PA UCC Residential Code Update: Part 1

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Pennsylvania Housing Research Center

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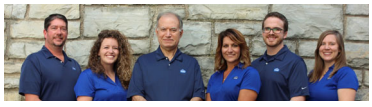
- Educational programs and publications by the PHRC address a wide range of topics relevant to the home building industry and are designed to reach a diverse audience: builders, code officials, remodelers, architects, developers, engineers, planners, landscape architects, local government officials, educators, etc. to provide professional development and continuing education



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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 2018 I-Codes on April 29, 2021. The code provisions that were adopted during this process will take effect in the first quarter of 2022 with the official effective date to be confirmed. This session will review implications of transitioning to 2018 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 2022.
2. Discuss the implications of transitioning to the 2018 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 2018 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 UCC?
- What is changing?
- When is it changing?
- Where do I go for more information?

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What is the UCC?

- What is the Uniform Construction Code?
  - Pennsylvania's statewide building code
- How does the UCC relate to ICC codes?
  - The UCC Administration and Enforcement regulation adopts ICC codes on a triennial basis, per Act 36 of 2017.
  - The previous adoption of the 2015 codes, with amendments, took effect on October 1, 2018.

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What is the UCC (continued)?

- 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 UCC Review & Advisory Council (RAC)

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Review: Code Review Process

- 8/31/2017 - ICC Officially Publishes 2018 ICC Family of Codes
- RAC Initiate PA Review of 2018 ICC Family of Codes (vote on items not changed to reviewed)
- RAC Opens Public Comment on 2018 ICC Family of Codes/Public Comment Closed
- TAC Committee Applications are Opened/TAC Committee Applications are Closed
- 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)
- Five (5) RAC Meetings to Deliberate
- 4/22/2021 - Draft Report Presented to the RAC
- 4/29/2021 - Final Report Approved by RAC
- 4/29/2021 - Final Report Submitted to Dept. L&I
- 1st 2022 - Quarter Go Live

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What is Changing?

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UCC Residential Code Summary

Base code

+ Statutory Amendments +

RAC amendments

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List of Statutory Amendments

- What are statutory amendments?
- Full list of statutory amendments to the UCC:
  - https://www.dli.pa.gov/ucc/Pages/Regulations-and-Statutes.aspx

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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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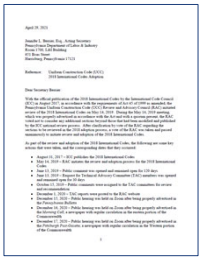
UCC RAC Report



https://www.dli.pa.gov/ucc/Documents/ICC-Code-Review-2018-Final-Report.pdf

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What does the RAC Report Address?

- Code adoptions for all UCC codes
- Specific amendments resulting from RAC review process (with amended language included)
- Note: PHRC Webinar from June 3, 2021 covers this information in detail
  - http://bit.ly/PHRCWebinar_PAUCC2018ICC

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When is it Changing?

- Anticipated effective date for UCC code changes:

February 14, 2022

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When is it Changing?

- **Phase-in period**
  - "Where a design or construction contract was signed before the effective date [2/14/22] 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."

16 Act 36 of 2017

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More Questions & Clarification

- **What is defined as a contract?**
  - "design or construction contract"
- **Important dates:**
  - 2/14/22: Effective date of regulations
    - Contract signed on or after 2/14/22 is subject to new (2018) codes
  - 8/13/22: Last day of phase-in period

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General Scenarios

- **Contract signed before 2/14/22**
  - Can apply for permit before 8/14/22 and be subject to previous (2015 base) UCC codes
  - If permit application submitted on or after 8/14/22, subject to new (2018 base) codes
- **Contract signed after 2/14/22**
  - Subject to new (2018 base) codes

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Where Do I Go for More Information?

- PA UCC RAC Report:
  - https://www.dli.pa.gov/ucc/Documents/ICC-Code-Review-2018-Final-Report.pdf
- 2018 IRC
  - https://codes.iccsafe.org/content/IRC2018
- 2018 IECC
  - https://codes.iccsafe.org/content/iecc2018

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UCC Energy Code Summary

Chapter 11

+

Residential Provisions

+

PA Alternative Residential Energy Provisions

Coming Soon!

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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

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PA Alternative

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

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What are the Big Changes?

1. Stucco & stone wall assemblies
2. Insulation & fenestration requirements
3. Blower door testing target

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1. Stucco & Stone Wall Assemblies

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1. Stucco & Stone Assemblies

- Exterior plaster provisions in the IRC were heavily modified in the 2021 version.
- These provisions were adopted by the UCC RAC to be included with the 2018 code adoption.

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Exterior Plaster: Hardcoat Stucco and Adhered Masonry Veneer

- Stucco will follow the 2021 Exterior plaster section (703.7 Exterior plaster)

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Exterior Plaster: Hardcoat Stucco and Adhered Masonry Veneer

- Adhered masonry veneer will follow the 2018 Section R703.12
- Adhered masonry veneer installation will refer to the 2021 Exterior Plaster section:
  - R703.7.1 which is installation of lath and all accessories
  - R703.7.3 water resistive barriers which will include a rainscreen drainage space

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Note on Section References

- When a specific section is referenced in provisions that were adopted by the RAC out of an alternative non-2018 ICC code, and the referenced section is not one of the specifically adopted sections, refer to the base code.

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2021 IRC R703.7 Exterior Plaster (Stucco)

- Installation of exterior plaster shall be in compliance with ASTM C926-2018B, ASTM C1063-2018B and the provisions of this code.

29 https://www.dll.pa.gov/ucc/Documents/ICC-Code-Review-2018-Final-Report.pdf

29

2021 IRC R703.7.1 Lath

- Lath and lath attachments shall be of corrosion-resistant materials in accordance with ASTM C1063-2018B. Expanded metal, welded wire, or woven wire lath shall be attached to wood framing members or furring. Where the exterior plaster is serving as wall bracing in accordance with Table R602.10.4, the lath shall be attached directly to framing. The lath shall be attached with 1-1/2-inch-long (38 mm), 11-gage nails having a 7/16 -inch (11.1 mm) head, or 7/8 -inch-long (22.2 mm), 16-gage staples, spaced not more than 7 inches (178 mm) on center along framing members or furring and not more than 24 inches (610 mm) on center between framing members or furring, or as otherwise approved. Additional fastening between wood framing members shall not be prohibited. Lath attachments to cold-formed steel framing or to masonry, stone, or concrete substrates shall be in accordance with ASTM C1063-2018B. Where lath is installed directly over foam sheathing, lath connections shall also be in accordance with Section R703.15, R703.16 or R703.17. Where lath is attached to furring installed over foam sheathing, the furring connections shall be in accordance with Section R703.15, R703.16 or R703.17.

