PA Alternative Residential Energy Provisions Update

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PennState College of Engineering | PENNSYLVANIA HOUSING RESEARCH CENTER

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1

Description

- The Pennsylvania Uniform Construction Code (UCC) Review and Advisory Council (RAC) completed the review of the 2018 I-Codes on April 29, 2021. The code provisions that were adopted during this process will take effect in the first quarter of 2022. These changes trigger an update of the PA Alternative Residential Energy Provisions. The Pennsylvania Alternative Residential Energy Provisions were developed with the intent of being: simpler to build and easier to enforce; more rational and flexible; focused on Pennsylvania in terms of climatic and other conditions; and, equivalent to the provisions of the International Energy Conservation Code (IECC) in terms of energy efficiency. This session will dig into the updated version of this standard.

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2

Learning Objectives

1. Discuss the overall intent of the PA Alternative Residential Energy Provisions as an energy code compliance path, including flexibility and simplicity.
2. Evaluate the available energy enhancement options that can be used as entrance requirements for this compliance path, including upgrades to building enclosure elements, higher efficiency equipment, and renewable energy generation.
3. Identify available trade-offs that are provided due to the inclusion of an energy enhancement option, such as alternative building enclosure parameters, and their effect on building performance.
4. Identify the impact of electing to use this compliance path on the permit and inspection process.

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Code Update: What is Changing?

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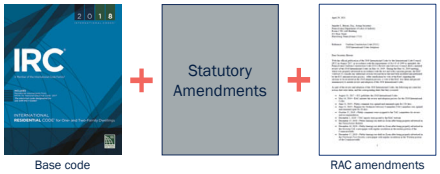
UCC Residential Code Summary: 2/14/22



Base code

RAC amendments

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UCC Energy Code Summary: 2/14/22

Chapter 11

Residential Provisions

6

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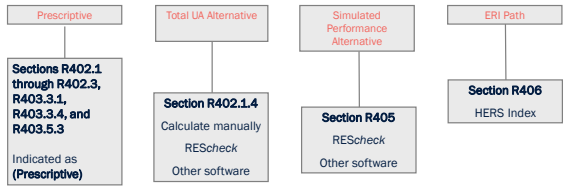
IECC Compliance Options



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PA Alternative Residential Energy Provisions

- Based on the 2018 IECC and UCC Amendments
- Compliance allowed by UCC Title 34, Chapter 403
- Created and published by the Pennsylvania Housing Research Center
- Allows trade-offs

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Overview of Energy Code Changes

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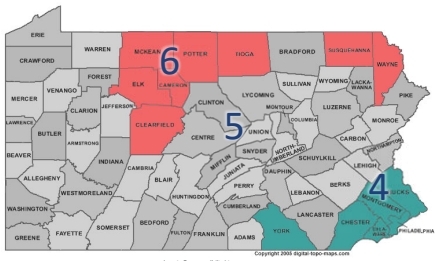
Climate Zones in PA



Copyright 2005 digital-topo-maps.com

Image Source: digital-topo-maps.com

10

2015 IRC Table N1102.1.2

Table N1102.1.2 (R402.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT [a]

Climate Zone	Fenestration *U*-Factor	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b, e]	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE[i]	MASS WALL *R*-VALUE	FLOOR *R*-VALUE	BAWSEMENT[c] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c] WALL *R*-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13 + 5[h]	8/13	19	5/13[f]	0	5/13
4 except Marine	0.35	0.55	0.40	49	20 or 13 + 5[h]	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.32	0.55	NR	49	20 or 13 + 5[h]	13/17	30[g]	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20 + 5 or 13 + 10[h] or 18 + 6.5[h]	15/20	30[g]	15/19	10, 4 ft	15/19
7 and 8	0.32	0.55	NR	49	20 + 5 or 13 + 10[h]	19/21	38[g]	15/19	10, 4 ft	15/19

Source: International Code Council (ICC). (2014). 2015 International Residential Code, Country Club Hill, Ill.

