September 5, 2018 – Christopher Hine

101: Code Update Overview

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PennState College of Engineering | PENNSYLVANIA HOUSING RESEARCH CENTER

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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.

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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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Industrialized Housing

- Note: DCED promulgated regulation adopting the same code provisions as the UCC
  - All new industrialized homes entering the first stage of production on or after ***April 1, 2019***, must be constructed in accordance with the applicable 2015 codes including the 2014 National Electric Code.

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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?

2015 I-Codes referenced in the UCC serve as new "base" code

Legislative Changes

- Wall bracing
- Floor protection
- Stair geometry
- Others

Pennsylvania Code Amendments

22 residential amendments from 2015 re-review process

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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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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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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

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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 Electrical**
  - E3901.7
  - E3901.11
- **2015 IRC Plumbing**
  - P2503.5.1
- **2015 IRC Mechanical**
  - M1601.4.1, Exception 3
  - M1602, Item 2
- **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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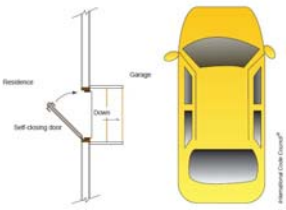
2015 IRC Section R302.5.1

- **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



Source: International Code Council (ICC). (2014). 2015 International Residential Code, Country Club Hill, Il.
Image Source: International Code Council. (2015). 2015 Significant Changes to the IRC, ICC, Country Club Hill, Il.

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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

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

2015 IRC Section R507.6

TABLE R507.5
DECK BEAM SPAN LENGTHS[a, b, c] (ft. - in.)

SPECIES[f]	SIZE[d]	DECK JOIST SPAN LESS THAN OR EQUAL TO: (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	5-1	4-7	4-2	2-10	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	7-1	6-4	5-10	5-5	5-0	4-9
	2 - 2 X 6	6-11	5-11	5-4	4-10	4-6	4-3	4-0
	2 - 2 X 8	8-9	7-7	6-9	6-2	5-9	5-4	5-0
	2 - 2 X 10	10-4	9-0	8-0	7-4	6-9	6-4	6-0
	2 - 2 X 12	12-2	10-7	9-5	8-7	8-0	7-6	7-0
	3 - 2 X 6	8-2	7-5	6-8	6-1	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	11-3	10-0	9-2	8-6	7-11	7-6
	3 - 2 X 12	15-3	13-3	11-10	10-9	10-0	9-4	8-10

a. Ground snow load, live load = 40 psf, dead load = 10psf, $L/\Delta = 360$ at main span, $L/\Delta = 180$ at cantilever with a 220-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 incising factor.
f. Northern species. Incising factor not included.
g. Beam cantilevers are limited to the adjacent beam's span divided by 4.

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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)

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

2015 IRC Section R602.3.1

TABLE R602.3(6)
ALTERNATE WOOD BEARING WALL STUD SIZE, HEIGHT AND SPACING

STUD HEIGHT	SUPPORTING	STUD SPACING[a]	ULTIMATE DESIGN WIND SPEED					
			115 mph		130 mph[b]		140 mph[b]	
			Maximum roof/floor span[c]		Maximum roof/floor span[c]		Maximum roof/floor span[c]	
			12 ft.	24 ft.	12 ft.	24 ft.	12 ft.	24 ft.
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 4	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 6	2 x 4	2 x 6	2 x 4	2 x 6
		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 6	2 x 4	2 x 6
		16 in.	2 x 4	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
	Roof and One Floor	12 in.	2 x 4	2 x 6	2 x 6	2 x 6	2 x 6	2 x 6
		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	DR

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.

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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, Ill.

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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[a]

MAXIMUM HEADER SPAN (feet)	ULTIMATE DESIGN WIND SPEED AND EXPOSURE CATEGORY	
	< 140 mph, Exposure B or < 130 mph, Exposure C	≤ 115 mph, Exposure B[b]
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)

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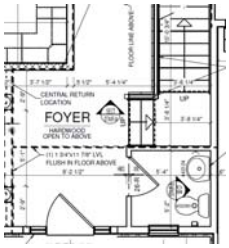
Source: International Code Council (ICC). (2014). 2015 International Residential Code, Country Club Hill, Ill.
Image Source: https://finelliironworks.com/portfolio-items/4594/

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



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

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

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

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, Ill.

