

UNDERSTANDING R AND U VALUES IN THERMAL INSULATION

WHY U-VALUE MATTERS

When selecting the right insulation system for your construction project, understanding the difference between R and U values & knowing you have a choice to meet code using either value, is critical. These values are key indicators of thermal performance, but they measure different aspects of insulation effectiveness.

U-VALUE: A COMPREHENSIVE MEASURE.

TABLE C402.1.4 OPAQUE THERMAL ENVELOPE ASSEMBLY MAXIMUM REQUIREMENTS, U-FACTOR METHOD^{a, b}

CLIMATE ZONE	0 AND 1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs												
Insulation entirely above roof deck	U-0.048	U-0.039	U-0.039	U-0.039	U-0.039	U-0.039	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032	U-0.032
Metal buildings	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.035	U-0.031	U-0.029
Walls, above grade												
Metal building	U-0.079	U-0.079	U-0.079	U-0.079	U-0.079	U-0.052	U-0.052	U-0.050	U-0.050	U-0.050	U-0.050	U-0.050
Metal framed	U-0.077	U-0.077	U-0.077	U-0.064	U-0.064	U-0.064	U-0.064	U-0.064	U-0.055	U-0.055	U-0.049	U-0.049

U-value measures the rate of heat transfer through a system, taking into account the entire assembly, including insulation, framing, and other materials used. Unlike the R-value, a lower U-value indicates better insulation performance.

The U-value is a superior metric for measuring insulation systems because it accounts for real-world factors such as thermal bridging, which can significantly impact the effectiveness of your insulation. (The table above C402.1.4, taken from IECC 2021, displays where/how the IECC communicates the U-Factor method's requirements for meeting the code)

R-VALUE: THE BASICS.

The R-value measures an insulation material's resistance to heat flow. The higher the R-value, the better the material insulates. This measurement is essential in determining how well an insulation material can keep heat from escaping or entering a building. For instance, if you have an R-30 insulation, it provides greater resistance to heat flow than an R-15 insulation. (The below Table C402.1.3, taken from IECC 2021, displays where/how the IECC communicates the R-Value method's requirements for meeting the code)

TABLE C402.1.3 OPAQUE THERMAL ENVELOPE INSULATION COMPONENT MINIMUM REQUIREMENTS, R-VALUE METHOD^a

CLIMATE ZONE	0 AND 1		2		3		4 EXCEPT MARINE		5 AND MARINE 4		6	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs												
Insulation entirely above roof deck	R-20ci	R-25ci	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci	R-30ci
Metal buildings ^b	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-19 + R-11 LS	R-25 + R-11 LS	R-30 + R-11 LS
Walls, above grade												
Metal building	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-14ci	R-13 + R-14ci	R-13 + R-14ci	R-13 + R-14ci	R-13 + R-14ci
Metal framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-10ci	R-13 + R-10ci	R-13 + R-12.5ci	R-13 + R-12.5ci

WHY U-VALUE MATTERS MORE.

While R-values are useful for understanding the properties of individual insulation materials, U-values provide a more comprehensive picture of a building's overall thermal performance. Here's why you should prioritize U-values when choosing an insulation system:

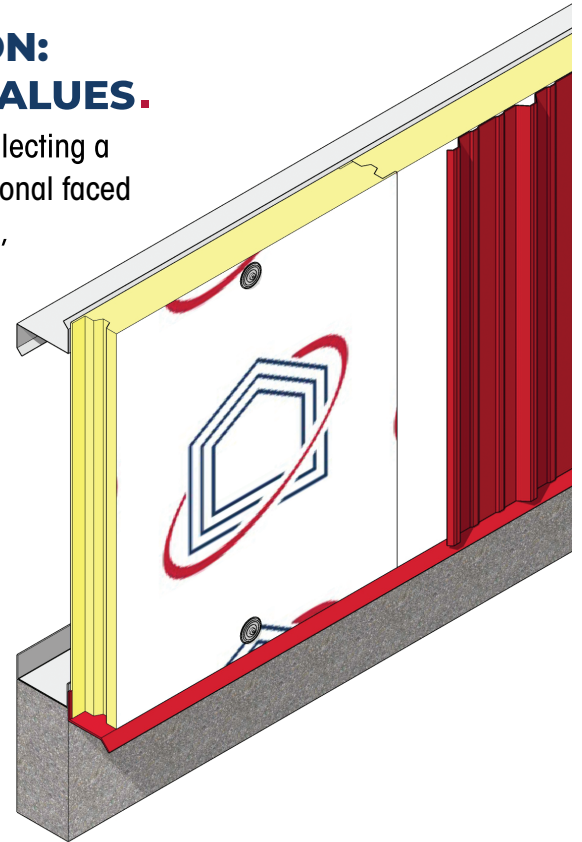
- **Holistic Assessment:** U-values consider the entire assembly, not just the insulation material. This includes potential heat loss through framing members and other components that can compromise insulation effectiveness.
- **Real-World Performance:** Construction projects often face issues like thermal bridging, where heat bypasses the insulation through conductive materials like metal girts and purlins. U-values account for these heat transfer paths, providing a more accurate representation of the building's thermal performance.
- **Energy Efficiency:** Lower U-values translate to better overall energy efficiency, reducing heating and cooling costs over the building's lifetime.

BEYOND ENVELOPE CONTINUOUS INSULATION: THE SUPERIOR CHOICE FOR MAXIMIZING U-VALUES.

When it comes to maximizing energy efficiency and thermal performance, selecting a comprehensive beyond envelope insulation system is essential. Unlike traditional faced fiberglass liner systems that often get compressed at girt and purlin supports, a beyond envelope continuous system, such as R-Seal®, ensures consistent insulation coverage without gaps or compression.

KEY BENEFITS.

- **Eliminates Thermal Bridging:** Continuous insulation covers the entire building envelope, minimizing thermal bridges and ensuring more uniform thermal protection.
- **Consistent Performance:** Our system maintains its integrity and insulation value across all areas, unlike faced fiberglass liners that can lose effectiveness when compressed.
- **Enhanced Comfort and Savings:** Better thermal performance means improved indoor comfort and significant savings on energy bills.



Investing in a continuous insulation system, with a focus on U-values, ensures your construction project achieves optimal thermal performance, energy efficiency, and long-term savings.