




# PA Residential Code Update Overview

[www.phrc.psu.edu](http://www.phrc.psu.edu)


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## Pennsylvania Housing Research Center

- The Pennsylvania Housing Research Center serves the home building industry and the residents of Pennsylvania by improving the quality and affordability of housing.
- We conduct applied research, foster the development and commercialization of innovative technologies, and transfer appropriate technologies to the housing community.
- The PHRC is housed within the Department of Civil & Environmental Engineering at Penn State. For more information about the PHRC (publications, webinars, conferences), check out our website, [phrc.psu.edu](http://phrc.psu.edu).





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## Description

- On May 1, 2018, the PA Uniform Construction Code (PA UCC) Review and Advisory Council (RAC) submitted their report to the Department of Labor and Industry adopting the majority of code provisions contained in the 2015 International Code Council (ICC) Model Codes. These new code provisions will take effect on October 1, 2018. Transitioning from the base 2009 codes to the 2015 versions means there will be a significant amount of changes in the enforceable code. While some of these changes are mostly administrative, some of them may warrant changes in building practices and design techniques and will have an impact on home performance, occupant safety, and affordability.




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**Learning Objectives**

- Provide an overview of the upcoming changes to the PA Uniform Construction Code and their impact throughout the Commonwealth of PA.
- Describe the sources of residential codes, including ICC I-Codes and UCC amendments, in order to make attendees aware of the nature of these codes changes.
- Discuss the amendments made to 2015 code provisions and the potential impact they will have on home performance, occupant safety, and affordability.
- Dig deeper into a handful of significant changes that will change the methods used for designing and building new homes in PA.




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**Why Are We Here?**

- On May 1, 2018, the PA Uniform Construction Code (PA UCC) Review and Advisory Council (RAC) submitted their report to the Department of Labor and Industry adopting the majority of code provisions contained in the 2015 International Code Council (ICC) Model Codes.
- **These new code provisions will take effect on October 1, 2018.**




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**Act 36 of 2017 – Main Points**

- **2015 I-Codes Re-Review Timeline**
  - According to Act 36 of 2017 the Council will begin its re-review of the 2015 ICC codes prior to November 24, 2017
  - The Council must provide its report on adopted updates to Labor & Industry's Secretary by May 1, 2018
  - Labor & Industry is required to promulgate regulations based on this report that must be in effect by October 1, 2018.
  - More information: <http://www.dli.pa.gov/ucc/Pages/UCC-Review-and-Advisory-Council.aspx>




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## Phase-In Period

- **Act 36 of 2017**
  - Where a design or construction contract was signed before the effective date of regulations for a subsequent Uniform Construction Code or International Fuel Gas Code issued under this act, the permit may be issued under the Uniform Construction Code or International Fuel Gas Code in effect at the time the design or construction contract was signed if the permit is applied for within six months of the effective date of the regulation or the period specified by a municipal ordinance, whichever is less.



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## Act 36 of 2017 – Main Points

- **Modification**
  - The RAC now has the ability to modify code provisions
  - Sources for these modifications include RAC expertise, public expertise, more recent code documents, and other technical sources



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## Which Code Provisions Will Apply on Oct. 1?

	<div style="border: 1px solid black; padding: 5px;">Legislative Changes</div>	<div style="border: 1px solid black; padding: 5px;">Pennsylvania Code Amendments</div>
2015 I Codes referenced in the UCC serve as new "base" code	<ul style="list-style-type: none"> <li>• Wall bracing</li> <li>• Floor protection</li> <li>• Stair geometry</li> <li>• Others</li> </ul>	22 residential amendments from 2015 re-review process



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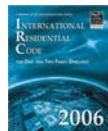
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### Which Code Books Will Apply on Oct. 1?



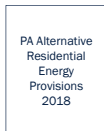
Wall bracing



2015 provisions that weren't adopted remain on 2009



New "base" code



PA Alternative Residential Energy Provisions 2018

Currently under development



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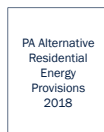
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### Pennsylvania's Energy Codes: Oct 1, 2018



PA Alternative Residential Energy Provisions 2018

OR



Chapter 11 of IRC 2015

OR



Residential Provisions of IECC 2015



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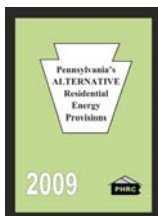
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### PA Alternative Residential Energy Provisions



- Based on the 2009 IECC
- Compliance allowed by UCC Title 34, Chapter 403
- Created and published by the Pennsylvania Housing Research Center
  - Based on guidance from L&I, this document is currently being updated by a subcommittee of the PHRC Industry Advisory Council
  - Updated PA Alternative Residential Energy Provisions will be available online by October 1, 2018



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## I-Codes Available Online

- <https://codes.iccsafe.org/public/collections/I-Codes>




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## Who Is The RAC?