30 https://www.dll.pa.gov/ucc/Documents/ICC-Code-Review-2018-Final-Report.pdf

30

2021 IRC R703.7.1 Lath

- Fastening pattern is to be minimum every 7" vertically on the framing members. Which is a change from 2015 code.
- "Fastening between wood framing members shall not be prohibited"
- The code has recognized it is difficult not to fasten between framing members by accident. Good practice is to reduce amount of fastener holes by trying to avoid fastening between framing members.

31 https://www.dll.pa.gov/ucc/Documents/ICC-Code-Review-2018-Final-Report.pdf

31

2021 IRC R703.7.1 Lath

- Exception: Lath is not required over masonry, cast-in-place concrete, precast concrete or stone substrates prepared in accordance with ASTM C1063-2018B.

- **703.7.1.1 Furring.** Where provided, furring shall consist of wood furring strips not less than 1 inch by 2 inches (25 mm by 51 mm), minimum 3/4-inch (19 mm) metal channels, or self-furring lath, and shall be installed in accordance with ASTM C1063-2018B. Furring shall be spaced not greater than 24 inches (600 mm) on center and, where installed over wood or cold-formed steel framing, shall be fastened into framing members.

32 https://www.dll.pa.gov/ucc/Documents/ICC-Code-Review-2018-Final-Report.pdf

32

2015 IRC R703.7.3 Water-Resistive Barriers

- **Water-resistive barriers shall be installed as required in Section R703.2 and, where applied over wood-based sheathing, shall include a water-resistive vapor-permeable barrier with a performance at least equivalent to two layers of Grade D paper. The individual layers shall be installed independently such that each layer provides a separate continuous plane and any flashing (installed in accordance with Section R703.4) intended to drain to the water-resistive barrier is directed between the layers.**
  - Exception: Where the water-resistive barrier that is applied over wood-based sheathing has a water resistance equal to or greater than that of 60-minute Grade D paper and is separated from the stucco by an intervening, substantially nonwater-absorbing layer or designed drainage space.

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

33

2021 IRC R703.7.3 Water-Resistive Barriers

- Water-resistive barriers shall be installed as required in Section R703.2 and, where applied over wood-based sheathing, shall comply with Section R703.7.3.1 or R703.7.3.2.

*R703.2 = 2018 provisions

34 https://www.dll.pa.gov/ucc/Documents/ICC-Code-Review-2018-Final-Report.pdf

34

2021 IRC R703.7.3.1 Dry Climates

- **In Dry (B) climate zones indicated in Figure N1101.7, water-resistive barriers shall comply with one of the following:**
  1. The water-resistive barrier shall be two layers of 10-minute Grade D paper or have a water resistance equal to or greater than two layers of a water-resistive barrier complying with ASTM E2556-10, Type I. The individual layers shall be installed independently such that each layer provides a separate continuous plane. Flashing installed in accordance with Section R703.4 and intended to drain to the water-resistive barrier shall be directed between the layers.
  2. The water-resistive barrier shall be 60-minute Grade D paper or have a water resistance equal to or greater than one layer of a water-resistive barrier complying with ASTM E2556-10, Type II. The water-resistive barrier shall be separated from the stucco by a layer of foam plastic insulating sheathing or other non-water-absorbing layer, or a designed drainage space.

35 https://www.dll.pa.gov/ucc/Documents/ICC-Code-Review-2018-Final-Report.pdf

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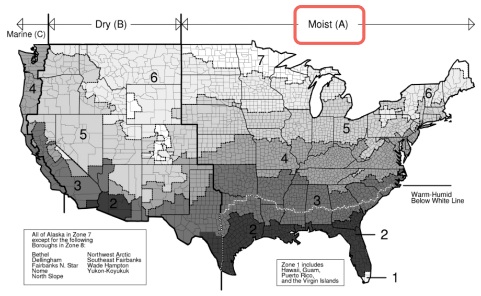

Source: International Code Council (ICC). (2017). 2018 International Residential Code, Country Club Hill, Ill.

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2021 IRC R703.7.3.2 Moist or Marine Climates

- **In the Moist (A) or Marine (C) climate zones indicated in Figure N1101.7, water-resistive barriers shall comply with one of the following:**
  1. In addition to complying with Section R703.7.3.1, a space or drainage material not less than 3/16 inch (5 mm) in depth shall be added to the exterior side of the water-resistive barrier.
  2. In addition to complying with Section R703.7.3.1, Item 2, drainage on the exterior of the water-resistive barrier shall have a drainage efficiency of not less than 90 percent, as measured in accordance with ASTM E2273-2018 or Annex A2 of ASTM E2925-17.

37 https://www.dli.pa.gov/ucc/Documents/ICC-Code-Review-2018-Final-Report.pdf

37

What is a Rainscreen?

- **A rainscreen is a *system* that provides an air space within a wall assembly to promote drainage and drying of that assembly**
  - Accelerates the evaporation of undrained moisture behind exterior cladding
  - Helps to dry wall that accumulates moisture seasonally
- **Common rainscreen products / systems**
  - Furring strips
  - Three-dimensional mesh

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Types of Rainscreen Systems

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How is Stone Impacted?

- R703.12 Adhered masonry veneer installation
- R703.12.3 Water-resistive barrier.
  - A water-resistive barrier shall be installed as required by Section R703.2 and shall comply with the requirements of Section R703.7.3.

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2021 IRC R703.7.3.2 Moist or Marine Climates

- In the Moist (A) or Marine (C) climate zones indicated in Figure N1101.7, water-resistive barriers shall comply with one of the following:
  1. In addition to complying with Section R703.7.3.1, a space or drainage material not less than 3/16 inch (5 mm) in depth shall be added to the exterior side of the water-resistive barrier.
  2. In addition to complying with Section R703.7.3.1, Item 2, drainage on the exterior of the water-resistive barrier shall have a drainage efficiency of not less than 90 percent, as measured in accordance with ASTM E2273-2018 or Annex A2 of ASTM E2925-17.

41 https://www.dli.pa.gov/ucc/Documents/ICC-Code-Review-2018-Final-Report.pdf

41

Note on Stone Installation

- The National Concrete Masonry Association (NCMA) published an installation guide for adhered manufactured stone veneer.
  - https://ncma.org/wp-content/uploads/2020/08/MSV_InstallationGuide_5thEd_4thPrinting.pdf
- This guide is used by many adhered manufactured stone veneer manufacturers for installation recommendations.