11

2018 IRC Table N1102.1.2

Table N1102.1.2 (R402.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT [a]

Climate Zone	Fenestration *U*-Factor	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b, e]	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE[i]	MASS WALL *R*-VALUE	FLOOR *R*-VALUE	BAWSEMENT[c] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c] WALL *R*-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13 + 5[h]	8/13	19	5/13[f]	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13 + 5[h]	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13 + 5[h]	13/17	30[g]	15/19	10, 2 ft	15/19
6	0.30	0.55	NR	49	20 + 5 or 13 + 10[h]	15/20	30[g]	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	20 + 5[h] or 13 + 10[h]	19/21	38[g]	15/19	10, 4 ft	15/19

Source: International Code Council (ICC). (2017). 2018 International Residential Code, Country Club Hill, Ill.

12

2018 IRC N1102.4.1.2 (R402.4.1.2) Testing

- The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding five air changes per hour in Climate Zones 1 and 2, and three air changes per hour in Climate Zones 3 through 8. Testing shall be conducted in accordance with RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals).

13

13

2021 PA Alternative Residential Energy Provisions

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14

PA UCC Section 301(c)

- (c) Prescriptive methods for energy-related standards.– The department shall, within 180 days of the effective date of this section, by regulation promulgate prescriptive methods to implement the energy-related standards of the Uniform Construction Code which take into account the various climatic conditions through this Commonwealth. In deriving these standards the department shall seek to balance energy savings with initial construction costs.

15

15

PA UCC Website

The UCC regulations provide for the use of an alternative to Chapter 11 of the *International Residential Code* (or Chapter 4 (RE) of the *International Energy Conservation Code*), to demonstrate compliance with the energy conservation requirements of the UCC. This alternative compliance path, which can be obtained by clicking on the link below, was developed by the Pennsylvania Housing Research Center at Penn State University and is entitled "Pennsylvania Alternative Energy Provisions" .

Pennsylvania Alternative 2009 (if complying with the 2009 International Codes)

Pennsylvania Alternative 2018 (if complying with the 2015 International Codes)

https://www.dli.pa.gov/ucc/Pages/UCC-Codes.aspx

16

16

Scope Clarification

SECTION PA100

GENERAL

PA101 Scope. The provisions of this document regulate energy efficiency for the design and construction of buildings regulated by the 2018 International Residential Code (IRC) as incorporated in the PA Uniform Construction Code (UCC) in the Commonwealth of Pennsylvania. In addition, the provisions of this document only apply to new construction of one- and two-family dwellings and townhouses not more than three stories above grade plane in height with a separate means of egress and their accessory structures not more than three stories above grade plane in height and are not applicable to alteration, repair, addition, and change of occupancy of existing buildings and structures.

Exception: Portions of the building envelope that do not enclose conditioned space.

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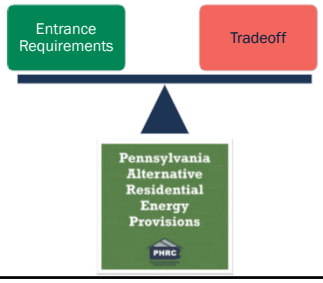
PA Alternative Residential Energy Provisions



- Choose one (1) Entrance Requirement
  - "Energy Enhancement Options"
- Receive ALL tradeoffs
- Energy modeling completed (BEopt) to ensure equivalent energy usage

18

18

Energy Enhancement Options

Choose ONE of the following Energy Enhancement Options to qualify for the alternative path.

