Insulation Requirements per the 2006 International Energy Conservation Code & the 2006 Pa. Alternative Energy Code for Residential Buildings

As per the Pennsylvania Uniform Construction Code, we now fall under the guidelines of the 2006 codes. Some significant changes have been brought about, some are as follows:

1) R-13 is required in exterior walls.
2) R-10, for 24", is required for slabs.
3) R-38 is required in ceilings, but R-30 may be used in a roof/ceiling assembly (cathedral) when the design does not allow a higher "R" value.
4) "RES CHECK" may still be used to show lower values, taking into consideration the "fenestration and solar heat gain coefficients" of all windows, glazed doors and skylights.

Please refer to some of these areas on the enclosed pages, any other questions, please, contact the building inspector.

Thank You…. Building Dept.

SECTION PA200
DEFINITIONS

PA201 General. Unless otherwise expressly stated, all words and terms shall have the meaning indicated in Chapter 2 of the 2006 International Residential Code.
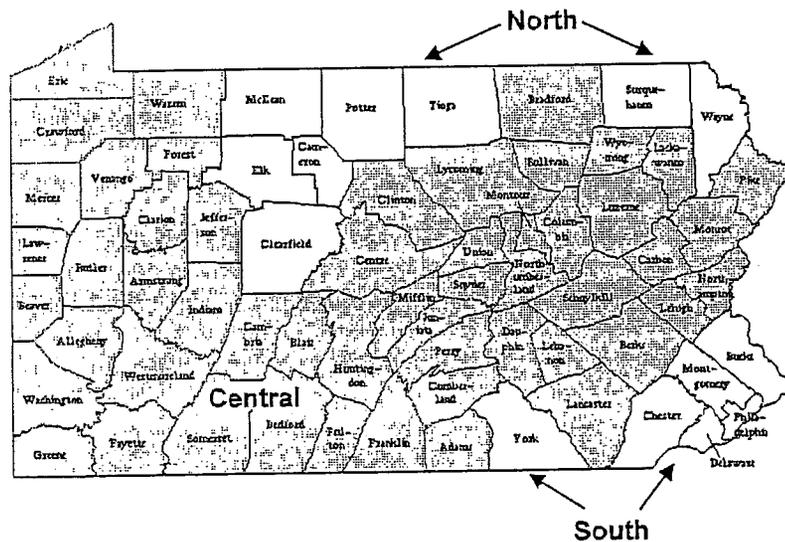
SECTION PA300
CLIMATE ZONES

PA301 General. Climate zones listed in PA301.1 shall be used.

PA301.1 Climate Zones

South: Bucks, Chester, Delaware, Montgomery, Philadelphia, York

Central: All other counties

North: Cameron, Clearfield, Elk, McKean, Potter, Susquehanna, Tioga, Wayne

**Figure PA301.1
Pennsylvania Climate Zones**

SECTION PA400
PERSCRIPTIVE REQUIREMENTS

PA401 - Building Thermal Envelope

PA401.1 General. The building thermal envelope shall meet the requirements of Table PA401.1 based on the climate zone specified in PA301.1.

PA401.1.1 *R*-value computation. Insulation material used in layers, such as framing cavity insulation and insulating sheathing, shall be summed to compute the component *R*-value. The manufacturer's settled *R*-value shall be used for blown insulation. Computed *R*-values shall not include an *R*-value for other building materials or air films.

Table PA401.1
Insulation and Fenestration Requirements by Component[a]

	Climate Zone		
	South	Central	North
Fenestration U-Factor	0.40	0.35	0.35
Skylight U-Factor[b]	0.60	0.60	0.60
Ceiling R-Value	38	38	49
Wood Frame Wall R-Value	13	19 or 13+5[f]	19 or 13+5[f]
Mass Wall R-Value	5	13	15
Floor R-Value	19	30[e]	30[e]
Basement[c] Wall R-Value	10 / 13	10 / 13	10 / 13
Slab[d] R-Value & Depth	10, 2 ft	10, 2 ft	10, 4 ft
Crawl Space[c] Wall R-Value	10 / 13	10 / 13	10 / 13

For SI: 1 foot = 304.8 mm.
  a. *R*-values are minimums. *U*-factors and SHGC are maximums. R-19 shall be permitted to be compressed into a 2 x 6 cavity.
  b. The fenestration *U*-factor column excludes skylights.
  c. The first *R*-value applies to continuous insulation, the second to framing cavity insulation; either insulation meets the requirement.
  d. R-5 shall be added to the required slab edge *R*-values for heated slabs.
  e. Or insulation sufficient to fill the framing cavity, R-19 minimum.
  f. "13+5" means R-13 cavity insulation plus R-5 insulated sheathing. If structural sheathing covers 25 percent or less of the exterior, insulating sheathing is not required where structural sheathing is used. If structural sheathing covers more than 25 percent of exterior, structural sheathing shall be supplemented with insulated sheathing of at least R-2.

