

Christopher Hline, November 12, 2024

2021 PA UCC Residential Code Update: Part 1

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Pennsylvania Housing Research Center

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Description

In accordance with the requirements of Act 45 of 1999 as amended, the Pennsylvania Uniform Construction Code (UCC) Review and Advisory Council (RAC) completed the review of the 2021 I-Codes on June 13, 2024. The code provisions that were adopted during this process are anticipated to take effect on or after July 13, 2025. This session will review implications of transitioning to 2021 ICC base codes, discuss PA legislative and RAC amendments, and dive into some highlights of the new code provisions for residential construction.

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Learning Objectives


1. Review the overall PA Uniform Construction Code update process and timeline for implementation in 2025.
2. Discuss the implications of transitioning to the 2021 ICC base codes, including the International Residential Code and International Energy Conservation Code for residential construction.
3. Examine the legislative and RAC amendments to the published 2021 ICC codes that will impact residential construction in Pennsylvania.
4. Evaluate the top highlights of the new code provisions that will have a substantial impact on project design, performance, and budget for residential construction.



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Fundamental Questions


- What is the PA UCC?
- What is changing?
- When is it changing?
- Where do I go for more information?



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What Is the PA UCC?


- **What is the PA Uniform Construction Code?**
 - Pennsylvania's statewide building code
- **How does the PA UCC relate to ICC codes?**
 - The PA UCC Administration and Enforcement regulation adopts ICC codes on a triennial basis, per Act 36 of 2017.
 - The previous adoption of the 2018 codes, with amendments, took effect on February 14, 2022.



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What Is the PA UCC? (Cont.)


- Are the ICC codes adopted word-for-word, or are amendments allowed?
 - Two types of amendments will impact enforceable codes:
 1. Statutory amendments
 2. Amendments by the PA UCC Review & Advisory Council (RAC)



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Review: Code Review Process

- 1/31/2021 - ICC Officially Publishes 2021 ICC Family of Codes
- RAC Initiates PA Review of 2021 ICC Family of Codes (vote on items not changed to reviewed)
- 11/15/2021 - RAC Opens Public Comment on 2021 ICC Family of Codes/Public Comment Closed
- TAC Committee Applications are Opened/TAC Committee Applications are Closed (12/12/2022)
- RAC Receives Public Comment and Assigns Comments to TAC's
- TAC Final Reports are Posted for Public Review
- Three (3) RAC Public Hearings (East/Harrisburg/West)
- RAC Meetings to Deliberate beginning on 5/2/2024
- 7/25/2024 - Draft Report Presented to the RAC
- 9/12/2024 - Final Report Approved by RAC
- 10/1/2024 - Final Report Submitted to Dept. L&I
- 7/13/2025 - Go Live




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Industrialized Housing Act

- The Department of Community and Economic Development, under section 5 of the **Industrialized Housing Act** (35 P.S. § 1651.5), is authorized to promulgate rules and regulations to interpret and make specific provisions of the act to assure the health, safety and welfare of the people of this Commonwealth by requiring safe and sanitary industrialized housing.

https://www.ecodepena.com/Display/Detail?file=/source/industrialized_housing_act/1651.5/1651.5.html



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New "Base" Code

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PA UCC Residential Code Summary

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List of Statutory Amendments

- What are statutory amendments?
- Full list of statutory amendments to the PA UCC:
- <https://www.pa.gov/en/agencies/dli/resources/compliance-laws-and-regulations/labor-management-relations/bois/ucc-regulations-and-statutes.html>

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Statutory Amendments

- **Act 13 of 2004:** Stairway tread & riser requirements
- **Act 92 of 2004:** Smoke alarm requirements
- **Act 108 of 2006:** Siding installation, lumber grading, & coal-fired boilers
- **Act 9 of 2007:** Concrete & masonry foundations
- **Act 1 of 2011:** Log walls, fire sprinklers, fire protection of floors, & wall bracing



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2021 ICC Code Adoption Final Report

November 10, 2024

Shawn J. Miller, Esq.
Executive Director of Code & Safety
Pennsylvania Department of Safety
Harrisburg, Pennsylvania 17103


Publication: International Code Council (ICC)
2021 International Code Adoption

Key findings include:


With the official adoption of the 2021 International Code by the International Code Council, Pennsylvania has joined a growing number of states that have adopted the 2021 International Code. This adoption is a significant milestone for Pennsylvania, as it aligns the state's building codes with the most current and comprehensive set of codes available. The adoption of the 2021 International Code will ensure that Pennsylvania's building codes remain up-to-date and consistent with the latest industry standards, promoting safety, health, and the general welfare of the public.