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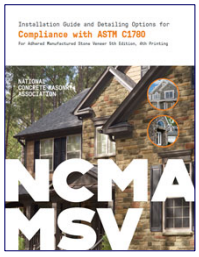
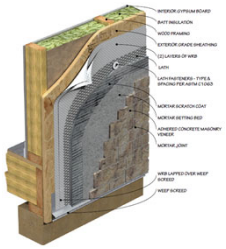
NCMA Installation Guide





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Note on Stone Installation

- **Currently, the NCMA MSV Installation Guide states:**
  - Rainscreens are optional building techniques used to improve the drainage of incidental water behind the cladding and reduce drying time. Rainscreen products (such as drainage mats or formed polymer sheeting) or construction techniques (such as strapping or furring) that create a capillary break/air space between the cladding and the water resistive barrier can be effectively incorporated into AMSV applications. Refer to the manufacturer's recommendation for rainscreen / drainage system applications with adhered manufactured stone veneer wall systems. Details of various applications utilizing rainscreen drainage plane systems can be found in Figures 35-38. Building codes may allow a single layer of a water resistive barrier when a drainage space is incorporated in the wall system (i.e. rainscreen). Requirements for rainscreens vary by region. Verify local jurisdictional requirements regarding the use and application of rainscreens and/or drainage products.

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Recommendations

- Review manufacturer installation guidelines
- Talk with your code officials
- Work with contractors and suppliers to discuss options

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Stucco & Stone Webinar

Adapting Stucco & Stone Assemblies to Changing Codes

February 15, 2022
1:00pm

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2. Insulation & Fenestration Requirements

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2. Insulation & Fenestration Requirements

- 2018 Table N1102.1.2 (R402.1.2) was adopted and effectively reset some of the modifications made during the 2015 review process
  - Note: amendment was made to fenestration requirement in Climate Zone 3, which does not apply to Pennsylvania

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Climate Zones in PA

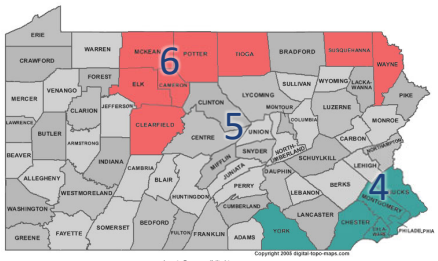

Image Source: digital-topo-maps.com

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2015 IRC Table N1102.1.2

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

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

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

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2018 IRC Table N1102.1.2

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1	NR	0.75	0.25	30	13	3/4	13	0	0	0
2	0.40	0.65	0.25	38	13	4/6	13	0	0	0
3	0.35	0.55	0.25	38	20 or 13 + 5[h]	8/13	19	5/13[f]	0	5/13
4 except Marine	0.32	0.55	0.40	49	20 or 13 + 5[h]	8/13	19	10/13	10, 2 ft	10/13
5 and Marine 4	0.30	0.55	NR	49	20 or 13 + 5[h]	13/17	30[g]	15/19	10, 2 ft	15/19
6	0.30	0.55	NR	49	20 + 5 or 13 + 10[h]	15/20	30[g]	15/19	10, 4 ft	15/19
7 and 8	0.30	0.55	NR	49	20 + 5[h] or 13 + 10[h]	19/21	38[g]	15/19	10, 4 ft	15/19

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

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Glazing Performance

- **Measures of performance**
  - U-Factor
  - Solar Heat Gain Coefficient
  - Visible Transmittance
  - Air Leakage

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3. Blower door testing target

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2018 IRC N1102.4.1.2 (R402.4.1.2) Testing

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

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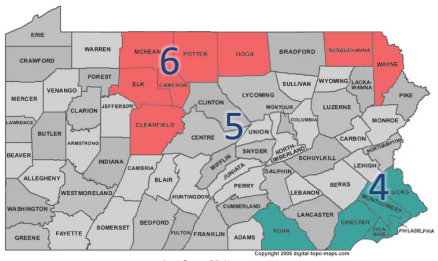
Climate Zones in PA



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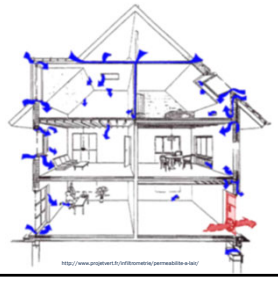
Airtightness Requirement: 3 ACH50



- Measured in Air Changes Per Hour at 50 Pascals (ACH50 / ACH_{50})
  - 50 pascals – equivalent to 20 MPH wind on the house

Value we need (Air Changes Per Hour @ 50 Pascals) | Value from the blower door pressure gauge (Cubic Feet Per Minute @ 50 Pascals) | Constant (60 minutes per hour)

$$ACH_{50} = \frac{CFM_{50} \times 60}{V} < 3$$

Volume of the House (Cubic Feet)

http://www.projetvert.fr/infiltrometrie/permeabilite-a-lair/

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Air Sealing Webinar

Adapting to Tighter Enclosures through Scopes of Work

November 9, 2021

1:00pm

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Recommendation: Getting Started

- Review the 2018 IRC & IECC online
  - Consider investing in additional ICC resources
- Print copy of RAC report
- Review statutory amendments

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Where Do I Go for More Information?

- PA UCC RAC Report:
  - https://www.dli.pa.gov/ucc/Documents/ICC-Code-Review-2018-Final-Report.pdf
- 2018 IRC
  - https://codes.iccsafe.org/content/IRC2018
- 2018 IECC
  - https://codes.iccsafe.org/content/iecc2018

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Questions?

www.phrc.psu.edu

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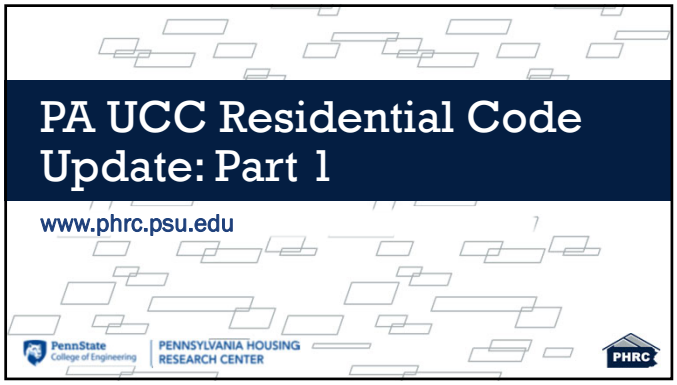
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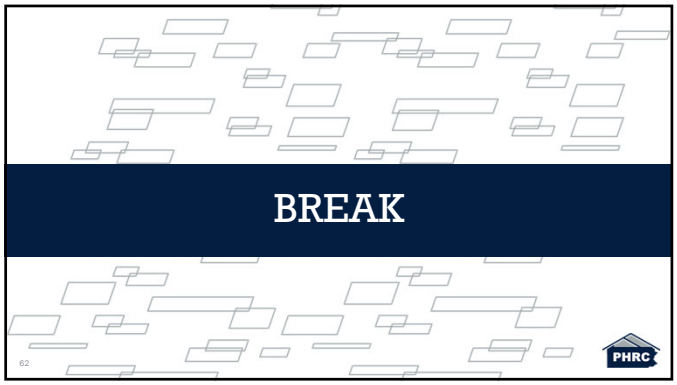
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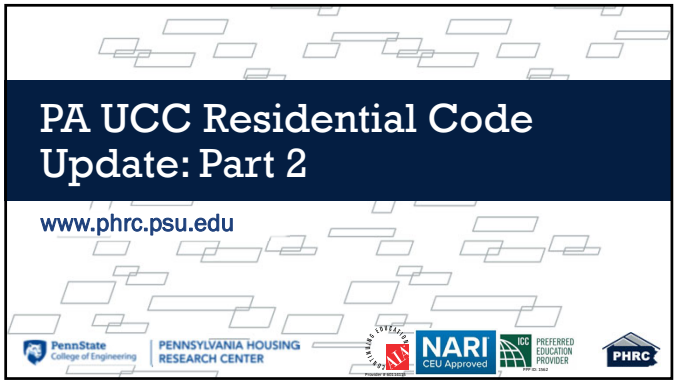
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Description