- The Uniform Construction Code Review and Advisory Council was established by the Pennsylvania Construction Code Act (PCCA). The Council consists of 21 members, with appointments made by the Governor and the General Assembly. The members represent industry sectors that participate in the various aspects relating to building - including building component design, construction, building code enforcement and local government representation.
- <http://www.dli.pa.gov/ucc/Pages/UCC-Review-and-Advisory-Council.aspx>




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## RAC Report to PA Dept. of Labor & Industry



CODE	ACTION	ABSTRACTS
ICC-500	AMAY	None
ICC-501	AMAY	None
ICC-502	AMAY	None
ICC-503	AMAY	None
ICC-504	AMAY	None
ICC-505	AMAY	None
ICC-506	AMAY	None
ICC-507	AMAY	None
ICC-508	AMAY	None
ICC-509	AMAY	None
ICC-510	AMAY	None
ICC-511	AMAY	None
ICC-512	AMAY	None
ICC-513	AMAY	None
ICC-514	AMAY	None
ICC-515	AMAY	None
ICC-516	AMAY	None
ICC-517	AMAY	None
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ICC-519	AMAY	None
ICC-520	AMAY	None
ICC-521	AMAY	None
ICC-522	AMAY	None
ICC-523	AMAY	None
ICC-524	AMAY	None
ICC-525	AMAY	None
ICC-526	AMAY	None
ICC-527	AMAY	None
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ICC-529	AMAY	None
ICC-530	AMAY	None
ICC-531	AMAY	None
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ICC-540	AMAY	None
ICC-541	AMAY	None
ICC-542	AMAY	None
ICC-543	AMAY	None
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ICC-567	AMAY	None
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ICC-570	AMAY	None
ICC-571	AMAY	None
ICC-572	AMAY	None
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ICC-579	AMAY	None
ICC-580	AMAY	None
ICC-581	AMAY	None
ICC-582	AMAY	None
ICC-583	AMAY	None
ICC-584	AMAY	None
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ICC-591	AMAY	None
ICC-592	AMAY	None
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ICC-595	AMAY	None
ICC-596	AMAY	None
ICC-597	AMAY	None
ICC-598	AMAY	None
ICC-599	AMAY	None
ICC-600	AMAY	None




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## What Was Amended?

- **2015 IRC General**
  - R302.5.1
  - R322.2.1
  - R322.3.2
  - R325.5
  - R507.6
  - R602.3.1
  - R602.7.5
- **2015 IRC Plumbing**
  - P2503.5.1
- **2015 IRC Mechanical**
  - M1601.4.1, Exception 3
  - M1602, Item 2
- **2015 IRC Electrical**
  - E3901.7
  - E3901.11
- **2015 IECC Residential**
  - R102.1.1 (Admin change only)
  - RE2 Definitions
  - Table R402.1.2
  - R403.3.6
  - R403.3.7
  - R402.4.1.2
  - R403.3.5
  - R403.5.2
  - R405.2
  - Table R406.4



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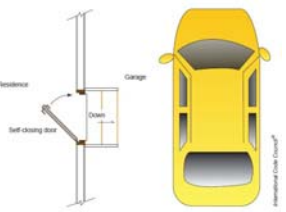
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## 2015 IRC Section R302.5.1

- **Topic:** Dwelling/garage opening/penetration protection
- **Code Section Summary:** 2015 IRC requires openings between the garage and residence to be equipped with a self-closing device
- **PA Amendment:** Revert to 2009 version without language requiring the self-closing device





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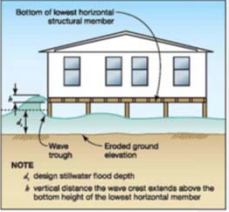
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## 2015 IRC Section R322.2.1

- **Topic:** Flood hazard areas – elevation requirements
- **Code Section Summary:** 2015 IRC required the lowest floors in all flood hazard areas to be elevated to or above the base flood elevation plus 1 foot
- **PA Amendment:** Not adopt 2015 version, stay w/2009 language (1ft freeboard only required in Coastal A zones)





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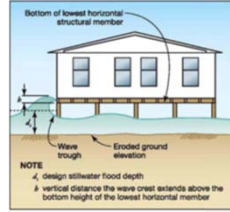
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### 2015 IRC Section R322.3.2

- **Topic:** Coastal high-hazard flood areas – elevation requirements
- **Code Section Summary:** 2015 IRC required the lowest floors in all coastal high-hazard flood areas to be elevated to or above the base flood elevation **plus 1 foot**
- **PA Amendment:** Not adopt 2015 version, stay w/2009 language (1ft freeboard only required if lowest structural member runs perpendicular to direction of wave approach)