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2015 IECC Table R402.1.2

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	BASEMENT[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[h]	15/19	10, 2 ft	15/19
6	0.32	0.55	NR	49	20 + 5 or 13 + 10[h] or 18 + 5[h]	15/20	30[h]	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[h]	15/19	10, 4 ft	15/19

a. R-values are minimums. U-factors and SHGC are maximums. When insulation is installed in a cavity which is less than the label or design thickness of the insulation, the installed R-value of the insulation shall not be less than the R-value specified in the table.
b. The fenestration U-factor column excludes skylights. The SHGC column applies to all glazed fenestration.
Exception: Skylights may be excluded from glazed fenestration SHGC requirements in Climate Zones 1 through 3 where the SHGC for such skylights does not exceed 0.30.
c. "15/19" means R-15 continuous insulation on the interior or exterior of the home or R-19 cavity insulation at the interior of the basement wall. "15/19" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the home. "10/13" means R-10 continuous insulation on the interior or exterior of the home or R-13 cavity insulation at the interior of the basement wall.
d. R-5 shall be added to the required slab edge R-values for heated slabs. Insulation depth shall be the depth of the footing or 2 feet, whichever is less in Zones 1 through 3 for heated slabs.
e. There are no SHGC requirements in the Marine Zone.
f. Basement wall insulation is not required in warm-humid locations as defined by Figure N1101.10 and Table N1101.10.
g. Or insulation sufficient to fill the framing cavity, R-19 minimum.
h. The first value is cavity insulation, the second value is continuous insulation, so "13+5" means R-13 cavity insulation plus R-5 continuous insulation.
i. The second R-value applies when more than half the insulation is on the interior of the mass wall.
j. R-18 insulation shall be permitted in place of R-20 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, Ill.

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Climate Zones in PA

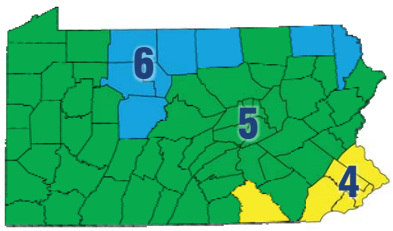

Image Source: Building Codes Assistance Project

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

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

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

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

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

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

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

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."

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

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

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Source: International Code Council. (2014). 2015 International Energy Conservation Code, ICC Country Club Hill, Ill.
Image Source: https://www.energyvanguard.com/blog/buried-ducts-allowed-2018-building-code

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^2) 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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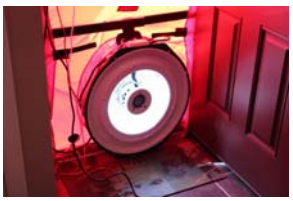
2015 IECC Section R402.4.1.2

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



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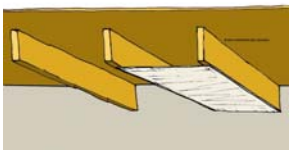
Source: International Code Council. (2014). 2015 International Energy Conservation Code, ICC Country Club Hill, Ill.

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)



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

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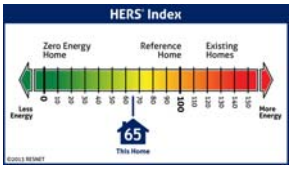
Source: International Code Council. (2014). 2015 International Energy Conservation Code, ICC Country Club Hill, Ill.

HERS Index Scale

- Existing homes > 100
- Reference home = 100
- Net-zero energy = 0

- 1 point lower = 1% reduction



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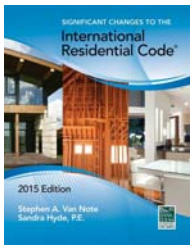
Source: www.hersindex.com

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



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Questions?

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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.
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- Pennsylvania Housing Research Center. (2012). *2009 Pennsylvania's ALTERNATIVE Residential Energy Provisions*, PHRC, University Park, PA.

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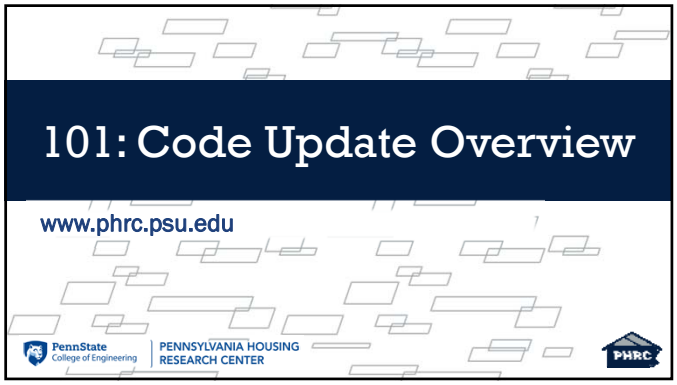
101: Code Update Overview
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