

# Slab-on-Grade Insulation - Code Compliance Brief

## Overview:

The intent of this brief is to provide code-specific information about slab-on-grade insulation to help ensure that the measure will be accepted as being in compliance with the code. Providing notes for codes officials on how to plan review and conduct field inspections can help builders or remodelers with proposed designs and installations and provide jurisdictional officials with information for acceptance. Providing the same information to all interested parties (e.g., code officials, builders, designers, etc.) is expected to result in increased compliance and fewer innovations being questioned at the time of plan review and/or field inspection.

Slabs lose energy primarily as a result of heat conducted outward and through the perimeter of the slab. Installing slab insulation around the perimeter of the slab will reduce heat loss and make the slab easier to heat. According to DOE's Building Energy Codes Program Helpdesk,<sup>1</sup> slab-on-grade insulation has been one of the more commonly addressed topics on code compliance for the past several years. Even though the requirements have essentially remained the same in the International Energy Conservation Code (IECC) and International Residential Code (IRC) versions 2009, 2012, and 2015, commonly asked questions continue to be asked about placement of insulation, depth of insulation, the thermal break between conditioned and unconditioned spaces, and additions or retrofits to existing homes. This brief provides an overview of slab-on-grade insulation requirements, insulation protection, and flashing.

## Plan Review:

Per the **IECC/IRC, Section R103.3/R106.3 Examination of Documents**. The code official/building official must examine or cause to be examined construction documents for code compliance.

This section lists applicable code requirements and details helpful for plan review regarding the provisions to meet the requirement for slab-on-grade insulation.

- **Construction Documentation.** Review the construction documents for the details describing slab insulation installation and construction techniques.<sup>2</sup>
  - 2015 IECC/IRC, Section R103.2/N1101.5 Information on Construction Documents.** Construction documents should include information about the insulation material and the R-value.
- **Insulation. 2015 IECC/IRC Section R402.2.10/N1102.2.10 Slab-On-Grade Floors.** Slab-on-grade floors with a floor surface less than 12 inches below grade should be insulated in accordance with information provided in the Insulation and Fenestration Requirements by Component Table, which is reproduced following this paragraph. Slab-on-grade insulation should extend downward from the top of the slab on either the outside or inside of the foundation wall. When a slab is independent from a perimeter foundation wall, insulation may be installed either on the exterior of the foundation wall or between the foundation wall and the slab. Insulation located below grade, as required in Climate Zones 4 through 8, should extend the length specified in the table by any combination of vertical insulation, insulation extending under the slab, or insulation extending out perpendicular to the building Insulation extending perpendicular away from the building should be protected by pavement or by not less than 10 inches of soil. It is permissible by the codes that the top edge of insulation installed between the exterior wall and the edge of the interior slab be permitted to be cut at a 45-degree angle away from the exterior wall. Slab edge insulation is not required in jurisdictions designated by the code official as having a heavy termite infestation. Slab-on-grade insulation requirements for the 2012 and 2009 versions of the IRC/IECC are found in the following sections:
  - 2012 IECC/IRC Section R402.2.9/N1102.2.9, Slab-on-grade floors
  - 2009 IECC/IRC Section 402.2.8/N1102.2.8, Slab-on-grade floors

Excerpt from the Insulation and Fenestration Requirements by Component  
**Table R402.1.2/N1101.1.2 (2015 IECC/IRC).**

Climate Zone	1	2	3	4	5	6	7	8
Insulation R-value	NA	NA	NA	NA	NA	NA	NA	NA
Slab R-value	NA	NA	NA	2	2	4	4	4
Depth	NA	NA	NA	2 ft	2 ft	4 ft	4 ft	4 ft

Insulation to R-5 should be added to the required slab edge R-values for heated slabs. For heated slabs in Climate Zones 1 through 3, install the insulation to the exterior of the footing or to 2 feet, whichever is less. A heated slab is a type of construction that has a slab-on-grade concrete floor with a heating system embedded in or beneath the slab floor. Building additions that include a slab-on-grade construction also are subject to the slab edge requirements listed in the IECC/IRC.