Additional information regarding the 2021 International Code, including the text for the adoption of the code, can be found at the following link:

- <https://www.pa.gov/content/dam/opaawps-pa.gov/en/dill/documents/ucc/documents/2021%20icc%20code%20adoption%20final%20report.pdf>




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What Does the RAC Report Address?

- Code adoptions for all PA UCC codes
- Specific amendments resulting from RAC review process (with amended language included)




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When Is It Changing?

- Anticipated effective date for PA UCC code changes:


July 13, 2025

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When Is It Changing?

- Phase-in period
 - "Where a design or construction contract was signed **before the effective date [7/13/25]** 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 [1/12/26] or the period specified by a municipal ordinance, whichever is less."

17 [Act 36 of 2017](#) 

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More Questions & Clarification


- **What is defined as a contract?**
 - "design or construction contract"
- **Important dates:**
 - 7/13/25: Effective date of regulations Contract signed on or after 7/13/25 is subject to new (2021) codes
 - 1/12/26: Last day of phase-in period (last day to apply for a permit under the 2018 IRC)

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General Scenarios

- **Contract signed before 7/13/25**
 - Can apply for permit before 1/13/26 and be subject to previous (2018 base) PA UCC codes
 - If permit application submitted on or after 1/13/26, subject to new (2021 base) codes
- **Contract signed after 7/13/25**
 - Subject to new (2021 base) codes



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Industrialized Housing


- **Timeline for industrialized housing will be determined once regulations are finalized by DCED**
- If the PA UCC adopts the 2021 codes as anticipated on July 13, 2025, DCED will require the following:
 - "All new industrialized housing and industrialized commercial buildings entering the first stage of production on or after January 1, 2026, must be constructed in accordance with the applicable 2021 codes including the 2020 National Electrical Code."



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Where Do I Go for More Information?

- 2021 ICC Code Adoption Final Report: 
- **2021 IRC**
 - <https://codes.iccsafe.org/content/IRC2021P2>
- **2021 IECC**
 - <https://codes.iccsafe.org/content/IECC2021P2>



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PA UCC Energy Code Summary

The diagram illustrates the composition of the Pennsylvania Uniform Construction Code (UCC) Energy Code. It consists of four main components:

- IRC Chapter 11**: International Residential Code Chapter 11.
- IECC Residential Provisions**: International Energy Conservation Code Residential Provisions.
- RAC Amendments**: Residential Amendments to the code.
- PA Alternative Residential Energy Provisions**: Pennsylvania-specific alternative provisions, noted as "Coming Soon!".

 The components are shown as a sequence of boxes connected by plus signs (+). A PHRC logo is located in the bottom right corner of the slide.

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PA Alternative Residential Energy Provisions

- Compliance allowed by UCC Title 34, Chapter 403
- Intent:
 - simpler to build to 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)
- Prescriptive (vs. requiring modeling)
- Allows trade-offs

A PHRC logo is located in the bottom right corner of the slide.

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2025 PA-Alt


- Will the PA Alternative Residential Energy Provisions be updated?
- When will this be available?

A PHRC logo is located in the bottom right corner of the slide.

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What Are the Big Changes?