Source: International Code Council (ICC), (2014), 2015 International Residential Code, Country Club Hill, IL  
 Image Source: FEMA's Coastal Construction Manual Update - Flood-Resistant Design




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### 2015 IRC Section R325.5

- **Topic:** Mezzanines
- **Code Section Summary:** 2015 IRC changed lofts to mezzanines
- **PA Amendment:** Under "openness" requirement, lower max wall height from 42" to 36". Eliminated exception to construct full-height wall when sprinklers are installed and 2 means of egress are present



Source: International Code Council (ICC), (2014), 2015 International Residential Code, Country Club Hill, IL  
 Image Source: <http://www.ihd.com/residential/mezzanine.aspx>




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### 2015 IRC Section R507.6

- **Topic:** Deck beam span table
- **Code Section Summary:** 2015 IRC did now allow for single-ply deck beams in prescriptive span table
- **PA Amendment:** Insert new deck beam span length table that allows for single-ply deck beams



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




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## 2015 IRC Section R507.6

TABLE R507.6  
DECK BEAM SPAN LENGTHS<sup>a</sup> (ft. - in.)

SPECIES <sup>b</sup>	SIZE <sup>c</sup>	DECK JOIST SPAN LESS THAN OR EQUAL TO: <sup>d</sup> (feet)						
		6	8	10	12	14	16	18
Southern pine	1-2 x 6	4-11	4-0	3-7	3-3	3-0	2-10	2-8
	1-2 x 8	5-11	5-5	4-7	4-2	3-10	3-7	3-5
	1-2 x 10	7-0	6-0	5-5	4-11	4-7	4-3	4-0
	1-2 x 12	8-3	7-5	6-4	5-10	5-5	5-0	4-9
	2-2 x 6	6-11	6-11	5-4	4-10	4-5	4-3	4-0
	2-2 x 8	8-9	7-7	6-9	6-2	5-9	5-4	5-0
	3-2 x 6	10-4	9-0	8-0	7-4	6-8	6-4	6-0
	3-2 x 8	12-2	10-7	9-5	8-7	8-0	7-6	7-0
	3-2 x 6	8-2	7-5	6-8	6-5	5-8	5-3	5-0
	3-2 x 8	10-10	9-6	8-6	7-9	7-2	6-8	6-4
	3-2 x 10	13-0	12-3	10-0	9-2	8-6	7-11	7-6
	3-2 x 12	15-3	14-3	11-0	10-8	10-0	9-4	8-10

- a. Ground snow load, live load = 80 psf; dead load = 10 psf;  $L/2$  = 300 at main span,  $L/4$  = 150 at cantilever with a 200-pound load applied to end.
- b. Beams supporting deck joists from one side only.
- c. No. 2 grade, wet service factor.
- d. Beams depth shall be greater than or equal to depth of joists with a flush beam condition.
- e. Includes ricing factor.
- f. Northern species: ricing factor not included.
- g. Beam cantilevers are limited to the adjacent beam's span divided by 4.



## 2015 IRC Section R602.3.1

- **Topic:** Stud size, height, & spacing
- **Code Section Summary:** 2015 IRC Table R602.3(5) limits max stud height to 10'
- **PA Amendment:** Add Exception 3 and new table to raise the max stud height to 12' if conditions are met (loading, materials, exposure)



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



## 2015 IRC Section R602.3.1

TABLE R602.3(1)  
ALTERNATE WOOD BEARING WALL STUD SIZE, HEIGHT AND SPACING

STUD HEIGHT	SUPPORTING	STUD SPACING <sup>a</sup>	ULTIMATE DESIGN WIND SPEED					
			115 mph		130 mph		140 mph	
			Maximum roof/floor span <sup>b</sup>	Maximum roof/floor span <sup>b</sup>	Maximum roof/floor span <sup>b</sup>	Maximum roof/floor span <sup>b</sup>	Maximum roof/floor span <sup>b</sup>	Maximum roof/floor span <sup>b</sup>
11 ft.	Roof Only	12 in.	2 x 4	2 x 4	2 x 4	2 x 4	2 x 4	2 x 4
		16 in.	2 x 4	2 x 6	2 x 4	2 x 6	2 x 4	2 x 6
		24 in.	2 x 6	2 x 6	2 x 6	2 x 6	2 x 6	2 x 6
	Roof and One Floor	12 in.	2 x 4	2 x 4	2 x 4	2 x 4	2 x 4	2 x 4
		16 in.	2 x 6	2 x 6	2 x 6	2 x 6	2 x 6	2 x 6
		24 in.	2 x 6	2 x 6	2 x 6	2 x 6	2 x 6	2 x 6
12 ft.	Roof Only	12 in.	2 x 4	2 x 4	2 x 4	2 x 4	2 x 4	2 x 4
		16 in.	2 x 4	2 x 6	2 x 4	2 x 6	2 x 4	2 x 6
		24 in.	2 x 6	2 x 6	2 x 6	2 x 6	2 x 6	2 x 6
	Roof and One Floor	12 in.	2 x 4	2 x 4	2 x 4	2 x 4	2 x 4	2 x 4
		16 in.	2 x 6	2 x 6	2 x 6	2 x 6	2 x 6	2 x 6
		24 in.	2 x 6	2 x 6	2 x 6	2 x 6	2 x 6	OR