- 2015 IECC/IRC, Section R402.2.10/N1102.2.10
- 2012 IECC/IRC, Section R402.2.9/ N1102.2.9
- 2009 IECC/IRC, Section 402.2.8/ N1102.2.8

- **Insulation Protection.** Confirm that the construction documents specify proper insulation protection if applicable. Rigid foam board is typically used for insulating slabs.
  - 2015 IRC, Section R403.3.2, Protection of Horizontal Insulation below Ground.** Horizontal insulation placed less than 12 inches below the ground surface or that portion of horizontal insulation extending outward more than 24 inches from the foundation edge should be protected against damage by use of a concrete slab or asphalt paving on the ground surface directly above the insulation or by cementitious board, plywood rated for below-ground use, or other acceptable materials, approved by the code official, placed below ground directly above the top surface.
- **Flashing.** Confirm that the construction documents specify the proper location for installing flashing and flashing material.
  - 2015 IRC, Section R703.8.5 Flashing.** Flashing should be located beneath the first course of masonry above the finished ground level, above the foundation wall or slab, and at other points of support including structural floors.
    - Section R703.4 Flashing. Approved corrosion resistant flashing should be applied in shingle fashion to prevent entry of water into the wall cavity or penetration of water to the building structural framing components.

### Field Inspection:

Per the 2015 IECC, Section R104, Inspections, construction or work for which a permit is required is subject to inspection. Construction or work is to remain accessible and exposed for inspection purposes until approved. Required inspections include footing and foundation, framing and rough-in work, plumbing rough-in, mechanical rough-in, and final inspection.

Per the 2015 IRC, Section R109, Inspections, the wording is somewhat different in that for onsite construction, from time to time the building official, upon notification from the permit holder or his agent, can make or cause to be made any necessary inspections. Further details are provided for inspections regarding foundation, plumbing, mechanical, gas and electrical, floodplain, frame and masonry, and final inspection. Any additional inspections are at the discretion of the building official.

This section provides details for inspecting to the specific provisions for slab-on-grade insulation where one or more specific type of inspection per the IECC or IRC may be necessary to confirm compliance. Verifying code compliance for slab-on-grade insulation would be at the foundation inspection.

- Confirm that the insulation material meets ratings approved on the construction documents.
- Confirm that insulation has been installed properly so the insulation coverage is continuous and complete. The following websites provide information on slab insulation installation.
  - Guide with pictures on what materials to use and how to properly install slab edge insulation:* <https://basc.pnnl.gov/resource-guides/slab-edge-insulation#block-views-guide-static-blocks-block-1> [1] and <https://basc.pnnl.gov/resource-guides/slab-edge-insulation#block-views-guide-static-blocks-block-2> [2]
  - Guide with pictures on how NOT to install* <https://basc.pnnl.gov/resource-guides/window-and-door-rough-openings#block-views-guide-static-blocks-block-1> [3]
- Confirm that proper insulation protection has been installed, if applicable, per approved construction documents.
- Confirm that proper flashing has been installed, if applicable, per approved construction documents.

### Technical Validation(s):

This section provides additional information and helpful resources.

- *Case Study: Exterior Rigid Foam Insulation at the Edge of Slab Foundation, Fresno, California (2013):* [http://energy.gov/sites/prod/files/2013/11/f5/case\\_study\\_exterior\\_rigid\\_foam.pdf](http://energy.gov/sites/prod/files/2013/11/f5/case_study_exterior_rigid_foam.pdf) [4]  
Author: IBACOS  
Publication Date: October 2013
- Guide for Slab Edge Insulation: <https://basc.pnnl.gov/resource-guides/slab-edge-insulation> [5]
- *Measure Guideline: Hybrid Foundation Insulation Retrofits (2012):* [http://apps1.eere.energy.gov/buildings/publications/pdfs/building\\_america/measure\\_guide\\_hybrid\\_found.pdf](http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/measure_guide_hybrid_found.pdf) [6]  
Author: Building Science Center  
Publication Date: May 2012
- *Slab Edge Insulation for All Climates, Information Sheet 513:* [http://apps1.eere.energy.gov/buildings/publications/pdfs/building\\_america/slab\\_edge\\_insulation.pdf](http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/slab_edge_insulation.pdf) [7]
- *Technology Fact Sheet Slab Insulation: Improve Comfort and Save Energy in Homes with Slab-on-Grade Floors,* [http://apps1.eere.energy.gov/buildings/publications/pdfs/building\\_america/29237.pdf](http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/29237.pdf) [8]

- *Thermal Enclosure System Rater Checklist*,  
[http://www.energystar.gov/ia/partners/bldrs\\_raters/downloads/Thermal\\_Enclosure\\_System\\_Rater\\_Checklist\\_Guide6bce](http://www.energystar.gov/ia/partners/bldrs_raters/downloads/Thermal_Enclosure_System_Rater_Checklist_Guide6bce) [9]