PA401.2.6 Basement walls. Walls associated with conditioned basements shall be insulated from the top of the basement wall down to 10 feet (3048 mm) below grade or to the basement floor, whichever is less. Walls associated with unconditioned basements shall meet this requirement unless the floor overhead is insulated in accordance with Sections PA401.1 and PA401.2.5.

PA401.2.7 Slab-on-grade floors. Slab-on-grade floors with a floor surface less than 12 inches (305 mm) below grade shall be insulated in accordance with Table PA401.1. The insulation can be installed on either the exterior or interior of the foundation wall.

Exterior Insulation: Exterior insulation shall be installed from the top of the slab and extend the distance provided in Table PA401.1 by any combination of vertical insulation or horizontal insulation extending away from the building. Insulation extending away from the building shall be protected by pavement or by a minimum of 10 inches (254 mm) of soil.

Interior Insulation: Interior insulation shall be installed from the bottom of the slab and extend the distance provided in Table PA401.1 by any combination of vertical insulation or horizontal insulation extending under the slab. The slab edge shall be separated from the foundation wall by a ½ inch thermal break as per Figure PA401.2.7. A thermal break shall be created by a material suitable for ground contact, which includes, but is not limited to, asphalt impregnated fiber board or extruded polystyrene.

Slab-edge insulation is not required in jurisdictions designated by the code official as having a very heavy termite infestation.
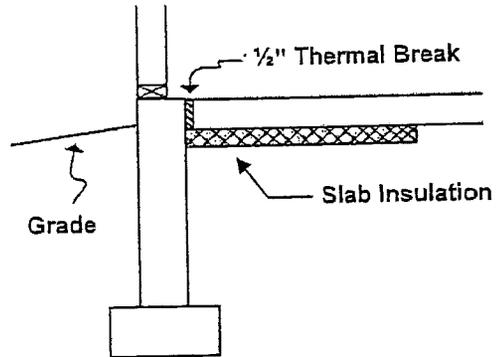

Figure PA401.2.7: Interior Slab Insulation

Insulating Foundation and Floors
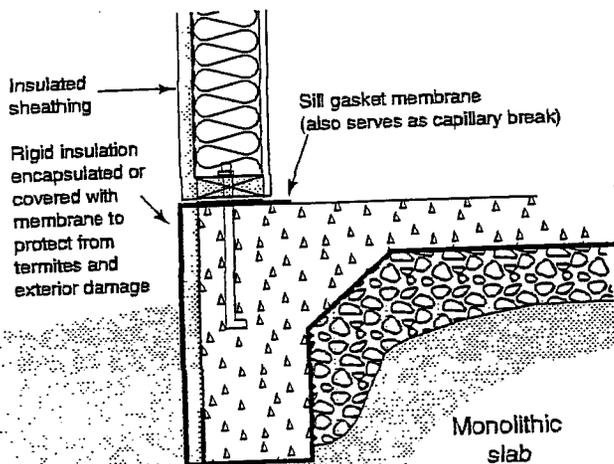
General guidelines for foundations

The bottom level of a home, whether slab-on-grade, floor over a crawl space, or underground basement, is susceptible to moisture and deterioration problems due to contact with the earth. The best approaches for preventing these problems will depend on the local climate and style of construction, but the same general rules apply to all foundation systems:

☐ Keep all untreated wood materials away from the earth.

☐ Provide rain drainage, such as gutters, to conduct rain water away from the house in non-arid climates.

☐ Slope the earth away from the house for at least five feet at a minimum 5% grade (3 inches in 5 feet).

☐ Provide a water managed foundation drainage system at the bottom of the footing when the foundation floor (interior grade) is below the exterior grade.

