

Closed Cell Spray Foam seals the wall to the vapor barrier and insulates in one step. At ~R-6/inch, ~2-3" are required in Illinois.

Vapor Barrier. Minimum 6 mil polyethylene (or as required by local code)

Photo courtesy of Greenriver LLC

What insulation is required for below-grade walls? On the one hand, the relatively moderate temperature of the earth makes these walls require *less* insulation compared to above grade walls. However, care must be taken to ensure an adequate and continuous thermal envelope where the foundation meets the wall.

This document summarizes the below-grade wall code requirements for Illinois and provides guidance for designing successful installations.

Below-grade Wall Requirements 2018 IECC

Construction Type	Climate Zone	R-value method	U-factor method	Distance?
Commercial	4 & 5	R-7.5 ci	C-0.119	Top of wall to 10' below grade or to top of finished floor (whichever is less).
Residential	4	R-10 ci or R-13 cavity	0.059	
	5	R-15 ci or R-19 cavity	0.050	

Source: Table C402.1.3/C402.1.4 and R402.1.2/R402.1.4

To U or not to U?

Two Compliance Paths allow designers the flexibility to use materials or methods different from those outlined in the R-value method. Examples of when flexibility might be valuable include commercial projects with insulated concrete formwork or residential projects that use a combination of cavity and continuous insulation.

What's a C-value? C-factor is actually very similar to a U-factor. U-factor is the measure of thermal conductivity of materials with air layers on each side. The C-factor, in contrast, measures heat transfer through materials that adjoin other solid materials. In below-grade walls, soil is in contact with the wall on the exterior so the C-value is used.

Commercial (C402.2.5)

Location of insulation can either be inside or outside the foundation wall.

Type of Insulation must be continuous if the R-value method is used.

Depth of insulation must extend 10' below grade *or* from the top of the wall to the finished floor, whichever is less.

U-factor method. If deviating from the prescribed R-value or using cavity insulation, an alternative compliance path is offered in section C402.1.4 and C402.1.5.

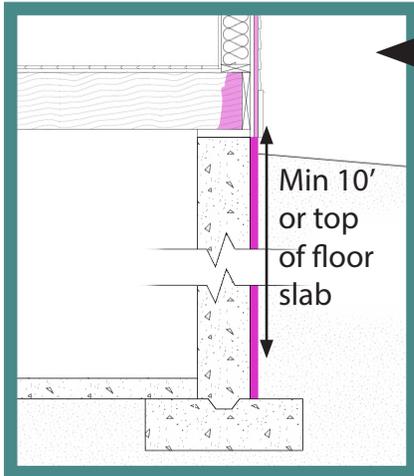
Residential (R402.2.9)

Location and Depth: The commercial provisions apply. However, IL amendments allow insulation to stop 6" above the floor surface.

Type of Insulation can be continuous or cavity insulation under the R-value method. However, different values are required to account for thermal bridging if cavity insulation is used.

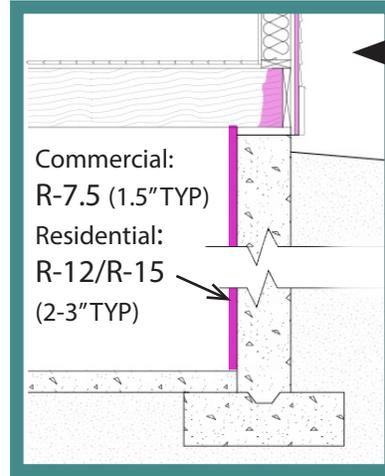
Successful Below-grade Insulation

To match the unique needs of each project, the code provides various options. Below are a few common examples.



Exterior Rigid

When the insulation is on the outside of the foundation it provides the best continuity through the floor framing, but it must be protected where it extends above grade and down to 6" below.

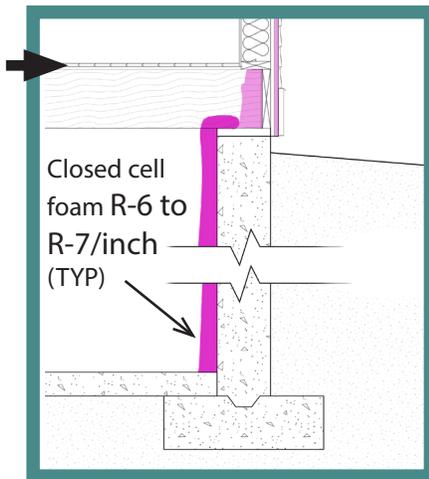


Interior Rigid

When insulation is on the interior, such as with existing below-grade walls, careful detailing can maintain as much of a continuous thermal break through the floor framing as possible.

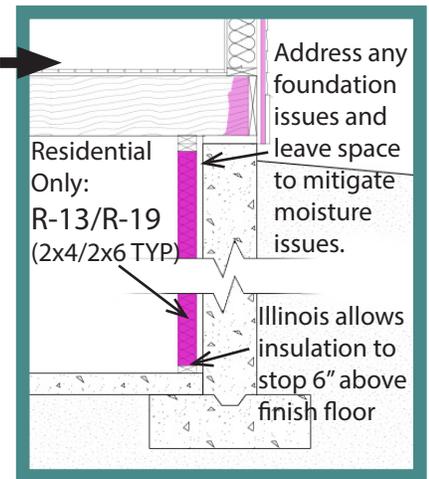
Spray Foam

Spray foam provides air sealing and insulation in one step. Spray foam adheres to the wall eliminating concerns about condensation. Can also adhere to a floor vapor barrier.



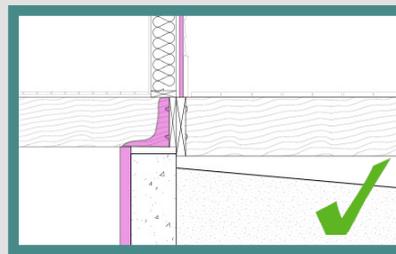
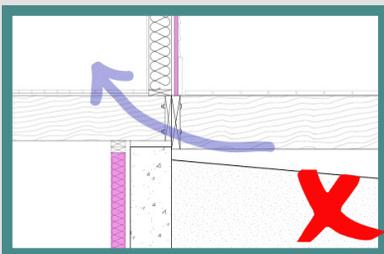
Cavity Insulation

For residential applications, cavity insulation may be used but the R-value is greater to account for the effect of thermal bridging through the framing members.



Define Your Thermal Envelope

Where dissimilar materials meet care must be taken to maintain a continuous thermal envelope. This can be especially challenging when the insulation is on both sides of the wall structure. In the example below, a deck connected to the structure creates a thermal bridge if not addressed.



Take it further: Example 2 is better, but can you see where a thermal bridge is still present?

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