Slab Edge Insulation

2015 IECC (w/ VA Specific Amendments) Plan Review Guide



Slab Edge Insulation:

Summary: Though the requirements have remained the same in the International Energy Conservation Code (IECC) and International Residential Code (IRC) since 2009, questions about placement of insulation, depth of insulation, the thermal break between conditioned and unconditioned spaces, and how additions or retrofits to existing homes should be handled remain.

Why: Slabs lose energy primarily as a result of heat conducted outward and through the perimeter of the slab. Installing insulation around the perimeter of the slab edge properly will prevent excessive heat loss and gain though the exposed concrete. *Insulation is included in slab-on-grade construction for two purposes:*

1. *Insulation prevents heat loss in winter, and heat gain in summer. This effect is most pronounced at the slab perimeter, where the slab edge often comes in direct contact with outdoor air/ambient conditions as it is placed above grade.*
2. *Even in climates and locations on the slab (perimeter vs. middle) where slab insulation may not confer large energy benefits, thermal isolation of the slab can prevent cool slab temperatures that can otherwise cause condensation inside the house. This can lead to mold and other moisture-related problems, especially if the slab is carpeted.*[1]

Items of Note:

* *Typical products used below grade: extruded polystyrene, expanded polystyrene, and rigid mineral fiber panels. (Baechler et al. 2005). Extruded polystyrene (XPS) is nominally R-5 per inch. Expanded polystyrene (EPS) nominally R-4 per inch and can be less expensive. Below-grade foams can be at risk for moisture accumulation under certain conditions.*[2]
    1. *All of the products listed would require 2+ Inches of insulation to achieve R-10.*
    2. *Depth of insulation in relation to wall assemblies can be of concern. Code allows the insulation to be cut away from the wall at a 45 degree angle for this reason.*
* *XPS has a higher initial insulating R-value than does a similar thickness and density of EPS, but the R-value of XPS degrades over time. EPS does not experience as much "thermal drift," and the reported R-value remains the same throughout its lifespan. EPS also has better drying*

[1] https://foundationhandbook.ornl.gov/handbook/section4-1.shtml
[2] https://foundationhandbook.ornl.gov/handbook/section4-1.shtml

capabilities than XPS allowing it to perform better below grade in locations that can remain wet for large parts of the year.

* *For durability and insulation efficacy, final grade must be sloped away from the building. Long-term moisture degrades insulating value of slab insulations. Proper compressive strength and ground contact rated insulations should be specified.*

Visual Reference:

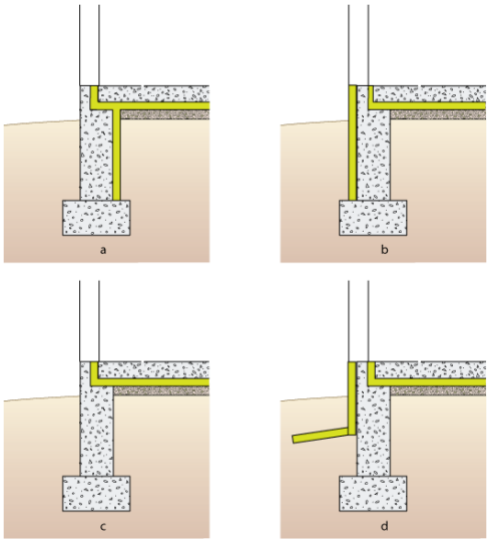

Figure 1: Common slab edge insulation locations[3]