1. Energy Code
2. Vapor Retarders & Continuous Insulation
3. New Testing Procedure for Air Leakage



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1. Energy Codes




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UCC Energy Code Summary

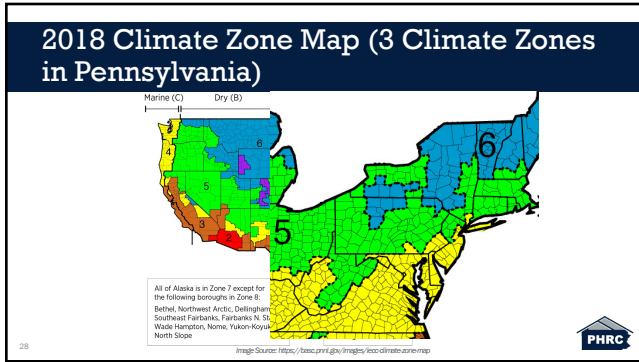


Chapter 11 + Residential Provisions + RAC amendments



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2018 IRC Table N1102.1.2

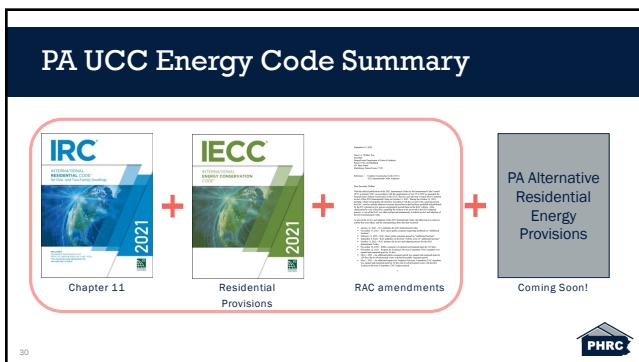
Table N1102.1.2 (R402.1.2) INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT *

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

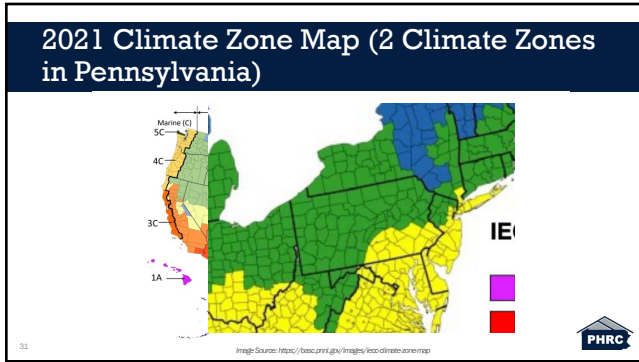
Source: International Code Council (ICC), 2018 International Residential Code, Country Club W.B. II.

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2021 Table N1102.1.3 – Insulation and Fenestration Table

TABLE R402.1.3 (N1102.1.3)
INSULATION MINIMUM R-VALUES AND FENESTRATION REQUIREMENTS BY COMPONENT*

CLIMATE ZONE	FENESTRATION U-FACTOR ¹	SKYLIGHT ² U-FACTOR	GLAZED FENESTRATION SHGC ^{3,4}	CEILING R-FACTOR	WOOD FRAME WALL R-VALUE	MASS WALL R-VALUE ⁵	FLOOR R-VALUE	BASEMENT ⁶ WALL R-VALUE	SLAB ⁷ R-VALUE & DEPTH	CRAWL SPACE ⁸ WALL R-VALUE
1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.55	0.25	38	13	4/8	13	0	0	0
3	0.32	0.55	0.25	38	20 or 13 + 5"	8/13	19	5/12 ⁹	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13 + 5"	8/13	19	10/13	10, 2ft	10/13
5 and Marine 4	0.30	0.55	NR	49	23 or 13 + 7.5" ¹⁰ or 20 + 3.8"	13/17	30 ¹¹	15/19	10, 4ft or 15, 3ft	15/19
6	0.30	0.55	NR	49	20 + 5" or 13 + 10"	15/20	30 ¹¹	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	20 + 5" or 13 + 10"	19/21	30 ¹¹	15/19	10, 4 ft	15/19

Source: <https://www.penn.gov/images/2021-climate-zone-map>

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Insulation Minimum R-Values and Fenestration Requirements Comparison Chart