19

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19

Energy Enhancement Options

Table PA104
Energy Enhancement Options

Option	Description		Minimum efficiency by climate zone		
			South (4)	Central (5)	North (6)
1	Ductless heat pumps		8.5 HSPF *and* 15 SEER	10 HSPF *and* 15 SEER	10 HSPF *and* 15 SEER
2	All air ducts located inside the thermal envelope		Compliant	Compliant	Compliant
3	Geothermal or water source heat pump installed		Compliant	Compliant	Compliant
4	Improved efficiency air source heat pump installed		9.5 HSPF *and* 19 SEER	9.5 HSPF *and* 19 SEER	11 HSPF *and* 19 SEER
5	Improved efficiency condensing furnace installed		92 AFUE	95 AFUE	95 AFUE
6	Exterior continuous insulation		R20+10	R20+10	R20+15
7	Improved efficiency windows		U-factor = 0.21	U-factor = 0.19	U-factor = 0.15
8	Package: Improved efficiency windows and higher attic R-value with raised heel truss[a]	Windows	U-factor = 0.25	U-factor = 0.21	U-factor = 0.19
		Attic	R-value = 60	R-value = 60	R-value = 60
9	Package: Improved efficiency windows and heat pump water heater	Windows	U-factor = 0.25	U-factor = 0.21	U-factor = 0.19
		Heat Pump Water Heater	Compliant	Compliant	Compliant

Notes:
a. Full height of uncompressed insulation shall extend over the top plate at the eaves.
b. For multiple cooling systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the cooling design load. For multiple heating systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the heating design load.

20

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20

Energy Enhancement Options

1. Ductless heat pumps

Minimum efficiency by climate zone		
South (4)	Central (5)	North (6)
8.5 HSPF *and* 15 SEER	10 HSPF *and* 15 SEER	10 HSPF *and* 15 SEER

Notes:
a. Full height of uncompressed insulation shall extend over the top plate at the eaves.
b. For multiple cooling systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the cooling design load. For multiple heating systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the heating design load.

Image Source: http://synergy-green-builders.com/tag/mini-split-pump/

21

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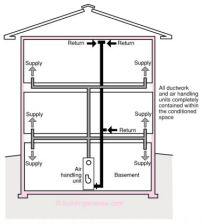
21

Energy Enhancement Options

2. All air ducts located inside the thermal envelope



Note: Colored shading depicts the building's thermal barrier and pressure boundary. The thermal barrier and pressure boundary enclose the conditioned space.

Minimum efficiency by climate zone		
South (4)	Central (5)	North (6)
Compliant	Compliant	Compliant

Notes:
a. Full height of uncompressed insulation shall extend over the top plate at the eaves.
b. For multiple cooling systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the cooling design load. For multiple heating systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the heating design load.

Image Source: https://buildingscience.com/documents/information-sheets/information-sheet-ducts-in-conditioned-space

22

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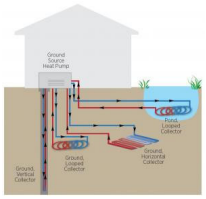
Energy Enhancement Options

3. Geothermal or water source heat pump installed



Minimum efficiency by climate zone		
South (4)	Central (5)	North (6)
Compliant	Compliant	Compliant

Notes:
a. Full height of uncompressed insulation shall extend over the top plate at the eaves.
b. For multiple cooling systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the cooling design load. For multiple heating systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the heating design load.

Image Source: https://basc.pnnl.gov/resource-guides/geothermal-heat-pumps

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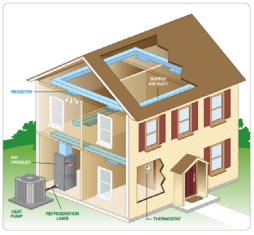
Energy Enhancement Options

4. Improved efficiency air source heat pump installed



Minimum efficiency by climate zone		
South (4)	Central (5)	North (6)
9.5 HSPF *and* 19 SEER	9.5 HSPF *and* 19 SEER	11 HSPF *and* 19 SEER

Notes:
a. Full height of uncompressed insulation shall extend over the top plate at the eaves.
b. For multiple cooling systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the cooling design load. For multiple heating systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the heating design load.

Image Source: https://www.goodmanmfg.com/resources/heating-cooling-101/how-a-heat-pump-works

24

24

Energy Enhancement Options

5. Improved efficiency condensing furnace installed

Minimum efficiency by climate zone		
South (4)	Central (5)	North (6)
92 AFUE	95 AFUE	95 AFUE

Notes:
a. Full height of uncompressed insulation shall extend over the top plate at the eaves.
b. For multiple cooling systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the cooling design load. For multiple heating systems, all systems shall meet or exceed the minimum efficiency requirements in this section and shall be sized to serve 100 percent of the heating design load.