- a. Wall studs not exceeding 16 inches on center shall be sheathed with minimum 1/2-inch wood structural sheathing on the exterior. Wood structural panel sheathing shall be attached with 8d nails not greater than 6 inches on center along panel edges and 12 inches on center at intermediate supports, and all panel joints shall occur over studs or blocking.
- b. Where the ultimate design wind speed exceeds 115 mph, studs shall be attached to top and bottom plates with connectors having a minimum 300-pound lateral capacity.
- c. The maximum span is applicable to both single- and multiple- span roof and floor conditions. The roof assembly shall not contain a habitable attic.





## 2015 IRC Section R602.7.5

- **Topic:** Supports for headers
- **Code Section Summary:** 2015 IRC added a new section on header support, including Table R602.7.5 which specifies a minimum number of adjacent full-height studs
- **PA Amendment:** 2015 Table R602.7.5 is removed and replaced with a table similar to 2018 Table R602.7.5



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




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## Amended 2015 Table R602.7.5

TABLE R602.7.5  
MINIMUM NUMBER OF FULL-HEIGHT STUDS AT EACH END OF HEADERS IN EXTERIOR WALLS<sup>a</sup>

MAXIMUM HEADER SPAN (feet)	ULTIMATE DESIGN WIND SPEED AND EXPOSURE CATEGORY	
	< 140 mph, Exposure B	≥ 115 mph, Exposure B <sup>b</sup>
	< 130 mph, Exposure C	
4	1	1
6	2	1
8	2	1
10	3	2
12	3	2
14	3	2
16	4	2
18	4	2

a. For header spans between those given, use the minimum number of full height studs associated with the larger header span  
 b. The tabulated minimum number of full-height studs is applicable where jack studs are provided to support the header at each end in accordance with Table R602.7.1. Where a framing anchor is used to support the header in lieu of a jack stud in accordance with Note d of Table R602.7.1, the minimum number of full-height studs at each end of a header shall be in accordance with requirements for wind speed < 140 mph, Exposure B.




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## 2015 IRC Section E3901.7

- **Topic:** Outdoor outlets
- **Code Section Summary:** 2015 IRC removed the minimum 20SF size of a balcony, deck, or porch that triggered a requirement to install at least 1 receptacle outlet
- **PA Amendment:** 2015 language was not adopted, therefore the 2009 section still applies (including the 20SF minimum size)



Source: International Code Council (ICC), (2014), 2015 International Residential Code, Country Club Hill, IL  
 Image Source: <https://fineartnetworks.com/portfolio-item/4594/>




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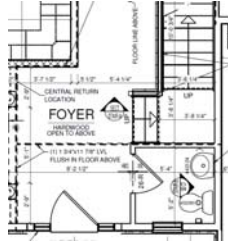
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### 2015 IRC Section E3901.11

- **Topic:** Foyer receptacle outlets
- **Code Section Summary:** In foyers (60SF or greater) not part of a hallway, the 2015 IRC required a receptacle outlet to be installed on wall spaces 3ft or more in width
- **PA Amendment:** Minimum wall width raised to 6ft with a minimum of 1 in each foyer



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

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### 2015 IRC Section P2503.5.1

- **Topic:** DWV system testing
- **Code Section Summary:** 2015 IRC removed the option to test plastic DWV piping using an air test
- **PA Amendment:** 2015 language was not adopted, therefore air testing is still allowed for plastic DWV piping



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

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### 2015 IRC Section M1601.4.1

- **Topic:** Snap-lock & button-lock type duct joints
- **Code Section Summary:** 2015 IRC removed snap-lock & button-lock type joints from the exception that allows them to be installed without additional closure systems
- **PA Amendment:** Now includes snap-lock & button-lock type joints in this exception, unless outside of conditioned space



Source: International Code Council (ICC), (2014), 2015 International Residential Code, Country Club Hill, IL  
Image Source: <https://www.handymanforums.com/lost-assembly-snap-lock-duct-joint-2196/>

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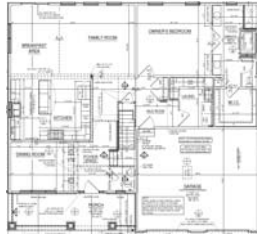
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## 2015 IRC Section M1602.2 (Item 2)

- Topic:** Return air openings
- Code Section Summary:** 2015 IRC states "the amount of return air taken from any room or space shall be not greater than the flow rate of supply air delivered to such room or space."
- PA Amendment:** Clarified that this requirement only applies to perimeter rooms or spaces



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

## 2015 IECC Section R202 (Definitions)

2015 IRC Section N1101.6

- Topic:** Framing factor definition
- Code Section Summary:** New definition was added to allow for addition of footnote j to Table R402.1.2 (see next section)
- PA Amendment:** "Framing Factor. The fraction of the total building component area that is structural framing."