	R-Values 2018			R-Values 2021 as amended	
	Zone 4, except Marine	Zone 5 & Marine 4	Zone 6	Zone 4 except Marine	Zone 5 and Marine 4
Fenestration U-Factor	0.32	0.30	0.30	0.32	0.30
Skylight U-Factor	0.55	0.55	0.55	0.55	0.55
Glazed Fenestration SHGC	0.40	NR	NR	0.40	NR
Ceiling R-Value	49	49	49	49	49
Wood Frame Wall R-Value	20 or 13+5	20 or 13+5	20+5 or 13+10	20 or 13+5	23 or 13+7.5 or 20+3.8
Mass Wall R-Value	8/13	13/17	15/20	8/13	13/17
Floor R-Value	19	30	30	19	30
Basement Wall R-Value	10/13	15/19	15/19	10/13	15/19
Slab R-Value & Depth	10, 2ft	10, 2ft	10, 4ft	10, 2ft	10, 4ft or 15, 3ft
Crawl-Space Wall R-Value	15/19	15/19	15/19	15/19	15/19

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N1101.13.5 Additional Energy Efficiency


- **This section was not adopted during the RAC process.**
 - RAC Report: Section N1101.13.5 (R401.2.5) **Additional energy efficiency, was not adopted** as part of the current Pennsylvania adoption of the 2021 IRC/IECC

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N1108.2 Additional Efficiency Package Options


- **Section N1108.2 - Additional efficiency package options, is adopted as follows:**
 - **N1108.2 (R408.2) Additional efficiency package options:** Additional efficiency package options ~~for compliance with Section N1101.13.5~~ are set forth in Sections N1108.2.1 (R408.2.1) through N1108.2.5 (R408.2.5).
 - This modified language leaves the provisions in the code but are **no longer mandatory**. They can now be a guide for increased energy efficiency.

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What Does This Mean?

- Check your location for change in Climate Zone
- Continuous insulation may become more mainstream due to the prescriptive requirement
- Look for new HD insulation that can meet the R-23 cavity only requirement (mineral wool)
- Review slab insulation details for the potential of R-10 for 4' or R-15 for 3'

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2. Vapor Retarders & Continuous Insulation





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2021 IRC R702.7 – Vapor Retarders

- Vapor retarder materials shall be classified in accordance with Table R702.7(1). A vapor retarder shall be provided on the interior side of frame walls of the class indicated in Table R702.7(2), including compliance with Table R702.7(3) or R702.7(4) where applicable. An approved design using accepted engineering practice for hygrothermal analysis shall be permitted as an alternative. The climate zone shall be determined in accordance with Section N1101.7.
- Exception:
 1. Basement walls
 2. Below-grade portions of any wall
 3. Construction where accumulation, condensation or freezing of moisture will not damage the materials.
 4. A vapor retarder shall not be required in Climate Zones 1, 2 and 3.

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Source: International Code Council (ICC), (2020), 2021 International Residential Code, Country Club Hill, IL.




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2021 IRC R702.7 – Vapor Retarders

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Source: International Code Council (ICC), (2020), 2021 International Residential Code, Country Club Hill, IL.



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2021 IRC R702.7(1) – Vapor Retarder Materials and Classes

TABLE R702.7(1) VAPOR RETARDER MATERIALS AND CLASSES

CLASS	ACCEPTABLE MATERIALS
I	Sheet polyethylene, nonperforated aluminum foil or other approved materials with a perm rating less than or equal to 0.1.
II	Kraft-faced fiberglass batts, vapor retarder paint or other approved materials applied in accordance with the manufacturer's installation instructions for a perm rating greater than 0.1 and less than or equal to 1.0.
III	Latex paint, enamel paint or other approved materials applied in accordance with the manufacturer's installation instructions for a perm rating greater than 1.0 and less than or equal to 10.0.