25

25

Energy Enhancement Options

6. Exterior continuous insulation

Minimum efficiency by climate zone		
South (4)	Central (5)	North (6)
R20+10	R20+10	R20+15

26

26

Energy Enhancement Options

7. Improved efficiency windows

Minimum efficiency by climate zone		
South (4)	Central (5)	North (6)
U-factor = 0.21	U-factor = 0.19	U-factor = 0.15

Image Source: http://peoriasiding.com/tag/best-replacement-windows-in-illinois/

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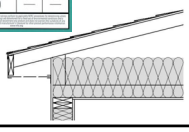
Energy Enhancement Options

8. Package: Improved efficiency windows & higher attic R-value with raised heel truss



	Minimum efficiency by climate zone		
	South (4)	Central (5)	North (6)
Windows	U-factor = 0.25	U-factor = 0.21	U-factor = 0.19
Attic	R-value = 60	R-value = 60	R-value = 60

Notes:
a. Full height of uncompressed insulation shall extend over the top plate at the eaves.

Image Source: TOP - http://peoriasiding.com/tag/best-replacement-windows-in-illinois/
BOTTOM – 2018 PA Alternative Energy Provisions

28

28

Energy Enhancement Options

9. Package: Improved efficiency windows & heat pump water heater

	Minimum efficiency by climate zone		
	South (4)	Central (5)	North (6)
Windows	U-factor = 0.25	U-factor = 0.21	U-factor = 0.19
Heat Pump Water Heater	Compliant	Compliant	Compliant

Image Source: LEFT - http://peoriasiding.com/tag/best-replacement-windows-in-illinois/
RIGHT – http://westinghousewaterheating.com/electric-heat-pump-water-heater.html

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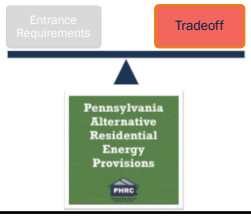
29

Energy Tradeoffs

- ALL of the following are allowed as a reduction when at least one energy enhancement option has been met.



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Climate Zones in PA

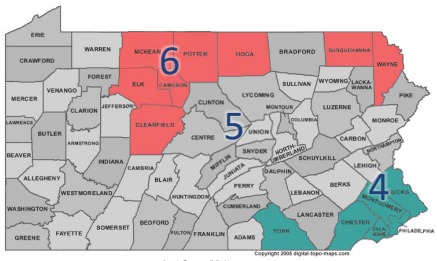

Image Source: digital-topo-maps.com

31

2018 IRC Section N1102.2.2

- **Ceilings without attic spaces**
  - Where Section N1102.1.2 requires insulation R-values greater than R-30 in the ceiling and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation R-value for such roof/ceiling assemblies shall be R-30. Insulation shall extend over the top of the wall plate to the outer edge of such plate and shall not be compressed.
  - This reduction of insulation from the requirements of Section N1102.1.2 shall be limited to 500 square feet (46 m2) or 20 percent of the total insulated ceiling area, whichever is less.

Source: International Code Council (ICC). (2017). 2018 International Residential Code, Country Club Hill, Ill.

32

Energy Tradeoffs

1. Cathedral ceilings: R-30 insulation, for up to 75% of the total *living space* square footage area

PA302.2 Ceilings without attic spaces. Where the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, such as cathedral ceilings, the minimum required insulation for such roof/ceiling assemblies shall be R-30. Insulation shall extend over the top of the wall plate to the outer edge of such plate and shall not be compressed. This reduction of insulation from the requirements of Section PA301 shall be limited to 75% of the total *living space* square footage area.

33

2018 IRC Section N1102.2.4

- **Access hatches and doors**
  - Access doors from conditioned spaces to unconditioned spaces such as attics and crawl spaces shall be weatherstripped and insulated to a level equivalent to the insulation on the surrounding surfaces.