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 2018 I-Codes on April 29, 2021. The code provisions that were adopted during this process will take effect in the first quarter of 2022 with the official effective date to be confirmed. This session will build on Part 1 by providing an overview of the most substantial changes between the 2015 and 2018 ICC base codes for residential construction.

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Learning Objectives

1. Review the most efficient ways to find out which code provisions have changed between the 2015 and 2018 ICC codes, including available ICC resources.
2. Discuss and highlight some of the most substantial and noteworthy code provision changes that will impact design, cost, and occupant safety.
3. Dive deeper into various code changes that will more substantially impact residential construction, including increased building envelope airtightness requirements.
4. Understand available resources to further study best practices that may be impacted by code changes, specifically focusing on those that affect the building enclosure.

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How Will the Changes Be Presented?

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"Section of Change" – "Provision Modified or Not Adopted"

- Change Type – Addition, Modification or Clarification
- Change Summary – Summary of the significant change
- Code language with changes in RED

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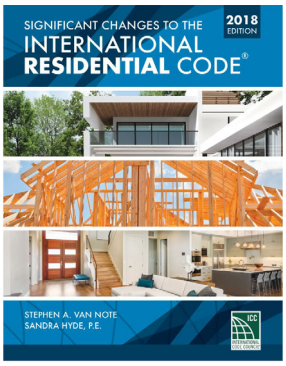
Today's Information

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



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Building Construction Significant Changes

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R104.11 – Alternative Materials and Methods of Construction

- Change Type: Modification
- Change Summary: The process to gain compliance through the alternative materials and methods provisions now requires an application by the owner or owner's authorized agent and gives authority to the building official to approve based on a prescriptive list of equivalencies.
- R104.11 Alternative materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code. The building official shall have the authority to approve an alternative material, design or method of construction upon application of the owner or the owner's authorized agent. The building official shall first finds that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, not less than the equivalent of that prescribed in this code in quality, strength, effectiveness, fire resistance, durability and safety. Compliance with the specific performance-based provisions of the International Codes shall be an alternative to the specific requirements of this code. Where the alternative material, design or method of construction is not approved, the building official shall respond in writing, stating the reasons why the alternative was not approved.

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

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R302.2 – Townhouse Separation

- **Change Type:** Modification
- **Change Summary:** Two paths for achieving the fire-resistant separation between townhouse dwelling units—two 1-hour walls or a common wall—are spelled out in the townhouse provisions.
- R302.2 Townhouses. Walls separating townhouse units shall be constructed in accordance with Section R302.2.1 or Section R302.2.2.
  - R302.2.1 Double Walls. Each townhouse shall be separated by two 1-hour fire-resistance rated wall assemblies tested in accordance with ASTM E119, UL 263 or Section 703.3 of the International Building Code.
  - R302.2.2 Common Walls. Common walls separating townhouses shall be assigned a fire-resistance rating in accordance with Item 1 or 2. The common wall shared by two townhouses shall be constructed without plumbing or mechanical equipment, ducts or vents in the cavity of the common wall. The wall shall be rated for fire exposure from both sides and shall extend to and be tight against exterior walls and the underside of the roof sheathing. Electrical installations shall be in accordance with Chapters 34 through 43. Penetrations of the membrane of common walls for electrical outlet boxes shall be in accordance with Section R302.4.

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

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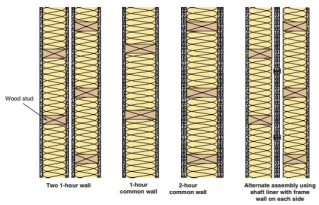
R302.2 – Townhouse Separation



Note: Gypsum wallboard and wood stud assemblies must meet all materials, dimensions, spacing, installation and fastening requirements of the specific tested assembly.

Typical fire-resistant-rated wall assemblies for separating townhouse dwelling units

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

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R302.5 – Dwelling-Garage Opening Protection – Not adopted per RAC Report; 2009 IRC

- **Change Type:** Modification
- **Change Summary:** An automatic-closing device is now permitted as an alternative to a self-closing device for the door between the garage and dwelling.
- RAC amended this and removed from UCC

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R302.13 – Fire Protection of Floors above Crawl Spaces – Act 1 of 2011?

- **Change Type:** Modification
- **Change Summary:** Fire-resistant membrane protection is now required for the applicable floor framing materials above crawl spaces containing fuel-fired or electric-powered heating appliances.
- R302.13 Fire protection of floors. Floor assemblies that are not required elsewhere in this code to be fire-resistance rated, shall be provided with a 1/2-inch (12.7 mm) gypsum wallboard membrane, 5/8-inch (16 mm) wood structural panel membrane, or equivalent on the underside of the floor framing member. Penetrations or openings for ducts, vents, electrical outlets, lighting, devices, luminaires, wires, speakers, drainage, piping and similar openings or penetrations shall be permitted.
- Exceptions:
  1. Floor assemblies located directly over a space protected by an automatic sprinkler system in accordance with Section P2904, NFPA 13D, or other approved equivalent sprinkler system.
  2. Floor assemblies located directly over a crawl space not intended for storage or for the installation of fuel-fired or electric-powered heating appliances.
  3. 3.and 4. No change to text

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

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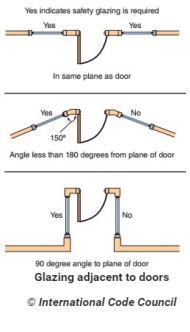
R308.4.2 – Glazing Adjacent to Doors

- **Change Type:** Modification
- **Change Summary:** Glazing within 24 inches of the hinge side of an in-swinging door now requires safety glazing where the glazing is at an angle less than 180 degrees from the plane of the door.
- R308.4.2 Glazing adjacent to doors. Glazing in an individual fixed or operable panel adjacent to a door shall be considered to be a hazardous location where the bottom exposed edge of the glazing is less than 60 inches (1524 mm) above the floor or walking surface and it meets either of the following conditions:
  - 1.Where the glazing is within 24 inches of either side of the door in the plane of the door in a closed position.
  - 2.Where the glazing is on a wall perpendicular to less than 180 degrees from the plane of the door in a closed position and within 24 inches of the hinge side of an in-swinging door.