☐ Insulate between the conditioned and unconditioned portions of the foundation system. In termite-prone areas, extra care should be taken to prevent termites from tunneling through the insulation.
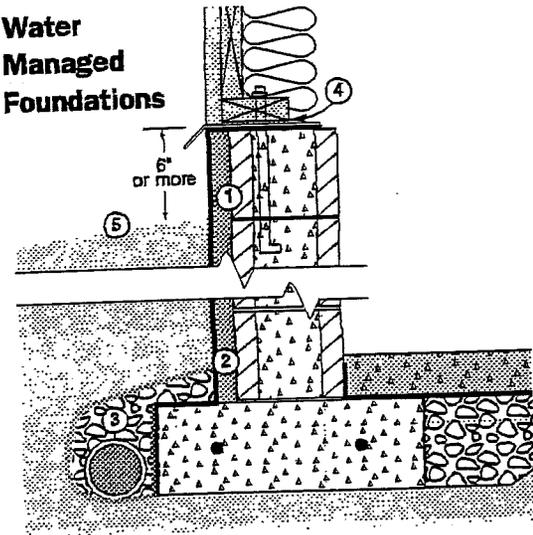
Methods of insulating slab-on-grade floors

Slabs lose energy primarily due to heat conducted outward and through the perimeter of the slab. Insulating the exterior edge of the slab in most sections of the country can reduce winter heating bills by 10% to 20%. Slab insulation is recommended in many localities by the Model Energy Code or state energy codes.
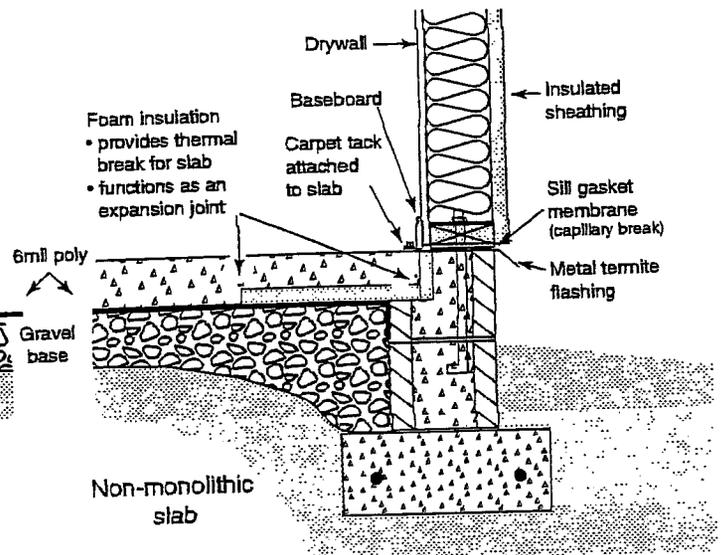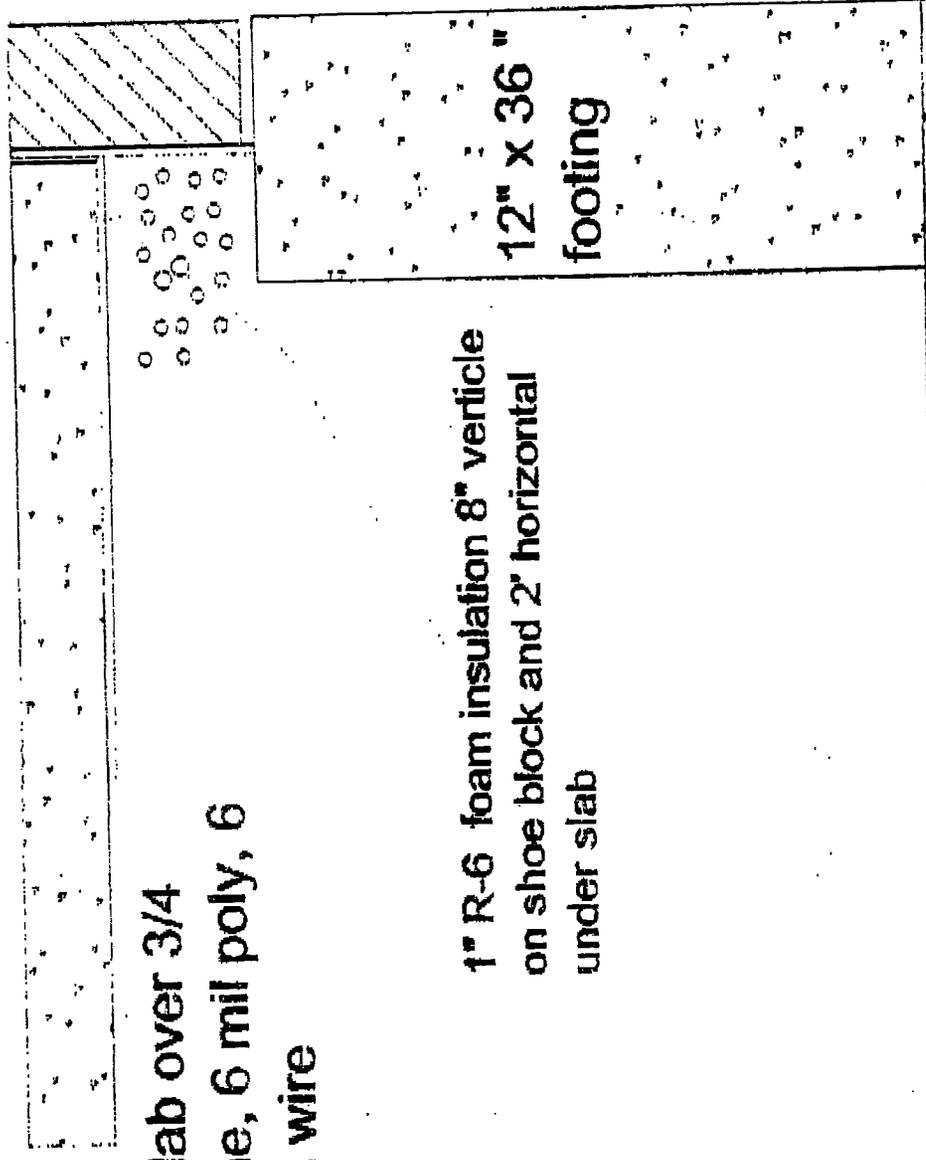

