

be placed in the wall construction to isolate the insulation from the interior of the space. The vapor retarder must be 4-mil (0.1 mm) thick polyethylene or equivalent.

C. Flame Spread Rating of Insulation

§110.8(c)

The *California Quality Standards for Insulating Materials* requires that exposed facings on insulation material be fire resistant and be tested and certified not to exceed a flame spread of 25 and a smoke development rating of 450. Insulation facings must be in contact with the finished assembly surface or they are considered exposed applications and cannot be installed.

Flame spread ratings and smoke density ratings are shown on the insulation or packaging material or may be obtained from the manufacturer.

D. Insulation Placement on Roof/Ceilings

§110.8(e)

Insulation installed on the top of suspended (T-bar) ceilings with removable ceiling panels may not be used to comply with the Standards unless the installation meets the criteria described in the *Exception* to §110.8(e)3 below. Insulation may be installed in this location for other purposes such as for sound control, but it will have no value in terms of meeting roof/ceiling insulation requirements of the Standards.

Acceptable insulation installations include placing the insulation in direct contact with a continuous roof or ceiling that is sealed to limit infiltration and exfiltration as specified in §110.7; including but not limited to placing insulation either above or below the roof deck or on top of a drywall ceiling.

E. Insulation Requirements for Heated Slab Floors

§110.8(g)

Heated slab-on-grade floors must be insulated according to the requirements in Table 110.8-A of the standards. The top of the insulation must be protected with a rigid plate to prevent intrusion of insects into the building foundation.

A common location for the slab insulation is on the perimeter of the foundation. Insulation that extends downward to the top of the footing is acceptable. Otherwise, the insulation must extend downward from the level of the top of the slab, down 16 inches (40 cm) or to the frost line, whichever is greater.

For below-grade slabs, vertical insulation shall be extended from the top of the foundation wall to the bottom of the foundation (or the top of the footing) or to the frost line, whichever is greater.

Another option is to install the insulation between the heated slab and foundation wall. In this case insulation must extend downwards to the top of the footing and then extend horizontally inwards a distance of 4 ft towards the center of the slab. R-5 vertical insulation is required in all climates except climate zone 16, which requires R-10 of vertical insulation and R-7 horizontal insulation.

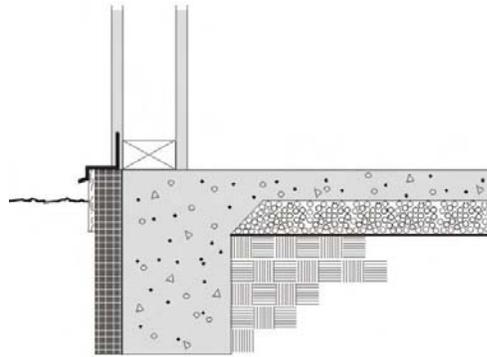


Figure 3-14 – Perimeter slab insulation
 Source: California Energy Commission

Table 3-5 – Slab Insulation Requirements for Heated Slab Floors

Insulation Location	Insulation Orientation	Installation Requirements	Climate Zone	Insulation R-Value
Outside edge of heated slab, either inside or outside the foundation wall	Vertical	From the level of the top of the slab, down 16 inches or to the frost line, whichever is greater. Insulation may stop at the top of the footing where this is less than the required depth. For below grade slabs, vertical insulation shall be extended from the top of the foundation wall to the bottom of the foundation (or the top of the footing) or to the frost line, whichever is greater.	1 – 15	5
			16	10
Between heated slab and outside foundation wall	Vertical and Horizontal	Vertical insulation from top of slab at inside edge of outside wall down to the top of the horizontal insulation. Horizontal insulation from the outside edge of the vertical insulation extending 4 feet toward the center of the slab in a direction normal to the outside of the building in plan view.	1 – 15	5
			16	10 vertical and 7 horizontal

F. Wet Insulation Systems

§110.8(h)

Wet insulation systems are roofing systems where the insulation is installed above the roof's waterproof membrane. Water can penetrate this insulation material and have an effect on the energy performance of the roofing assembly in wet and cool climates. In climate zones 1 and 16, the insulating R-value of continuous insulation materials installed above the roof's waterproof membrane must be multiplied by 0.8 before choosing the table column in Reference Joint Appendix JA4 for determining assembly U-factor. See the footnotes for Tables 4.2.1 through 4.2.7 in the Reference Joint Appendix JA4.

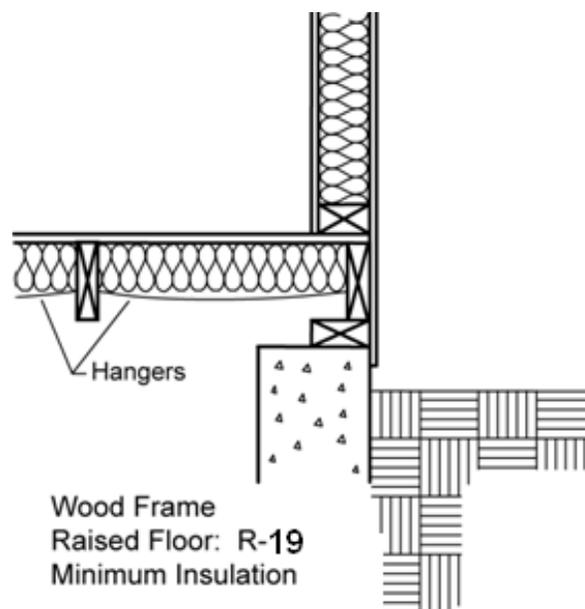


Figure 3-24 – Raised Floor Insulation

Source: California Energy Commission

2. Slab Insulation

§150.1(c)1D

Prescriptive Table 150.1-A, Package A, requires slab insulation only in climate zone 16. In this case, a minimum of R-7 must be installed. The insulation must be installed to a minimum depth of 16 in. or to the bottom of the footing, whichever is less. The depth is measured from the top of the insulation, as near the top-of-slab as practical, to the bottom edge of the insulation (see).