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

## 2015 IECC Table R402.1.2

2015 IRC Table N1102.1.2

Climate Zone	Permeation Coefficient	Sealed Envelope Leakage Fraction	GLAZED FENESTRATION SGC <sup>a</sup>	INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT:						
				CEILING R VALUE	WOOD FRAME WALL R VALUE	GLAZED WALL R VALUE	FLOOR R VALUE	BASEMENT <sup>b</sup> WALL R VALUE	SLAB <sup>c</sup> R VALUE & DETAIL	CEILING SPACE WALL R VALUE
1	NR	0.15	0.25	10	13	10	10	10	0	0
2	NR	0.15	0.25	10	13	10	10	10	0	0
3	0.15	0.15	0.25	10	20 or 13-1/2 <sup>d</sup>	10/13	10	10/12	0	10/13
4 except Marine e	0.15	0.15	0.40	49	20 or 13-1/2 <sup>d</sup>	10/13	10	10/13	10/13	10/13
5 Land Marine e	0.15	0.15	NR	49	20 or 13-1/2 <sup>d</sup>	10/13	10 <sup>f</sup>	10/13	10/13	10/13
6	0.15	0.15	NR	49	20 or 13-1/2 <sup>d</sup> or 15.5 <sup>g</sup>	10/13	10/13	10/13	10/13	10/13
7 and 8	0.15	0.15	NR	49	20 or 13-1/2 <sup>d</sup> or 15.5 <sup>g</sup>	10/13	10 <sup>f</sup>	10/13	10/13	10/13

a. SGC values are determined by the U-factor and solar heat gain coefficient (SHGC) of the glazing. The SGC column applies to glazed fenestration. **Exception:** Skylights may be excluded from glazed fenestration SGC requirements in Climate Zones 1 through 3 where the SGC for each skylight does not exceed 0.30.

b. Basement wall insulation is not required in warm-humid locations as defined by Figure N1101.10 and Table N1101.10.

c. Slab insulation shall be R-10 in the footing and R-5 in the slab.

d. The first value is cavity insulation, the second value is continuous insulation, or 13-1/2" means R-13 cavity insulation plus R-5 continuous insulation.

e. The second value applies when there is no insulation on the interior of the mass wall.

f. R-10 insulation shall be permitted in place of R-5 requirement provided the wall framing factor is 20% or less or exterior walls with 24" o.c. nominal vertical stud spacing.

g. R-15 insulation shall be permitted in place of R-10 requirement provided the wall framing factor is 20% or less or exterior walls with 24" o.c. nominal vertical stud spacing.



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

### Climate Zones in PA

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Image Source: Building Codes Assistance Project

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### Envelope Changes: Zone 4

Component	2009 (or current)	2015
Fenestration U-Factor	0.35	0.35
Skylight U-Factor	0.60	0.55
Glazed Fenestration SHGC	NR	0.40
Ceiling R-Value	38	49
Wood Frame Wall R-Value	13	20 or 13+5
Mass Wall R-Value	5/10	8/13
Floor R-Value	19	19
Basement Wall R-Value	10/13	10/13
Slab R-Value & Depth	10, 2ft	10, 2ft
Crawlspace Wall R-Value	10/13	10/13

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Source: International Code Council (ICC), (2008), 2009 International Residential Code, Country Club Hill, IL; International Code Council, (2014), 2015 International Residential Code, ICC, Country Club Hill, IL

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### Envelope Changes: Zone 5

Component	2009 (or current)	2015
Fenestration U-Factor	0.35	0.32
Skylight U-Factor	0.60	0.55
Glazed Fenestration SHGC	NR	NR
Ceiling R-Value	38	49
Wood Frame Wall R-Value	20 or 13+5	20 or 13+5
Mass Wall R-Value	13/17	13/17
Floor R-Value	30	30
Basement Wall R-Value	10/13	15/19
Slab R-Value & Depth	10, 2ft	10, 2ft
Crawlspace Wall R-Value	10/13	15/19

41

Source: International Code Council (ICC), (2008), 2009 International Residential Code, Country Club Hill, IL; International Code Council, (2014), 2015 International Residential Code, ICC, Country Club Hill, IL