Glazing adjacent to doors

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

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R310.1 – Emergency Escape and Rescue Openings

- **Change Type:** Modification
- **Change Summary:** Emergency escape and rescue openings are no longer required for bedrooms in basements when the dwelling unit is protected with an automatic fire sprinkler system and other conditions are met.
- R310.1 Emergency escape and rescue opening required. Basements, habitable attics and every sleeping room shall have not less than one operable emergency escape and rescue opening. Where basements contain one or more sleeping rooms, an emergency escape and rescue opening shall be required in each sleeping room. Emergency escape and rescue openings shall open directly into a public way, or to a yard or court that opens to a public way.
- Exceptions:
  1. Storm shelters and basements used only to house mechanical equipment not exceeding a total floor area of 200 square feet (18.58 m2).
  2. Where the dwelling or townhouse is equipped with an automatic sprinkler system installed in accordance with Section P2904, sleeping rooms in basements shall not be required to have emergency escape and rescue openings provided that the basement has one of the following:
     - 2.1. One means of egress complying with Section R311 and one emergency escape and rescue opening.
     - 2.2. Two means of egress complying with Section R311.

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

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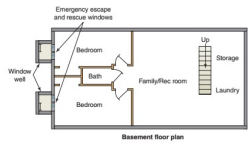
R310.1 – Emergency Escape and Rescue Openings



2015 IRC required emergency escape and rescue opening in each bedroom

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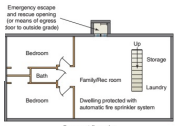

2018 IRC does not require emergency escape and rescue openings in basement bedrooms when meeting conditions

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

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R311.7.11, R311.7.12 – Alternating Tread Devices and Ships Ladders

- **Change Type:** Modification
- **Change Summary:** Alternating tread devices and ships ladders are now permitted as a means of egress for serving lofts that do not exceed 200 square feet in area.
- R311.7.11 Alternating tread devices. Alternating tread devices shall not be used as an element of a means of egress. Alternating tread devices shall be permitted provided that the required means of egress stairway or ramp serves the same space at each adjoining level or where a means of egress is not required. The clear width at and below the handrails shall be not less than 20 inches (508 mm).
  - Exception: Alternating tread devices are allowed to be used as an element of a means of egress for lofts, mezzanines, and similar areas of 200 gross square feet (18.6 m2) or less where such devices do not provide exclusive access to a kitchen or bathroom.
- R311.7.12 Ships ladders. Ships ladders shall not be used as an element of a means of egress. Ships ladders shall be permitted provided that a required means of egress stairway or ramp serves the same space at each adjoining level or where a means of egress is not required. The clear width at and below the handrails shall be not less than 20 inches.
  - Exception: Ships ladders are allowed to be used as an element of a means of egress for lofts, mezzanines, and similar areas of 200 gross square feet (18.6 m2) or less where such devices do not provide exclusive access to a kitchen or bathroom.

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

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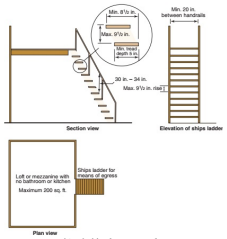
R311.7.11, R311.7.12 – Alternating Tread Devices and Ships Ladders – Cont.



Ships ladder for means of egress

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

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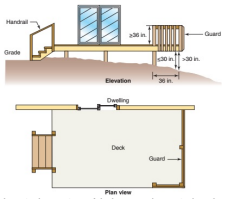
R312.1 – Guards

- **Change Type:** Clarification
- **Change Summary:** The guard requirements only apply to the specific portion of a walking surface that exceeds 30 inches above grade.
- R312.1 Guards. Guards shall be provided in accordance with Sections R312.1.1 through R312.1.4.
- R312.1.1 Where required. Guards shall be provided for those portions of open-sided walking surfaces, including stairs, ramps and landings, that are located more than 30 inches (762 mm) measured vertically to the floor or grade below at any point within 36 inches (914 mm) horizontally to the edge of the open side. Insect screening shall not be considered as a guard.



Guard required at portions of deck greater than 30 inches above grade

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

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R314 – Smoke Alarms – Modified - 2015 IRC

- **Change Type:** Modification
- **Change Summary:** The exemption for interconnection of alarms during alterations based on feasibility has been removed from the code. **Added back in due to RAC report to stay with 2015 language**
- R314.2.2 Alterations, repairs and additions. Where alterations, repairs or additions requiring a permit occur, the individual dwelling unit shall be equipped with smoke alarms located as required for new dwellings.
- Exceptions:
  - 1.Work involving the exterior surfaces of dwellings, such as the replacement of roofing or siding, the addition or replacement of windows or doors, or the addition of a porch or deck.
  - 2.Installation, alteration or repairs of plumbing or mechanical systems.
- Where more than one smoke alarm is required to be installed within an individual dwelling unit in accordance with Section R314.3, the alarm devices shall be interconnected in such a manner that the actuation of one alarm will activate all of the alarms in the individual dwelling unit. Physical interconnection of smoke alarms shall not be required where listed wireless alarms are installed and all alarms sound upon activation of one alarm.
  - Exception: Interconnection of smoke alarms in existing areas shall not be required where alterations or repairs do not result in removal of interior wall or ceiling finishes exposing the structure, unless there is an attic, crawl space or basement available that could provide access for interconnection without the removal of interior finishes. – 2015 IRC ADDED BACK IN PER RAC REPORT.

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

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R315 – Carbon Monoxide Alarms

- **Change Type:** Modification
- **Change Summary:** Interconnection is now required where multiple carbon monoxide alarms are required in a dwelling unit.
- R315.2.2 Alterations, repairs and additions. Where alterations, repairs or additions requiring a permit occur, the individual dwelling unit shall be equipped with carbon monoxide alarms located as required for new dwellings.
- Exceptions:
  - 1.Work involving the exterior surfaces of dwellings, such as the replacement of roofing or siding, or the addition or replacement of windows or doors, or the addition of a porch or deck.
  - 2.Installation, alteration or repairs of plumbing or mechanical systems.
- R315.5 Interconnectivity. Where more than one carbon monoxide alarm is required to be installed within an individual dwelling unit in accordance with Section R315.3, the alarm devices shall be interconnected in such a manner that the actuation of one alarm will activate all of the alarms in the individual dwelling unit. Physical interconnection of carbon monoxide alarms shall not be required where listed wireless alarms are installed and all alarms sound upon activation of one alarm.
  - Exception: Interconnection of carbon monoxide alarms in existing areas shall not be required where alterations or repairs do not result in removal of interior wall or ceiling finishes exposing the structure, unless there is an attic, crawl space or basement available that could provide access for interconnection without the removal of interior finishes.