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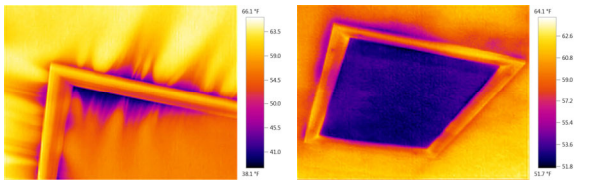
Source: International Code Council (ICC). (2017). 2018 International Residential Code, Country Club Hill, Ill.

34

Attic Access Gone Wrong



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Energy Tradeoffs

2. Attic Hatches: R-20 instead of full insulation req't

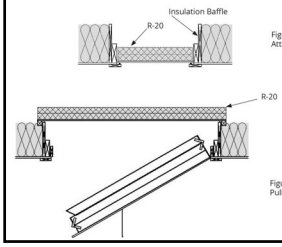


Figure PA302.3 (1)
Attic Hatch

Figure PA302.3 (2)
Pull-Down Stairs

PA302.4 Access hatches and doors. Access hatches and doors from conditioned spaces to unconditioned spaces (e.g., attics and crawl spaces) shall be weather stripped. Both vertical and horizontal access hatches shall be insulated to a minimum of R-20 with rigid foam permanently attached to the access hatch. This is not intended to restrict the use of proprietary products meeting the intent of this provision. Side hinged access door shall meet the fenestration requirements of Table PA301.

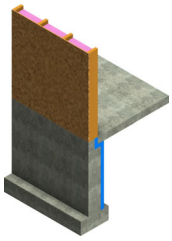
A wood framed or equivalent baffle or retainer is required to be provided when loose fill insulation is installed. The purpose of which is to prevent the loose fill insulation from spilling into the living space when the attic access is opened. Areas around access hatches required to service equipment shall provide a permanent means of maintaining the installed R-value of the insulation.

Exception: Vertical doors that provide access from conditioned to unconditioned spaces shall be permitted to meet the fenestration requirements of Table PA301 based on the applicable climate zone specified in section PA201.1.

36

2018 IRC Section N1102.2.10

- **Slab-on-grade floors**
  - The insulation shall extend downward from the top of the slab on the outside or inside of the foundation wall



Source: International Code Council (ICC). (2017). 2018 International Residential Code, Country Club Hill, Ill.

37

37

Energy Tradeoffs

3. Slab edge insulation: Thermal break

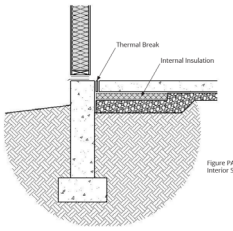


Figure PA302.7.2
Interior Slab Insulation

PA302.9.2 Interior Insulation. Interior insulation shall be installed from the bottom of the slab and extend the distance provided in Table PA301 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 continuous ½ inch thermal break as per Figure PA302.8.(2) 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.

Note: The provisions in PA302.9.2 only apply to unheated slabs. For heated slabs, refer to requirements in 2018 IRC Table N1102.1.2 (R402.1.2) and 2018 IRC Section N1102.2.10 (R402.2.10).

38

38

2018 IRC Section N1102.3.4

- **Opaque door exemption**
  - One side-hinged opaque door assembly not greater than 24 square feet (2.22 m2) in area shall be exempt from the U-factor requirement in Section N1102.1.2.

Source: International Code Council (ICC). (2017). 2018 International Residential Code, Country Club Hill, Ill.

39

39

Energy Tradeoffs

4. Opaque doors: 54ft² U-factor exemption (instead of 24ft²)

PA303.4 Opaque door exemption. One door assembly, including side hinged opaque doors, sidelights and transoms, up to 54 square feet (5.02 m²) in area is exempted from the U-factor requirement in Table PA301.