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## Envelope Changes: Zone 6

Component	2009 (or current)	2015
Fenestration U-Factor	0.35	0.32
Skylight U-Factor	0.60	0.55
Glazed Fenestration SHGC	NR	NR
Ceiling R-Value	49	49
Wood Frame Wall R-Value	20 or 13+5	20+5, 18+6.5, or 13+10
Mass Wall R-Value	15/19	15/20
Floor R-Value	30	30
Basement Wall R-Value	10/13	15/19
Slab R-Value & Depth	10, 4ft	10, 4ft
Crawlspace Wall R-Value	10/13	15/19

Source: International Code Council (ICC), (2009), 2009 International Residential Code, Country Club Hill, IL, International Code Council; (2014), 2015 International Residential Code, Country Club Hill, IL

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## 2015 IECC Table R402.1.2

2015 IRC Table N1102.1.2

- Topic:** Climate zone 6 wood frame wall R-value
- Code Section Summary:** Additional option added using combination of cavity and continuous exterior insulation
- PA Amendment:** R18+6.5 is now an option along with R20+5 and R13+10



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

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## 2015 IECC Table R402.1.2

2015 IRC Table N1102.1.2

- Topic:** New footnote
- Code Section Summary:** Addition of footnote j
- PA Amendment:** "j. R-18 insulation shall be permitted in place of R-20 requirement provided the wall framing factor is 20% or less on exterior walls with 24" o.c. nominal vertical stud spacing."



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

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**2015 IECC Section R403.3**  
2015 IRC Section N1103.3

- **Topic:** Ducts
- **Code Section Summary:** 2015 IECC is silent on buried ducts and does not define ducts located within conditioned space
- **PA Amendment:** Adds sections on ducts buried within ceiling insulation & ducts located in conditioned space



45 Source: International Code Council. (2014). 2015 International Energy Conservation Code. ICC Country Club Hill, IL. Image Source: <https://www.enr.com/galleries/2014/08/buried-ducts-allow-2015-building-code>




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**2015 IECC Section R403.3.6**  
2015 IRC Section N1103.3.6

- **R403.3.6 Ducts buried within ceiling insulation**
  - Where supply and return air ducts are partially or completely buried in ceiling insulation, such ducts shall comply with all of the following:
    1. The supply and return ducts shall have an insulation R-value not less than R-8.
    2. At all points along each duct, the sum of the ceiling insulation R-value against and above the top of the duct, and against and below the bottom of the duct, shall be not less than R-19, excluding the R-value of the duct insulation.
    3. In Climate Zones 1A, 2A and 3A, the supply ducts shall be completely buried within ceiling insulation, insulated to an R-value of not less than R-13 and in compliance with the vapor retarder requirements of Section 604.11 of the International Mechanical Code or Section M1601.4.6 of the International Residential Code, as applicable.
      - Exception: Sections of the supply duct that are less than 3 feet (914 mm) from the supply outlet shall not be required to comply with these requirements.

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**2015 IECC Section R403.3.7**  
2015 IRC Section N1103.3.7

- **R403.3.7 Ducts located in conditioned space.**
  - For ducts to be considered as inside a conditioned space, such ducts shall comply with either of the following:
    1. The duct system shall be located completely within the continuous air barrier and within the building thermal envelope.
    2. The ducts shall be buried within ceiling insulation in accordance with Section R403.3.6 and all of the following conditions shall exist:
      - 2.1. The air handler is located completely within the continuous air barrier and within the building thermal envelope.
      - 2.2. The duct leakage, as measured either by a rough-in test of the ducts or a post-construction total system leakage test to outside the building thermal envelope in accordance with Section R403.3.4, is less than or equal to 1.5 cubic feet per minute (42.5 L/min) per 100 square feet (9.29 m<sup>2</sup>) of conditioned floor area served by the duct system.
      - 2.3. The ceiling insulation R-value installed against and above the insulated duct is greater than or equal to the proposed ceiling insulation R-value, less the R-value of the insulation on the duct.

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## 2015 IECC Section R402.4.1.2

2015 IRC Section N1102.4.1.2

- **Topic:** Air leakage testing
- **Code Section Summary:** 2015 IECC mandates air leakage testing and the rate to not exceed 3ACH50 in climate zones 3-8
- **PA Amendment:** Changes the requirement to not exceed 5ACH50 in climate zones 1-8



Source: International Code Council. (2014). 2015 International Energy Conservation Code. ICC Country Club Hill, IL.

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## 2009 N1102.4.2: Air Leakage Demonstration

- **N1102.4.2 – Air sealing and insulation. Building envelope airtightness and insulation installation shall be demonstrated to comply with one of the following options:**
    - N1102.4.2.1 – **Testing option.** Tested air leakage is less than 7 ACH when tested with a blower door at a pressure of 50 pascals.
- OR**
- N1102.4.2.2 – **Visual Inspection**



Source: International Code Council. (2014). 2015 International Energy Conservation Code. ICC Country Club Hill, IL.