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

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R317.3 – Fasteners in Treated Wood

- **Change Type:** Modification
- **Change Summary:** Staples in preservative-treated wood and fireretardant-treated wood are now required to be made of stainless steel.
- R317.3.1 Fasteners for preservative-treated wood. Fasteners, including nuts and washers, for preservative-treated wood shall be of hot-dipped, zinc-coated galvanized steel, stainless steel, silicon bronze or copper. Staples shall be of stainless steel. Coating types and weights for connectors in contact with preservative-treated wood shall be in accordance with the connector manufacturer's recommendations. In the absence of manufacturer's recommendations, a minimum of not less than ASTM A 653 type G185 zinc-coated galvanized steel, or equivalent, shall be used.
- Exceptions:
  1. ½-inch-diameter (12.7 mm) or greater steel bolts.
  2. Fasteners other than nails, staples, and timber rivets shall be permitted to be of mechanically deposited zinc-coated steel with coating weights in accordance with ASTM B 695, Class 55 minimum.
  3. Plain carbon steel fasteners in SBX/DOT and zinc borate preservative-treated wood in an interior, dry environment shall be permitted.

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

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R324.6 – Roof Access for Photovoltaic Solar Energy Systems

- **Change Type:** Addition
- **Change Summary:** Requirements for roof access and pathways for firefighters have been introduced into the IRC provisions for rooftopmounted photovoltaic solar energy systems.
- R324.6 Roof access and pathways. Roof access, pathways, and setback requirements shall be provided in accordance with Sections R324.6.1 through R324.6.2.1. Access and minimum spacing shall be required to provide emergency access to the roof, to provide pathways to specific areas of the roof, provide for smoke ventilation opportunity areas, and to provide emergency egress from the roof.
- Exceptions:
  - 1.Detached, nonhabitable structures, including but not limited to, detached garages, parking shade structures, carports, solar trellises, and similar structures shall not be required to provide roof access.
  - 2.Roof access, pathways, and setbacks need not be provided where the code official has determined that rooftop operations will not be employed.
  - 3.These requirements shall not apply to roofs with slopes of 2 units vertical in 12 units horizontal (17-percent slope) or less.
- R324.6.1 Pathways. Not fewer than two pathways on separate roof planes from lowest roof edge to ridge and not less than 36 inches (914 mm) wide, shall be provided on all buildings. Not fewer than one pathway shall be provided on the street or driveway side of the roof. For each roof plane with a photovoltaic array, a pathway not less than 36 inches wide (914 mm) shall be provided from the lowest roof edge to ridge on the same roof plane as the photovoltaic array, on an adjacent roof plane, or straddling the same and adjacent roof planes. Pathways shall be over areas capable of supporting fire fighters accessing the roof. Pathways shall be located in areas with minimal obstructions such as vent pipes, conduit, or mechanical equipment.
- R324.6.2 Setback at ridge. For photovoltaic arrays occupying not more than 33 percent of the plan view total roof area, not less than an 18-inch (457 mm) clear setback is required on both sides of a horizontal ridge. For photovoltaic arrays occupying more than 33 percent of the plan view total roof area, not less than a 36-inch (914 mm) clear setback is required on both sides of a horizontal ridge.
- R324.6.2.1 Alternative setback at ridge. Where an automatic sprinkler system is installed within the dwelling in accordance with NFPA 13D or Section P2904, setbacks at ridges shall comply with one of the following:
  - 1.For photovoltaic arrays occupying not more than 66 percent of the plan view total roof area, not less than an 18-inch (457 mm) clear setback is required on both sides of a horizontal ridge.
  - 2.For photovoltaic arrays occupying more than 66 percent of the plan view total roof area, not less than a 36-inch (914 mm) clear setback is required on both sides of a horizontal ridge.

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

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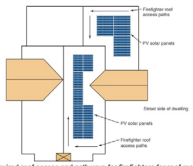
R324.6 – Roof Access for Photovoltaic Solar Energy Systems - Cont.

TABLE 3-1 Minimum Ridge Setback

Array Percent of Roof Area	Fire Sprinkler System	Minimum Setback on Both Sides of Ridge (inches)
≤ 33 %	No	18
> 33%	No	36
≤ 66 %	Yes	18
> 66%	Yes	36



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

Required roof access and pathways for firefighters for roof-mounted PV solar systems

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R324.6.2.2 – Solar Panels near Emergency Escape and Rescue Openings

- **Change Type:** Addition
- **Change Summary:** Rooftop-mounted photovoltaic solar energy panels and modules are not permitted to be installed directly below emergency escape and rescue openings
- R324.6.2.2 Emergency escape and rescue opening. Panels and modules installed on dwellings shall not be placed on the portion of a roof that is below an emergency escape and rescue opening. A pathway not less than 36-inches (914 mm) wide shall be provided to the emergency escape and rescue opening.

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

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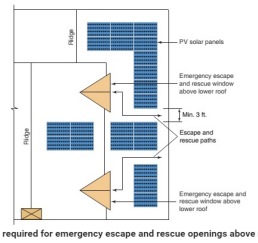
R324.6.2.2 – Solar Panels near Emergency Escape and Rescue Openings – Cont.



A 36-inch-wide pathway is required for emergency escape and rescue openings above roof-mounted PV solar panels.

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

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R507.3.1 – Minimum Footing Size for Decks

- **Change Type:** Addition
- **Change Summary:** Table R507.3.1 has been added and provides the minimum residential deck footing sizes based on Live or Ground Snow Load (highest case load)

TABLE R507.3.1 MINIMUM FOOTING SIZE FOR DECKS

LIVE OR GROUND SNOW LOAD[b] (psf)	TRIBUTARY AREA (sq. ft.)	LOAD BEARING VALUE OF SOIL[b, c, d] (psf)											
		1500[e]			2000[e]			2500[e]			≥ 3000[e]		
		Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness (inches)	Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness (inches)	Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness (inches)	Side of a square footing (inches)	Diameter of a round footing (inches)	Thickness (inches)
40	20	12	14	6	12	14	6	12	14	6	12	14	6
	40	14	16	6	12	14	6	12	14	6	12	14	6
	60	17	19	6	15	17	6	13	15	6	12	14	6
	80	20	22	7	17	19	6	15	17	6	14	16	6
	100	22	25	8	19	21	6	17	19	6	15	17	6
	120	24	27	9	21	23	7	19	21	6	17	19	6
	140	26	29	10	22	25	8	20	23	7	18	21	6
	160	28	31	11	24	27	9	21	24	8	20	22	7

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

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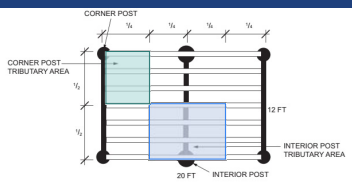
R507.3.1 – Minimum Footing Size for Decks – Cont.



