COMPLYING WITH THE INTERNATIONAL ENERGY CONSERVATION CODE (IECC)

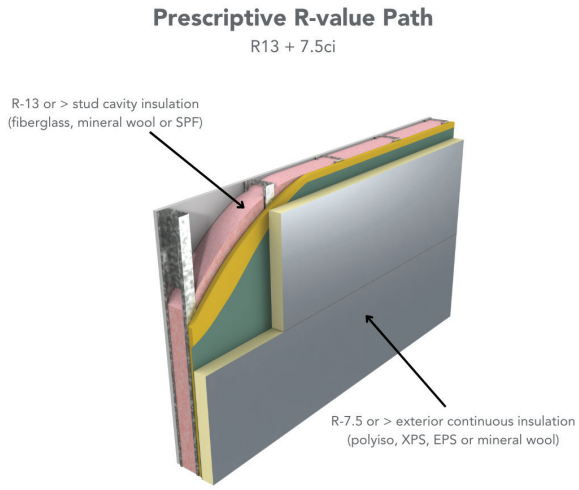
PRESCRIPTIVE R-VALUE VS. PRESCRIPTIVE U-VALUE FOR ABOVE-GRADE EXTERIOR WALLS

To comply with the International Energy Conservation Code (IECC) requirements for insulating above-grade exterior walls, building professionals can follow one of two commonly used prescriptive methods: the R-value path or the U-value path, as set forth in the opaque thermal envelope requirements of the IECC.

R-VALUE PRESCRIPTIVE PATH

Complying with the R-value method is straightforward – simply use products with R-values that meet or exceed the values shown in the IECC for the appropriate climate zone and wall type.

For example, the prescriptive R-value for metal framed walls in most climate zones (Zone 3 and above) is R-13 + 7.5 ci. This means the wall must incorporate insulation of R-13 or greater within the stud cavity, and insulation of R-7.5 or greater as continuous insulation, as shown in the following illustration:



U-VALUE PRESCRIPTIVE PATH

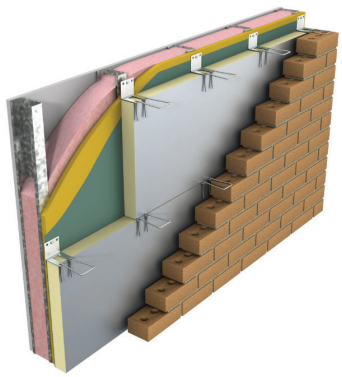
The U-value method is different. It takes the thermal resistance of all the components of the wall assembly into consideration, not just the insulation. The R-values of the wall assembly components are added together. Since U-value is the reciprocal of R-value, the U-value of the assembly is determined by dividing 1 by the total R-value. There are tables within the code documents that assign R-values to certain components of wall assemblies such as cavity air spaces and interior air film.

The U-value calculation will be slightly different for framed walls depending on whether the framing members are steel or wood. Since steel conducts heat, there is a reduction in effectiveness of the stud cavity insulation within a steel framed wall assembly – in other words, the effective R-value of the wall assembly is less than the insulation's stated R-value. This is not any fault of the insulation, rather it is because the steel framing is a thermal short circuit in the wall. Therefore, the energy efficiency of the stud cavity insulation is reduced by a "framing factor" percentage found in the IECC.

In the below example, the reduction is 54% for steel framed walls 16" oc, meaning the R-value of the insulation is multiplied by .46 (1 – 0.54).

Prescriptive U-value Path - Steel Stud Framing

U-value .064ci

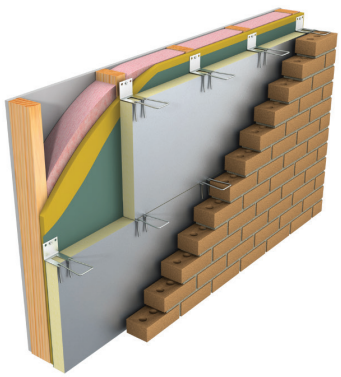


Component	R-value
Interior Air Film	0.68
Interior Gypsum Board - 5/8"	0.56
Stud Cavity Insulation (R-13 x .46 framing factor reduction for steel studs)	5.98
Exterior Gypsum Sheathing - 5/8"	0.56
Exterior Continuous Insulation	7.50
Brick	0.80
Outside Air Film	0.17
R-value Total	16.25
U-value Calculation (1/R-value total)	0.062

Wood framing provides some measure of insulating value, so it is treated differently than steel framing when calculating U-value for the wall assembly. The most common way to calculate wood framing U-value is the "parallel path" method, whereby the U-values for the framing path and the cavity path are calculated and then added. So, if the wood studs are 16" oc, the code calls for using a framing factor of 0.25 (meaning the studs take up 25% of the wall area). The U-value of the framing path is then multiplied by 0.25 and the U-value of the cavity path is multiplied by 0.75 to account for the remainder of the wall assembly. The U-value of the total wall is the sum of the framing path U-value and the cavity path U-value.

Prescriptive U-value Path - Wood Stud Framing

U total = U-value (Framing Path) + U-value (Cavity Path)
U total = [FFraming*(1/Rframing)] + [FFcavity*(1/Rcavity)]
U total = [.025*(1/14.645)] + [0.75*(1/23.27)]
U total = .049



Component	Framing Path R-value	Cavity Path R-value
Interior Air Film	0.68	0.68
Interior Gypsum Board - 5/8"	0.56	0.56
Stud Cavity Insulation	—	13.00
Wood Stud	4.375	—
Exterior Gypsum Sheathing - 5/8"	0.56	0.56
Exterior Continuous Insulation	7.50	7.50
Brick	0.80	0.80
Outside Air Film	0.17	0.17
R-value Total	14.645	23.27