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## Blower Door Concept

- **Depressurize the home to an exaggerated pressure difference to quantify air infiltration and compare with established benchmarks**
- **ACH<sub>50</sub> = Air Changes per Hour at pressure difference of 50 Pa**
  - Current limit in Pennsylvania is 7 ACH<sub>50</sub> if tested
  - 50 Pa simulates roughly a 20 mph wind on all sides of the home



Image Source: <http://www.naeed.com/blower-door-testing>

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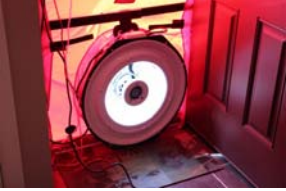
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### 2015 IECC Section R402.4.1.2

2015 IRC Section N1102.4.1.2

- **Topic:** Air leakage testing
- **Code Section Summary:** 2015 IECC mandates air leakage testing and the rate to not exceed 3ACH50 in climate zones 3-8
- **PA Amendment:** Changes the requirement to not exceed 5ACH50 in climate zones 1-8



Source: International Code Council (ICC), (2014), 2015 International Energy Conservation Code, ICC Country Club Hill, IL




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### Ventilation: Existing Requirements

- **Ventilation requirements in Section R303 of the 2009 IRC can be met through installation of operable glazing in habitable rooms based on a percentage of floor area**
- **If operable glazing requirements cannot be met:**
  - Mechanical ventilation capable of 0.35 ACH in the habitable room
  - Or
  - Whole-house mechanical ventilation system capable of supplying 15 CFM of ventilation air per occupant (assuming 2 occupants in master)



Source: International Code Council (ICC), (2008), 2009 International Residential Code, Country Club Hill, IL




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### 2015 Ventilation Requirements

- **R303.4 Mechanical Ventilation**
  - Where the air infiltration rate of a dwelling unit is 5 air changes per hour or less where tested with a blower door at 50 Pa, the dwelling unit shall be provided with whole-house mechanical ventilation in accordance with Section M1507.3.
- **If airtightness requirement is not to exceed 5 ACH<sub>50</sub>, mechanical ventilation is required**

Source: International Code Council (ICC), (2008), 2009 International Residential Code, Country Club Hill, IL




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## Mechanical Ventilation

- **Main considerations:**
  - System design (supply only, exhaust only, balanced)
  - Integration w/overall HVAC system(s)
  - Ventilation rate
- **2015 IRC Tables M1507.3.3(1) and M1507.3.3(2) provide guidance for continuous and intermittent ventilation rates**

54
Source: International Code Council (ICC), (2008), 2009 International Residential Code, Country Club Hill, IL

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## 2015 IRC Table M1507.3.3 (1) & (2)

**TABLE M1507.3.3(1)**  
CONTINUOUS WHOLE-HOUSE MECHANICAL VENTILATION SYSTEM AIRFLOW RATE REQUIREMENTS

DWELLING UNIT FLOOR AREA (square feet)	NUMBER OF BEDROOMS				
	0 - 1	2 - 3	4 - 5	6 - 7	> 7
	Airflow in CFM				
< 1,500	30	45	60	75	90
1,501 - 3,000	45	60	75	90	105
3,001 - 4,500	60	75	90	105	120
4,501 - 6,000	75	90	105	120	135
6,001 - 7,500	90	105	120	135	150
> 7,500	105	120	135	150	165

**TABLE M1507.3.3(2)**  
INTERMITTENT WHOLE-HOUSE MECHANICAL VENTILATION RATE FACTORS

RUN-TIME PERCENTAGE IN EACH 4-HOUR SEGMENT	25%	33%	50%	66%	75%	100%
Factor	4	3	2	1.5	1.3	1.0

55
Source: International Code Council (ICC), (2008), 2009 International Residential Code, Country Club Hill, IL

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## 2015 IECC Section R403.3.5

2015 IRC Section N1103.3.5

- **Topic:** Ducts & building cavities
- **Code Section Summary:** 2015 IECC does not allow building cavities to be used as ducts or plenums
- **PA Amendment:** 2015 language was not adopted, therefore 2009 language still applies (building framing cavities shall not be used as supply ducts)

56
Source: International Code Council, (2014), 2015 International Energy Conservation Code, ICC Country Club Hill, IL  
Image Source: <https://www.nachi.org/building-cavities-supply-return-ducts.htm>

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### 2015 IECC Section R403.5.2

2015 IRC Section N1103.5.2

- **Topic:** Hot water demand recirculation systems
- **Code Section Summary:** 2015 IECC added language pertaining specifically to demand recirculation systems
- **PA Amendment:** 2015 language was not adopted, therefore this requirement is removed entirely

Circulating system using cold water line return.