Perimeter insulation is not required along the slab edge between conditioned space and the concrete slab of an attached unconditioned enclosed space such as a garage, covered porch, or covered patio. Neither would it be practical or necessary to insulate concrete steps attached to the outside slab edge.

In situations where the slab is below grade and slab edge insulation is being applied to a basement or retaining wall, the top of the slab edge insulation should be placed as near to ground level as possible and extended down at least 16 inches. In situations where the slab is above grade and slab edge insulation is being applied, the top of the slab edge insulation should be placed at the top of the slab.

Construction Practice/Compliance and Enforcement

Slab-edge insulation should be protected from physical damage and ultraviolet light exposure because deterioration from moisture, pest infestation, ultraviolet light and other factors can significantly reduce the effectiveness of the insulation.

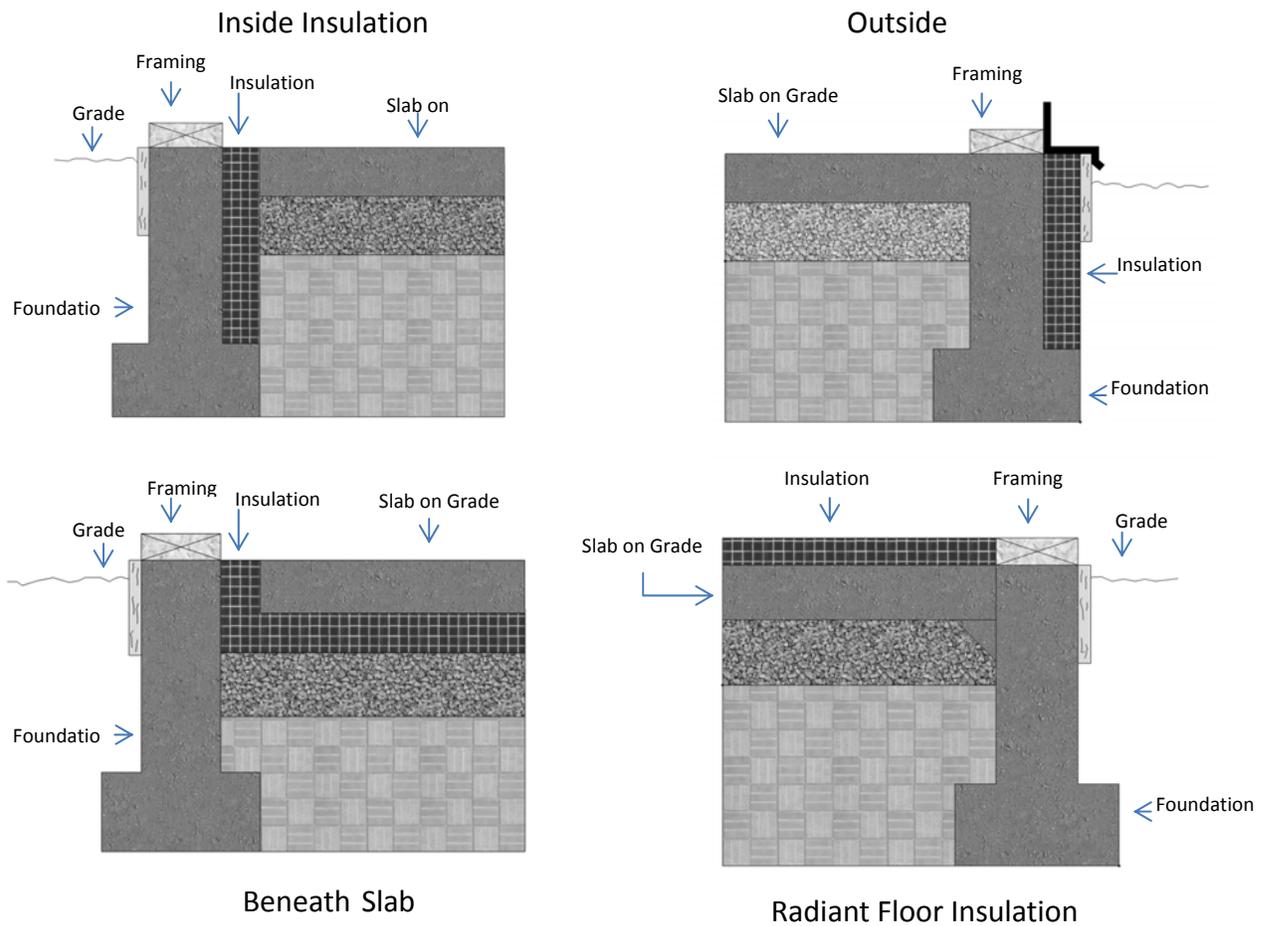


Figure 3-25 – Allowed Slab Edge Insulation Placement

When slab-edge insulation is required by the prescriptive or performance requirements, then minimum depth is 16 inch or to the top of the footing, whichever is less.
Source: California Energy Commission

Example 3-24

Question

What are the slab edge insulation requirements for a hydronic-heating system with the hot water pipes in the slab?

Answer

The requirements for insulation of heated slabs can be found in §110.8(g) of the Standards and are described in Chapter 4 of this manual. The material and installation specifications are as follows:

- Insulation values as shown in Table 110.8-A of the Standards
- Protection from physical damage and ultra-violet light deterioration
- Water absorption rate no greater than 0.3% (ASTM-C272)
- Water vapor permeance no greater than 2.0 perm/inch (ASTM-E96)