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- Vapor retarder materials shall be classified in accordance with Table R702.7(1). A vapor retarder shall be provided on the interior side of frame walls of the class indicated in Table R702.7(2), including compliance with Table R702.7(3) or R702.7(4) where applicable. An approved design using accepted engineering practice for hygrothermal analysis shall be permitted as an alternative. The climate zone shall be determined in accordance with Section N1101.7.
- Exception:
 - Basement walls
 - Below-grade portions of any wall
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2021 IRC R702.7(2) – Vapor Retarder Options

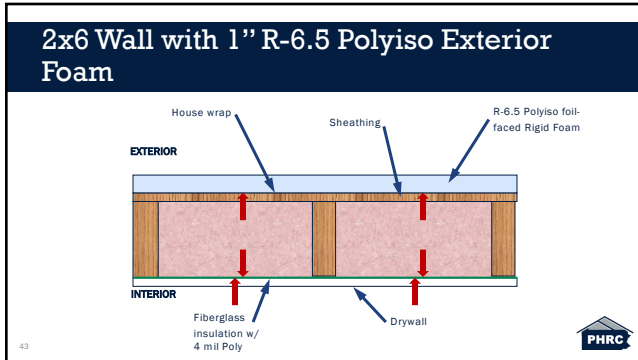
TABLE R702.7(2) VAPOR RETARDER OPTIONS

CLIMATE ZONE	VAPOR RETARDER CLASS		
	CLASS I ^a	CLASS II ^b	CLASS III
1, 2	Not Permitted	Not Permitted	Permitted
3, 4 (except Marine 4)	Not Permitted	Permitted ^c	Permitted
Marine 4, 5, 6, 7, 8	Permitted ^d	Permitted ^d	See Table R702.7(3)

a. Class I and II vapor retarders with vapor permeance greater than 1 perm when measured by ASTM E96 water method (Procedure B) shall be allowed on the interior side of any frame wall in all climate zones.
 b. Use of a Class I interior vapor retarder in frame walls with a Class I vapor retarder on the exterior side shall require an approved design.
 c. Where a Class II vapor retarder is used in combination with foam plastic insulating sheathing installed as continuous insulation on the exterior side of frame walls, the continuous insulation shall comply with Table R702.7(4) and the Class II vapor retarder shall have a vapor permeance greater than 1 perm when measured by ASTM E96 water method (Procedure B).
 d. See Table R702.7(3).

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2021 IRC R702.7(2) – Vapor Retarder Options

TABLE R702.7(2) VAPOR RETARDER OPTIONS

CLIMATE ZONE	VAPOR RETARDER CLASS		
	CLASS I ^a	CLASS II ^a	CLASS III
1, 2	Not Permitted	Not Permitted	Permitted
3, 4 (except Marine 4)	Not Permitted	Permitted ^b	Permitted
Marine 4, 5, 6, 7, 8	Permitted ^b	Permitted ^b	See Table R702.7(3)

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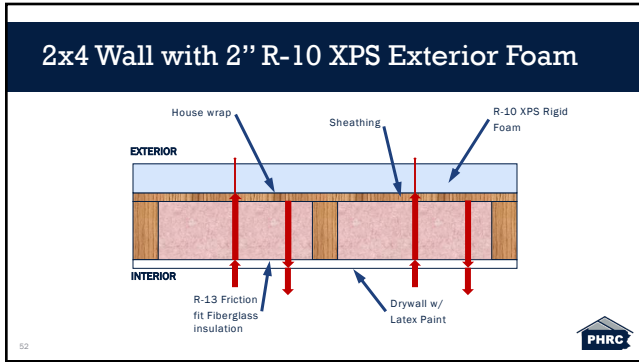
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 - Basement walls
 - Below-grade portions of any wall
 - Construction where accumulation, condensation or freezing of moisture will not damage the materials.
 - A vapor retarder shall not be required in Climate Zones 1, 2 and 3.

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Potential for Double Class II Vapor Retarder

- 2" R-10 Rigid XPS = .7 perm max./Inch; Class II
- R-13 Friction Fit batt insulation = N/A
- Drywall with Latex Pain = 6 perm; Class III
- House wrap = 11-54 perm; Vapor Open

Is this good?
Remember "Throttle"
>1/3 (R-7.6) of the total insulation is on the exterior
which can reduce the risk of condensation

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3. Blower Door Testing

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Blower Door Testing in the 2018 IRC





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N1102.4.1.2 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). Where required by the building official, testing shall be conducted by an approved third party. **A written report of the results of the test shall be signed by the party conducting the test and provided to the building official. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope.**

Source: International Code Council (ICC), (2017), 2018 International Residential Code, Country Club Wb, W.