Image Source: http://openi.co/prehung-exterior-french-doors/exterior-french-doors-interior-rustic-wood-prehung-installing-with/

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N1101.6, Tables N1101.10.3(1) & N1101.10.3(2) – Fenestration Definitions and U-Factors

- **Change Type:** Gpevmjmgexmsr
- **Change Summary:** Xli$hijmrmxmsr$jsv$wo}pmklx$erh$zivxmgep$jiriwxvexmsr$lezi$fiir$qszih$yrhivxlihijmrmxmsrjsvjiriwxvexmsr0erhe$hijmrmxmsr$jsv$steuyi$hssvlewfiir$ehhih2
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- STEUYI$HSSV2$E$hssv$xlexmwrsx$piww$xler94tivgirx$steuyi$mr$wyvjegi$evie2

Source: International Code Council (ICC). (2018). *2018 Significant Changes to the International Residential Code*, Country Club Hill, Ill.

41

41

2018 IRC Table N1102.1.2

Table N1102.1.2 (R402.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT [a]

Climate Zone	Fenestration U-Factor	SKYLIGHT[b] U-FACTOR	GLAZED FENESTRATION SHGC[b, e]	CEILING R-VALUE	WOOD FRAME WALL R-VALUE[j]	MASS WALL R-VALUE	FLOOR R-VALUE	BAWSEMENT[c] WALL R-VALUE	SLAB[d] R-VALUE & DEPTH	CRAWL SPACE[c] WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13 + 5[h]	8/13	19	5/13[f]	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13 + 5[h]	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13 + 5[h]	13/17	30[g]	15/19	10, 2 ft	15/19
6	0.30	0.55	NR	49	20 + 5[h] or 13 + 10[h]	15/20	30[g]	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	20 + 5[h] or 13 + 10[h]	19/21	38[g]	15/19	10, 4 ft	15/19

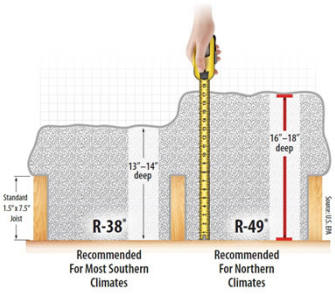
Source: International Code Council (ICC). (2017). 2018 International Residential Code, Country Club Hill, Ill.

42

42

Attic Insulation

- How much thicker?



* Recommended Dept. of Energy attic insulation levels for commonly used fiberglass, mineral wool, and cellulose insulation assuming about R-3 per inch.

43

43

Energy Tradeoffs

5. CZ4 Attic Insulation: R-38 insulation (instead of R-49)

Table PA301

Insulation and Fenestration Requirements by Component[a]

Climate Zone	Fenestration[b] U-factor	Skylights[b] U-factor	Glazed Fenestration SHGC[b,e]	Ceiling R-value	Wood Frame Wall R-value	Mass Wall R-value[k]	Floor R-value	Basement[c] Wall R-value	Slab[d] R-value and depth	Crawlspace[c] Wall R-value
South (4)	0.32	0.55	0.4	38	20[h] or 13+5[g]	8/13	19	10/13	10, 2 ft	10/13
Central (5)	0.30	0.55	NR	49	20[h] or 13+5[g]	13/17	30[f]	10/13	10, 2 ft	10/13
North (6)	0.30	0.55	NR	49	23, 20+5[g], , or 13+10[g]	15/20	30[f]	10/13	10, 4 ft	10/13

Image Source: 2021 PA Alternative Energy Provisions

44

44

2018 IRC Table N1102.1.2

Table N1102.1.2 (R402.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT [a]

Climate Zone	Fenestration U-Factor	SKYLIGHT[b] U-FACTOR	GLAZED FENESTRATION SHGC[b, e]	CEILING R-VALUE	WOOD FRAME WALL R-VALUE[i]	MASS WALL R-VALUE	FLOOR R-VALUE	BAWSEMENT[c] WALL R-VALUE	SLAB[d] R-VALUE & DEPTH	CRAWL SPACE[c] WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13 + 5[h]	8/13	19	5/13[f]	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13 + 5[h]	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13 + 5[h]	13/17	30[g]	15/19	10, 2 ft	15/19
6	0.30	0.55	NR	49	20 + 5[h] or 13 + 10[h]	15/20	30[g]	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	20 + 5[h] or 13 + 10[h]	19/21	38[g]	15/19	10, 4 ft	15/19

Source: International Code Council (ICC). (2017). 2018 International Residential Code, Country Club Hill, Ill.

