R-value and Performance of BuildBlock and BuildLock Knockdown Insulating Concrete Forms

The R-value is a measure of thermal resistance used in the building and construction industry. It is generally used to indicate how efficient the insulation value of the material or product is. R-value under uniform conditions is the ratio of the temperature difference across an insulator and the heat flux (heat transfer per unit area per unit time, QA) through it or R=ΔT/QA. Thermal resistance varies with temperature but it is common practice in construction to treat it as a constant value. (A common method is to standardize the temperature at which the values are reported. (75° typical) (1)

BuildBlock Products R-value

R-value		
	Material R-Value	Performance R-Value
BuildBlock	R-21	R-45-55
BuildLock KD	R-21	R-45-55
GlobalBlock 4"	R-26	R-50-60
GlobalBlock 6"	R-30	R-50-60
BuildDeck 8"	R-23	R-48-58
BuildDeck 10"	R-29	R-50-60
BuildDeck 12"	R-36	R-55-65
BuildDeck 12"+2"	R-42	R-65+
ThermalSert 1"	+4.2	-
ThermalSert 2"	+8.4	-
ThermalSert 4"	+16.8	-

NOTE: R-values are calculated using 4.2 R's per inch based on 1.5 lb/ft^3 density. Performance R-values may vary by climate zone, solar orientation, and wall openings. Performance R-values plateau once insulation thickness approaches 10-inches.

BuildBlock ICF forms consist of 2 panels of Expanded Polystyrene (EPS). Each panel is 2.5" thick. Common accepted values for Type II EPS R-values range from 3.9 – 4.4 (1,2). The R-Value of BuildBlock forms is estimated to be R-21, using an industry average of R-4.2/inch, across 5 inches of foam depth. There are additional factors that help to push the Performance R-value to R-30 - R-50. This performance will reduce the needed size of the HVAC units, and will keep the home at a more constant comfort level.

Another BuildBlock product, GlobalBlock is different since it is an all foam screen grid ICF. The increase of foam displacing the concrete in the cores provides a much higher overall R-value. A commonly accepted way to estimate the R-value of a form like GlobalBlock is to determine the average foam thickness by taking the total volume of foam and dividing it by the area of the form. This will allow you to estimate the R-value based on a uniform foam thickness. GlobalBlock R-values range from R-26 to R-30 (4" and 6" respectively).

EPS Insulation does not degrade over the normal lifespan of a building and in tests performed by the Expanded Polystyrene Industry Alliance (EPS-IA), it was demonstrated that over extended periods of time, even in direct contact with the soil, EPS will retain most of its stated R-value. Furthermore, EPS exhibits cyclical drying, allowing moisture which is absorbed into the foam, to also dry out from the foam. The report states that Type II EPS (the material used in BuildBlock ICF products) can exhibit a significant drying potential, which "is critical to maintaining thermal resistance (R-value) under severe long term exposure conditions." (3) All building materials exposed to moisture, weather, humidity, etc. will both gain and lose moisture, depending on current conditions. The difference with EPS foam is that it doesn't affect the insulative value. Simply put, EPS foam is like wool socks for your home, even when damp, they still keep you warm.

EPS foam will maintain its R-value, even with significant saturation percentages. In contrast, Extruded Polystyrene (XPS) foam, while having lower moisture absorption rates is more dramatically affected by small amounts of moisture. XPS below grade systems can experience a 10-44% loss of energy savings performance when subjected to moisture accumulation in the range of 8%-16%.

Performance values of ICF vary by temperature, location, number of openings and orientation of the house.Many ICF homes will perform in the range of R-30 – R-50. ICFs will perform better in colder temperatures, because EPS exhibits higher R-values at lower temperatures. Also, properly placed or more efficient windows will contribute to a higher performance value.

Site placement of the home is important in order to take advantage of passive solar gain in the winter while minimizing it in the summer. Large eaves are usually designed into a home to help shield the sun

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when it's more directly overhead, and allow it to warm the home through large areas of glass when it is lower on the horizon.

Prevailing winds likewise can be directed around the home by trees or landscaping. By using fewer and smaller windows on the north walls, the wind will have less of an effect on the indoor temperatures. Air infiltration which causes drafts and cold spots is eliminated when using ICFs becasue of the seamless poured monolithic wall created.

Keeping the whole home more comfortable is the goal of any insulation system. ICFs, by controlling conductive losses, and eliminating convective losses, can provide the highest levels of comfort in any weather.

SOURCES:

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