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Blower Door Concept

- **Depressurize the home to an exaggerated pressure difference to quantify air infiltration and compare with established benchmarks**
- **ACH₅₀ = Air Changes per Hour at pressure difference of 50 Pa**
 - Current limit in Pennsylvania is 3 ACH₅₀
 - 50 Pa simulates roughly a 20 mph wind on all sides of the home

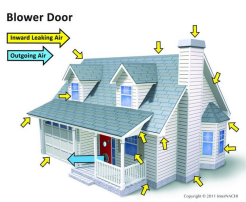



Image Source: <https://www.nrcd.com/blower-door-testing>



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Blower Door Testing in the 2021 IRC





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N1102.4.1.2 Testing

- The building or dwelling unit shall be tested for air leakage. The maximum air leakage rate for any building or dwelling unit under any compliance path shall not exceed 5.0 air changes per hour or 0.28 cubic feet per minute (CFM) per square foot (0.0079 m³/(s × m²)) of dwelling unit enclosure area. Testing shall be conducted in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch w.g. (50 Pascals). Where required by the code official, testing shall be conducted by an approved third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the code official. Testing shall be performed at any time after creation of all penetrations of the building thermal envelope have been sealed.

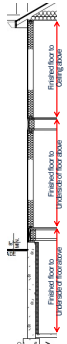

Source: International Code Council (ICC), (2020), 2021 International Residential Code, County CUB 916, 91.



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Dwelling Unit Enclosure Area - Defined

- DWELLING UNIT ENCLOSURE AREA.** The sum of the area of ceiling, floors and walls separating a dwelling unit's conditioned space from the exterior or from adjacent conditioned or unconditioned spaces. Wall height shall be measured from the finished floor of the dwelling unit to the underside of the floor above.

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What Exactly Does That Mean?

- **2018 Testing Provisions**
 - Volume based test
 - Air Changes per Hour (ACH)
 - @ 50 Pascals (3ACH50)
- **2021 Testing Provisions**
 - Building envelope or dwelling unit enclosure area-based test
 - Cubic feet per minute per square foot of dwelling unit enclosure area
 - @ 50 Pascals (.28CFM50/SqFt)



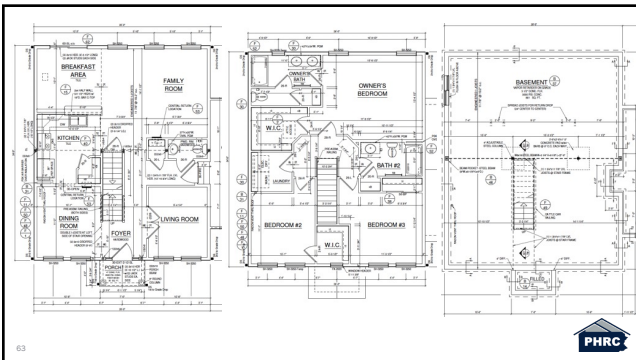
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Details of Example #1

- **Single Family Detached**
- **Square Footage**
 - 1897 Finished
 - 2758 Conditioned
- **Ceiling Height**
 - 8' Basement
 - 8' First Floor
 - 8' Second Floor