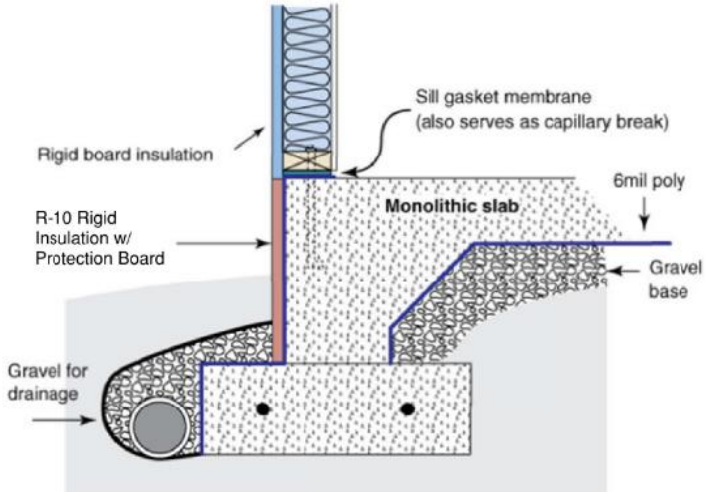

Figure 2: Example of monolithic pour with slab edge insulation

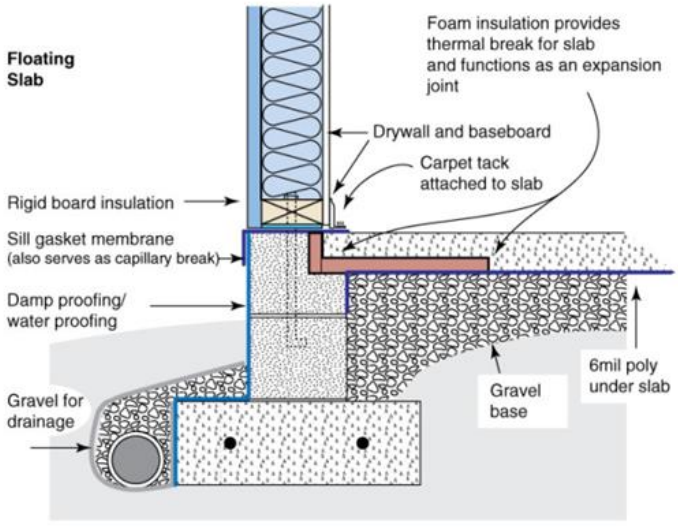

Figure 3: Slab and stem wall configuration

[3] https://foundationhandbook.ornl.gov/handbook/chapter4.shtml

Figure 4: Stem Wall insulated to height of Slab. Insulation to be cut at 45 degree angle away from wall (Code Section **R402.2.10)**

Figure 5: Slab Edge insulation with flashing and protection.

Plan Review Focus:

Construction Documentation: Review the construction documents for the details describing slab insulation installation and construction techniques

Vapor Barrier and Under-slab Fill: Ensure vapor barrier specified with all seams overlapped and taped. 57 Stone under slabs is recommended as a moisture control strategy but not required by code

R-Value/Depth: Ensure R-Value is denoted in drawings and current details achieve a full thermal break at the slab edge from the top of the slab to 2' below grade. Ensure Thermal Envelope is completed leaving no gaps between Wall and slab edge insulation coverage

Insulation Protection: Confirm that the construction documents specify proper insulation protection if applicable. Rigid foam board is typically used for insulating slabs

Flashing: Confirm that the construction documents specify the proper location for installing flashing and flashing material

2015 IECC/IRC Code Reference:

Table R402.1.2/N1102.1.2

Climate Zone	4 except Marine	5 and Marine 4
Slab R-Value	R-10	R-10
Depth	2 ft	2 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 depth 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.

Section R103.2/N1101.5 Information on Construction Documents. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed and show in sufficient detail pertinent data and features of the building, systems and equipment...Details shall include but are not limited to, as applicable:

1. Insulation materials and R-Values. (*Items 2-8 not shown, see Chapter 11 of Virginia Residential Code)

Section R303.1.1/N1101.10.1 Building thermal envelope insulation. An R-value identification mark shall be applied by the manufacturer to each piece of building thermal envelope insulation 12" or greater in width. Alternately, the insulation installers shall provide a certification listing the type, manufacturer and R-Value of insulation installed in each element of the building thermal envelope. For blown or sprayed insulation (fiberglass and cellulose), the initial installed thickness, settled thickness, settled R-Value, installed density, coverage area and number of bags installed shall be listed on the certification.

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 shall be insulated in accordance with Table R402.1.2/N1102.1.2. **The insulation shall extend downward from the top of the slab on the outside or inside of the foundation wall. Insulation located below grade shall be extended to the distance provided in Table R402.1.2/N1102.1.2 by any combination of vertical insulation, insulation extending under the slab or insulation extending out from the building. Insulation extending away from the building shall be protected by pavement or by not less than 10 inches of soil.** The top edge of the insulation installed between the exterior wall and the edge of the interior slab shall be permitted to be cut a a 45 degree angle away from the exterior wall. Slab-edge insulation is not required in jurisdictions designated by the buidling officisal as having a very heavy termite infestation.

Section R303.2.1/N1101.11.1 Protection of exposed foundation insulation. Insulation applied to the exterior of basement walls, crawlspace walls and the perimeter of slab-on-grade floors shall have a rigid, opaque and weather-resistant protective covering to prevent degradation of the insulation's thermal performance. The protective covering shall cover the exposed exterior insulation and extend not less than 6 inches below grade.

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.

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.

Definitions:

Slab-on-Grade: Slab floor less than 12" below grade requiring insulation

Vapor Retarder: A material or product that controls the migration of moisture due to vapor diffusion

Heated Slab: Slab-on-grade construction in which the heating elements, hydronic tubing, or hot air distribution system is in contact with, or placed within or under, the slab

Infiltration: The uncontrolled inward air leakage into a building caused by the pressure effects of wind, or the effect of differences in the indoor and outdoor air density or both

Building Thermal Envelope: The basement walls, exterior walls, floor, roof and any other building elements that enclose conditioned space or provide a boundary between conditioned space and exempt or unconditioned space

Conditioned Space: An area, room or space that is enclosed within the building thermal envelope and that is directly heated or cooled or indirectly heated or cooled

Above-Grade Wall: A wall more than 50% above grade and enclosing conditioned space; this includes between-floor spandrels, peripheral edges of floors, roof and basement knee-walls, dormer walls, gable end walls, walls enclosing mansard roof and skylight shafts

Air Barrier: Material(s) assembled and joined together to provide a barrier to air leakage through the building envelope; An air barrier may be a single material or a combination of materials

R-Value: Resistance to Heat Flow of a single material, expressed as a whole number, higher numbers denote higher resistance to heat flow

U-Value: Resistance to heat flow of multiple materials expressed as a decimal point, lower numbers denote higher resistance to heat flow

Infiltration: The uncontrolled inward air leakage into a building caused by the pressure effects of wind, or the effect of differences in the indoor and outdoor air density or both