compliment of windows, doors, HVAC systems, and methods, these structures typically realize a 50% - 80% savings in heating and cooling costs.

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Stated R-Value

The R-Value of an Insulated Concrete Form (ICF) is derived from Expandable Polystyrene (EPS) foam. The R-Value of EPS foam is specified in ASTM C578-95:

Specification Reference (ASTM-C578-95)			Type I (1#)	Type VIII (1.25#)	Type II (1.35#)	Type IX (2#)	
Property:	Units	ASTM Test					
Density, Min.	(pcf)	C303 or D1622	0.90	1.15	1.35	1.80	
Thermal Conductivity "K Factor"	BTU/(hr) (sqft)(°F/In)	C177 or C518	@ 25° F	0.238	0.227	0.217	0.208
			@ 40° F	0.250	0.238	0.227	0.217
			@ 75° F	0.277	0.263	0.250	0.238
Thermal Resistance "R Value"	One Inch Thickness	C177 or C518	@ 25° F	4.20	4.40	4.60	4.80
			@ 40° F	4.00	4.20	4.40	4.60
			@ 75° F	3.60	3.80	4.00	4.20

The EPS used in Greenblock ICF's is Type II, 1.5 minimum density which has an R Value of approximately 4.4/inch of foam. Based on this data, the R-Value of the foam panels in Greenblock products is as follows:

- Greenblock 2-4-2 Panel System: R 18
- Greenblock Gblox Panel System: R 23
- Greenblock Fixed Web Systems: R 23

Source: American National Standards Institute (ANSI)
<http://webstore.ansi.org/default.aspx>