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2018 Air Testing Provisions

- **Basement**
 - 6,888 cubic feet
- **First floor**
 - 7,546 cubic feet
- **Second floor**
 - 7,616 cubic feet
- **Total Area**
 - 22,050 total cubic feet

$$3.8ACH_{50} = \frac{1,425 \times 60}{22,050 (vol.)}$$

- **Results to pass must be $\leq 3.0 ACH_{50}$**
- **This would not pass**




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2021 Air Testing Provisions

- **Basement**
 - 2,013 SqFt dwelling unit enclosure area
- **First floor**
 - 1,152 SqFt dwelling unit enclosure area
- **Second floor**
 - 1,944 SqFt dwelling unit enclosure area
- **Total Dwelling Unit Enclosure Area**
 - 5,109 SqFt

$$\frac{1,425}{5,109 (sq. ft.)} = .278 CFM50 \text{ per SqFt}$$

- **Results to pass must be $\leq .28 CFM50$ per SqFt**
- **This would pass!**




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N1102.4.1.2 Testing (Exception)

- **Exception:** When testing individual dwelling units, an **air leakage rate not exceeding 0.30 cubic feet per minute per square foot** [0.008 m³/(s × m²)] of the dwelling unit enclosure area, tested in accordance with ANSI/RESNET/ICC 380, ASTM E779 or ASTM E1827 and reported at a pressure of 0.2 inch water gauge (50 Pa), shall be permitted in **all climate zones** for:
 1. Attached single- and multiple-family building dwelling units.
 2. Buildings or dwelling units that are 1,500 square feet (139.4 m²) or smaller.
- Mechanical ventilation shall be provided in accordance with Section M1505 of this code or Section 403.3.2 of the International Mechanical Code, as applicable, or with other approved means of ventilation.


Source: International Code Council (ICC), (2020), 2021 International Residential Code, Country Club Hill, IL



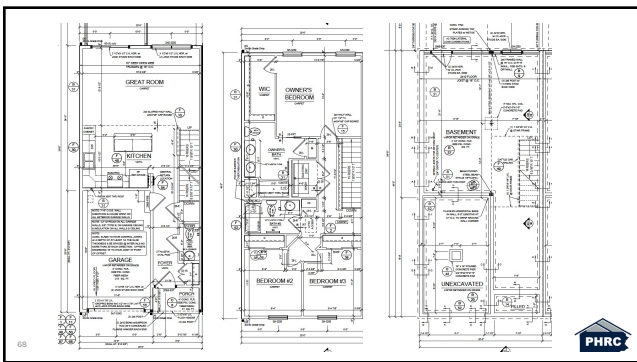
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Details of Example #2

- **Single Family Attached**
- **Square Footage**
 - 1496 Finished
 - 2041 Conditioned
- **Ceiling Height**
 - 9' Basement
 - 8' First Floor
 - 8' Second Floor



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2018 Air Testing Provisions

<ul style="list-style-type: none"> • Basement <ul style="list-style-type: none"> - 4,986 cubic feet • First floor <ul style="list-style-type: none"> - 4864 cubic feet • Second floor <ul style="list-style-type: none"> - 7040 cubic feet • Total Area <ul style="list-style-type: none"> - 16,890 total cubic feet 	$4.9ACH_{50} = \frac{1375 \times 60}{16,890 (vol.)}$	<ul style="list-style-type: none"> • Results to pass must be $\leq 3.0 ACH_{50}$ • This <u>would not pass</u>
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2021 Air Testing Provisions

- Basement**
 - 1,754 SqFt dwelling unit enclosure area
- First floor**
 - 1,080 SqFt dwelling unit enclosure area
- Second floor**
 - 1,904 SqFt dwelling unit enclosure area
- Total Dwelling Unit Enclosure Area**
 - 4,738 SqFt


$$\frac{1375}{4,738 \text{ (sq. ft.)}} = .29 \text{ CFM50/SqFt}$$


- Results to pass must be $\leq .30$ CFM50/SqFt
- This would pass!



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Where Do I Go for More Information?

- 2021 ICC Code Adoption Final Report: 
- 2021 IRC
 - <https://codes.iccsafe.org/content/IRC2021P2>
- 2021 IECC
 - <https://codes.iccsafe.org/content/IECC2021P2>



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Thank you for attending!

Check out the next webinar on:

Tuesday, Dec. 10 @ 1pm ET
 2021 PA UCC Residential Code Update:
 Part 2
Darrin Wright & Chris Hine








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2021 PA UCC Residential Code Update: Part 1

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