TRIBUTARY AREA – CORNER POST
LENGTH IS ½ OF TOTAL LENGTH = 20 FT × ¼ = 5 FT
WIDTH IS ½ OF TOTAL WIDTH = 12 FT × ½ = 6 FT
AREA = 5 FT × 6 FT = 30 FT²

TRIBUTARY AREA – INTERIOR POST
LENGTH IS ½ OF TOTAL LENGTH = 20 FT × ½ = 10 FT
WIDTH IS ½ OF TOTAL WIDTH = 12 FT × ½ = 6 FT
AREA = 10 FT × 6 FT = 60 FT²

Commentary Figure R507.3.1DECK TRIBUTARY AREA

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Energy, Mechanical, Electrical Plumbing Significant Changes

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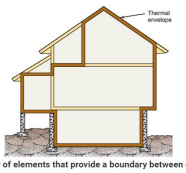
N1101.6 – Definition of Thermal Envelope

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

- **Change Type:** Clarification
- **Change Summary:** The revised definition for building thermal envelope clarifies that it is an assembly of materials enclosing conditioned space or creating a boundary between conditioned and unconditioned space.
- BUILDING THERMAL ENVELOPE. The basement walls, exterior walls, floors, ceilings, roofs and any other building element assemblies that enclose conditioned space or provide a boundary between conditioned space and exempt or unconditioned space.



The building thermal envelope is an assembly of elements that provide a boundary between conditioned space and unconditioned space.

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

- **Change Type:** Clarification
- **Change Summary:** The definitions for skylights and vertical fenestration have been moved under the definition for fenestration, and a definition for opaque door has been added.
- FENESTRATION. Products classified as either vertical fenestration or skylights.
  - Skylights. Glass or other transparent or translucent glazing material installed at a slope of less than 60 degrees (1.05 rad) from horizontal.
  - Vertical Fenestration. Windows that are fixed or operable, opaque doors, glazed doors, glazed block and combination opaque/glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of not less than 60 degrees (1.05 rad) from horizontal.
- OPAQUE DOOR. A door that is not less than 50 percent opaque in surface area.

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

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N1102.2.2 – Reduction of Ceiling Insulation

- **Change Type:** Modification
- **Change Summary:** When applying the exception for insulation in ceilings without attics, the insulation must extend to the outside of the top plate.
- N1102.2.2 (R402.2.2) Ceilings without attic spaces. Where Section N1102.1.2 requires insulation R-values greater than R-30 in the ceiling and the design of the roof/ceiling assembly does not allow sufficient space for the required insulation, the minimum required insulation R-value for such roof/ceiling assemblies shall be R-30. Insulation shall extend over the top of the wall plate to the outer edge of such plate and shall not be compressed. This reduction of insulation from the requirements of Section N1102.1.2 shall be limited to 500 square feet (46 m2) or 20 percent of the total insulated ceiling area, whichever is less. This reduction shall not apply to the U-factor alternative approach in Section N1102.1.4 and the Total UA alternative in Section N1102.1.5.

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

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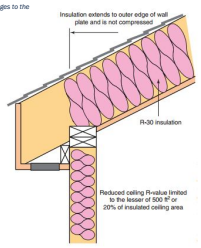
N1102.2.2 – Reduction of Ceiling Insulation – Cont.

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



Reduced R-value for vaulted ceiling

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N1103.3.6, N1103.3.7 – Ducts Buried within Ceiling Insulation

- **Change Type:** Addition
- **Change Summary:** New provisions address the methods, minimum coverage requirements and thermal benefits for ducts buried within ceiling insulation, and when those ducts are considered inside the building thermal envelope.
- 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 insulation of an R-value not less than R-8.
  - 2.At all points along each duct, the sum of the ceiling insulation R-values above the top of the duct, and against and below the bottom of the duct shall be not less than R-19, excluding the duct R-value.
  - 3.In climate zones 1A, 2A and 3A, the supply ducts 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 M1601.4.6.
- Exception: Sections of supply ducts less than 3 feet (914 mm) from the supply outlet shall not be required to comply with these requirements.

95

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

95

N1103.3.6, N1103.3.7 – Ducts Buried within Ceiling Insulation – Cont.

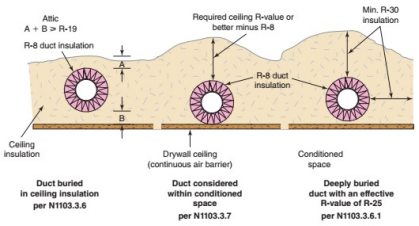
- **Change Type:** Addition
- N1103.3.6.1 (R403.3.6.1) Effective R-value of deeply buried ducts. Where using a simulated energy performance analysis, sections of ducts that are installed in accordance with Section N1103.3.6, located directly on, or within 5.5 inches (140 mm) of the ceiling, surrounded with blown-in attic insulation having an R-value of R-30 or greater and located such that the top of the duct is not less than 3.5 inches (89 mm) below the top of the insulation, shall be considered as having an effective duct insulation R-value of R-25.
- 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 is located completely within the continuous air barrier and within the building thermal envelope.
  - 2.The ducts are buried within ceiling insulation in accordance with Section N1103.3.6 and all of the following conditions exist:
    - 2.1The air handler is located completely within the continuous air barrier and within the building thermal envelope.
    - 2.2The 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 N1103.3.4, is less than or equal to 1.5 cubic feet per minute (42.5 L/min) per 100 square feet (9.29 m2) of conditioned floor area served by the duct system.
    - 2.3The 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.

96

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

96

N1103.3.6, N1103.3.7 – Ducts Buried within Ceiling Insulation – Cont.



Ducts buried within ceiling insulation

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

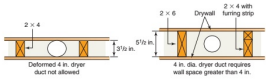
97

97

M1502.4.2 – Concealed Dryer Exhaust Ducts

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

- **Change Type:** Modification
- **Change Summary:** Wall and ceiling cavities enclosing dryer exhaust ducts must provide sufficient space that the 4-inch duct is not squeezed out of its round shape.
- M1502.4.2 Duct installation. Exhaust ducts shall be supported at intervals not to exceed 12 feet (3658 mm) and shall be secured in place. The insert end of the duct shall extend into the adjoining duct or fitting in the direction of airflow. Exhaust duct joints shall be sealed in accordance with Section M1601.4.1 and shall be mechanically fastened. Ducts shall not be joined with screws or similar fasteners that protrude more than ⅛ inch (3.2 mm) into the inside of the duct. Where dryer exhaust ducts are enclosed in wall or ceiling cavities, such cavities shall allow the installation of the duct without deformation.



Dryer exhaust duct in concealed spaces

98

98

M1503 – Domestic Cooking Exhaust Equipment

- **Change Type:** Modification
- **Change Summary:** "Domestic cooking exhaust equipment" is the preferred terminology for "kitchen exhaust" because it is more descriptive and includes all of the components of the exhaust system.