45

45

Basement Wall Insulation

46

PHRC

46

Energy Tradeoffs

6. Basement Walls: R-10 insulation option (instead of R-15)

Table PA301

Insulation and Fenestration Requirements by Component[a]

Climate Zone	Fenestration[b] U-factor	Skylights[b] U-factor	Glazed Fenestration SHGC[b,e]	Ceiling R-value	Wood Frame Wall R-value	Mass Wall R-value[h]	Floor R-value	Basement[c] Wall R-value	Slab[d] R-value and depth	Crawlspace[c] Wall R-value
South (4)	0.32	0.55	0.4	38	20[h] or 13+5[g]	8/13	19	10/13	10, 2 ft	10/13
Central (5)	0.30	0.55	NR	49	20[h] or 13+5[g]	13/17	30[f]	10/13	10, 2 ft	10/13
North (6)	0.30	0.55	NR	49	23, 20+5[g], or 13+10[g]	15/20	30[f]	10/13	10, 4 ft	10/13

47

PHRC

47

2018 IRC Table N1102.1.2

Table N1102.1.2 (R402.1.2)
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT [a]

Climate Zone	Fenestration *U*-Factor	SKYLIGHT[b] *U*-FACTOR	GLAZED FENESTRATION SHGC[b, e]	CEILING *R*-VALUE	WOOD FRAME WALL *R*-VALUE[i]	MASS WALL *R*-VALUE	FLOOR *R*-VALUE	BAWSEMENT[c] WALL *R*-VALUE	SLAB[d] *R*-VALUE & DEPTH	CRAWL SPACE[c] WALL *R*-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13 + 5[h]	8/13	19	5/13[f]	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13 + 5[h]	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13 + 5[h]	13/17	30[g]	15/19	10, 2 ft	15/19
6	0.30	0.55	NR	49	20 + 5[h] or 13 + 10[h]	15/20	30[g]	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	20 + 5[h] or 13 + 10[h]	19/21	38[g]	15/19	10, 4 ft	15/19

Source: International Code Council (ICC). (2017). 2018 International Residential Code, Country Club Hill, Ill.

48

PHRC

48

Energy Tradeoffs

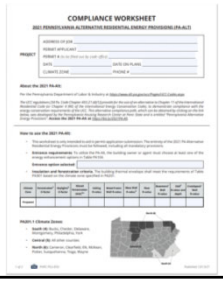
7. CZ6 Walls: Cavity-Only Wall Insulation Option

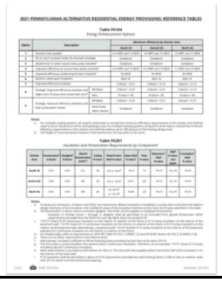
Table PA301
Insulation and Fenestration Requirements by Component[a]

Climate Zone	Fenestration[b] U-factor	Skylights[b] U-factor	Glazed Fenestration SHGC[b,e]	Ceiling R-value	Wood Frame Wall R-value	Mass Wall R-value[k]	Floor R-value	Basement[c] Wall R-value	Slab[d] R-value and depth	Crawlspace[c] Wall R-value
South (4)	0.32	0.55	0.4	38	20[h] or 13+5[g]	8/13	19	10/13	10, 2 ft	10/13
Central (5)	0.30	0.55	NR	49	20[h] or 13+5[g]	13/17	30[f]	10/13	10, 2 ft	10/13
North (6)	0.30	0.55	NR	49	23 or 20+5[g], or 13+10[g]	15/20	30[f]	10/13	10, 4 ft	10/13

49

PA Alt Worksheet





50

Links

- 2021 PA Alternative Residential Energy Provisions
  - https://bit.ly/2021PA-Alt
- 2021 PA Alternative Worksheet
  - https://bit.ly/2021PA-Alt_Worksheet
- Note: we recommend using these links if posting/linking the documents on your own website
  - This will ensure future revisions are automatically linked.

51

UCC Energy Code Summary: 2/14/22

Chapter 11

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Residential Provisions

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52

52

Questions?

www.phrc.psu.edu

53

53