57

Source: International Code Council. (2014). 2015 International Energy Conservation Code, ICC Country Club Hill, IL.  
 Image Source: <http://www.coldwaterline.com/press.html>

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### 2015 IECC Section R405.2

2015 IRC Section N1105.2

- **Topic:** Simulated performance mandatory requirements
- **Code Section Summary:** Projects using the simulated performance path must also comply with mandatory requirements in Section R401-404
- **PA Amendment:** "Compliance with this section requires that the mandatory provisions identified in Section R402.4.1.2 be met."

58

Source: International Code Council. (2014). 2015 International Energy Conservation Code, ICC Country Club Hill, IL.

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### 2015 IECC Section R406.4

2015 IRC Section N1106.4

- **Topic:** Energy Rating Index
- **Code Section Summary:** 2015 IECC added a new compliance path using an Energy Rating Index (HERS index)
- **PA Amendment:** ERI target values were amended. Footnote a was added:
  - "a. Where on-site renewable energy is included for compliance using the ERI analysis of Section R406.4, the building shall meet the mandatory requirements of R406.2 and the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4."

Climate Zone	2015 IECC	Amended Targets
4	54	62
5	55	61
6	54	61

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Source: International Code Council. (2014). 2015 International Energy Conservation Code, ICC Country Club Hill, IL.

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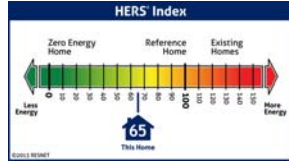
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## How Is A HERS Rating Calculated?

- Certified RESNET HERS Rater conducts an energy rating on a specific home (often using REM/Rate)
- The analysis is compared to a 'reference home'- a designed-model home of the same size and shape as the actual home
  - Reference home designed to meet the 2006 IECC and given a score of 100




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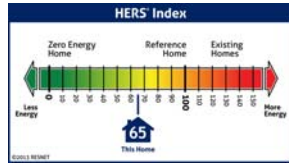
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## HERS Index Scale

- Existing homes > 100
- Reference home = 100
- Net-zero energy = 0
- 1 point lower = 1% reduction




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## HERS and the Code

- According to DOE, a home complying with the 2009 IECC (minimum) would be ~15-20% more energy efficient than 2006

Climates	2009 IECC HERS Index Scores
Zone 1 – 2	79
Zone 3	78
Zone 4 – 5	82
Zone 6	83
Zone 7	85
Zone 8	86
U.S. Average	82




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## 2015 IECC Section R406.4

2015 IRC Section N1108.4

- Topic:** Energy Rating Index
- Code Section Summary:** 2015 IECC added a new compliance path using an Energy Rating Index (HERS index)
- PA Amendment:** ERI target values were amended. Footnote a was added:
  - "a. Where on-site renewable energy is included for compliance using the ERI analysis of Section R406.4, the building shall meet the mandatory requirements of R406.2 and the building thermal envelope shall be greater than or equal to the levels of efficiency and SHGC in Table R402.1.2 or Table R402.1.4."

Climate Zone	2015 IECC	Amended Targets
4	54	62
5	55	61
6	54	61

Source: International Code Council. (2014). 2015 International Energy Conservation Code. ICC Country Club Hill, IL.

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## Is This All That Is Changing?

- No, it's not!*
- How do I find out what else changed?**
  - Black bars in code books
  - Significant changes books
  - PHRC training

[www.PHRC.psu.edu](http://www.PHRC.psu.edu)

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## Resources for Code Changes

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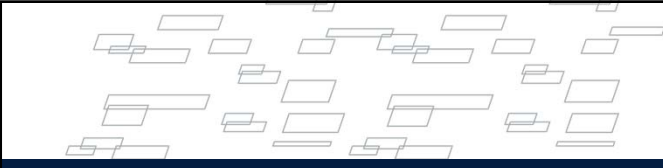
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## Questions?

[www.phrc.psu.edu](http://www.phrc.psu.edu)



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## References

- International Code Council. (2008). *2009 International Energy Conservation Code*, ICC, Country Club Hill, Ill.
- International Code Council. (2014). *2015 International Energy Conservation Code*, ICC, Country Club Hill, Ill.
- International Code Council. (2008). *2009 International Residential Code*, ICC, Country Club Hill, Ill.
- International Code Council. (2014). *2015 International Residential Code*, ICC, Country Club Hill, Ill.
- Pennsylvania Housing Research Center. (2012). *2009 Pennsylvania's ALTERNATIVE Residential Energy Provisions*, PHRC, University Park, PA.



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## Residential Code Updates in Pennsylvania

[www.phrc.psu.edu](http://www.phrc.psu.edu)



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