Water Managed Foundations

1. Damp-proof below-grade portion of foundation wall - this is to seal the wall against ground moisture penetration.

2. Install drainage plane material or gravel against foundation wall - this relieves hydrostatic pressure and channels water to the drain.

3. Cover perforated drain pipe with gravel and cover with filter fabric. Locate drain beside footing, not on top - this creates an underground gutter.

4. Add sill gasket membrane - this serves as a capillary break to reduce wicking of water from the concrete and provides air sealing.

5. When backfilling foundation wall, slope earth away from house 5%.

Insulation approaches to termite-resistant, slab-on-grade foundations

Insulated sheathing

Rigid insulation encapsulated or covered with membrane to protect from termites and exterior damage

Sill gasket membrane (also serves as capillary break)

Monolithic slab

Gravel base

6mil poly

Foam insulation
• provides thermal break for slab
• functions as an expansion joint

Drywall

Baseboard

Carpet tack attached to slab

Insulated sheathing

Sill gasket membrane (capillary break)

Metal termite flashing

Non-monolithic slab

4" x 8" shoe
block

12" x 36 "
footing

4" slab over 3/4
stone, 6 mil poly, 6
inch wire

1" R-6 foam insulation 8" verticle
on shoe block and 2" horizontal
under slab

Wood and Insulation Sizes

Nominal Size	Actual Size	**	R-Value	Actual Thickness
			"Fanfold"	
2x3	1 ½ x 2 ½		(R-1.5)	3/8"
			R-13	3 ½"
2x4	1 ½ x3 ½		R-15	3 ½"
			R-19	6 3/4"
2x6	1 ½ x 5 ½		R-25	8"
2x8	1 ½ x 7 1/4		R-30	9 3/4"
2x10	1 ½ x 9 1/4		R-38	13 ½"
2x12	1 ½ x 11 1/8		R-21C	5 ½"
			R-30C	8 1/4"
			R-38C	10"

The following are just a few of the available materials which may be used, there are many manufactured named products which may be used meeting ASTM standards:

Owens Corning Foamboard (Polystyrene Insulation)		Dow Insulating Sheathing (Structural Foamboard)	
1/2	R-3	1/2	R-3.3
3/4	R-4	5/8	R-4.1
1"	R-5	3/4	R-5.0
1 ½	R-7.5	1"	R-6.5
2"	R-10	1 3/8	R-9.1
3"	R-15	1 ½	R-10
4"	R-20	1 7/8	R-12

(An additional R-2.8 can be obtained when used with an air space)