SECTION M1503

RANGE HOODS DOMESTIC COOKING EXHAUST EQUIPMENT

- M1503.1 General. Domestic cooking exhaust equipment shall comply with the requirements of this section.
- M1503.2 Domestic cooking exhaust. Where domestic cooking exhaust equipment is provided it shall comply with one of the following:
  - 1.The fan for overhead range hoods and downdraft exhaust equipment not integral with the cooking appliance shall be listed and labeled in accordance with UL 507.
  - 2.Overhead range hoods and downdraft exhaust equipment with integral fans shall comply with UL 507.
  - 3.Domestic cooking appliances with integral downdraft exhaust equipment shall be listed and labeled in accordance with ANSI Z21.1 or UL 858.
  - 4.Microwave ovens with integral exhaust for installation over the cooking surface shall be listed and labeled in accordance with UL 923.
- M1503.2.1 Open top broiler exhaust. Domestic open-top broiler units shall be provided with a metal exhaust hood, having a thickness of not less than 0.0157-inch (0.3950 mm) (No. 28 gage). Such hoods shall be installed with a clearance of not less than ¼ inch (6.4 mm) between the hood and the underside of combustible material or and cabinets. A clearance of not less than 24 inches (610 mm) shall be maintained between the cooking surface and the combustible material and cabinets. The hood width shall be not less than the width of the broiler unit and shall extend over the entire unit.
- Exception: Broiler units that incorporate an integral exhaust system, and that are listed and labeled for use without an exhaust hood, shall not be required to have an exhaust hood.

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

99

99

M1503.6 – Makeup Air for Kitchen Exhaust System

- **Change Type:** Modification
- **Change Summary:** Makeup air for domestic cooking exhaust systems is no longer required if all fuel-burning appliances in the dwelling unit have a direct vent or mechanical draft vent system.
- M1503.6 Makeup air required. Where one or more gas-, liquid-, or solid-fuel- burning appliance that is neither direct-vent nor uses a mechanical draft venting system is located within a dwelling unit's air barrier, each exhaust system capable of exhausting in excess of 400 cubic feet per minute (0.19 m3/s) shall be mechanically or naturally passively provided with makeup air at a rate approximately equal to the exhaust air rate. Such makeup air systems shall be equipped with not fewer than one damper complying with Section M1503.6.2.
  - Exception: Makeup air is not required for exhaust systems installed for the exclusive purpose of space cooling and intended to be operated only when windows or other air inlets are open.
- M1503.6.1 Location. Kitchen exhaust makeup air shall be discharged into the same room in which the exhaust system is located or into rooms or duct systems that communicate through one or more permanent openings with the room in which such exhaust system is located. Such permanent openings shall have a net cross-sectional area not less than the required area of the makeup air supply openings.
- M1503.6.2 Makeup air dampers. Where makeup air is required by Section M1503.6, makeup air dampers shall comply with this section. Each damper shall be a gravity damper or an electrically operated damper that automatically opens when the exhaust system operates. Dampers shall be accessible for inspection, service, repair and replacement without removing permanent construction or any other ducts not connected to the damper being inspected, serviced, repaired or replaced. Gravity or barometric dampers shall not be used in passive makeup air systems except where the dampers are rated to provide the design makeup airflow at a pressure differential of 0.01 inch w.c. (3 Pa) or less.

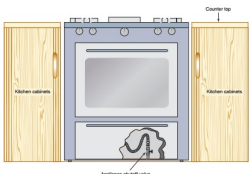
100

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

100

G2420.5.1 – Shutoff Valve Location

- **Change Type:** Clarification
- **Change Summary:** Shutoff valves located behind movable appliances are considered as meeting the requirement for access.
- G2420.5.1 (409.5.1) Located within same room. The shutoff valve shall be located in the same room as the appliance. The shutoff valve shall be within 6 feet (1829 mm) of the appliance, and shall be installed upstream of the union, connector or quick disconnect device it serves. Such shutoff valves shall be provided with access. Shutoff valves serving movable appliances, such as cooking appliances and clothes dryers, shall be considered to be provided with access where installed behind such appliances. Appliance shutoff valves located in the firebox of a fireplace shall be installed in accordance with the appliance manufacturer's instructions.



Shutoff valve behind gas range meets the requirement for access

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101

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

101

G2447.2 – Commercial Cooking Appliances

- **Change Type:** Modification
- **Change Summary:** Commercial cooking appliances are now permitted in dwelling units when installed in accordance with an engineered design and the manufacturer's instructions.
- G2447.2 (623.2) Prohibited location. Cooking appliances designed, tested, listed and labeled for use in commercial occupancies shall not be installed within dwelling units or within any area where domestic cooking operations occur.
- Exceptions:
  1. Appliances that are also listed as domestic cooking appliances.
  2. Where the installation is designed by a licensed professional engineer in compliance with the manufacturer's installation instructions.

Commercial cooking appliances are permitted with an engineered design

Artazum/Shutterstock.com

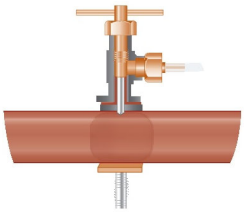
102

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

102

P2906.6.1 – Saddle Tap Fitting on Water Distribution Piping – NOT adopted by RAC

- ~~**Change Type:** Addition~~
- ~~**Change Summary:** Saddle tap fittings are no longer permitted on water distribution system piping.~~
- ~~P2906.6.1 Saddle tap fittings. The use of saddle tap fittings and combination saddle tap and valve fittings shall be prohibited.~~



Saddle tap fitting

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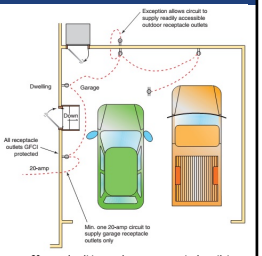
103

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

103

E3703.5 – Garage Branch Circuits

- **Change Type:** Addition
- **Change Summary:** A separate 20-ampere branch circuit is now required to serve receptacle outlets of attached garages and detached garages with electric power.
- E3703.5 Garage branch circuits. In addition to the number of branch circuits required by other parts of this section, not less than one 120-volt, 20 ampere branch circuit shall be installed to supply receptacle outlets in attached garages and in detached garages with electric power. This circuit shall not have other outlets. [210.11(C)(4)]
  - Exception: This circuit shall be permitted to supply readily accessible outdoor receptacle outlets. [210.11(C)(4) Exception]



20-amp circuit to supply garage receptacle outlets

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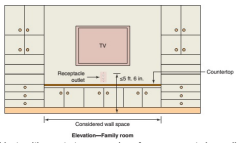
Source: International Code Council (ICC). (2018). *2018 Significant Changes to the International Residential Code*, Country Club Hill, Ill.

104

E3901.2 – Wall Space for Receptacle Distribution

- **Change Type:** Modification
- **Change Summary:** Cabinets with countertops are now considered wall space in determining required locations for general purpose receptacle outlets.
- E3901.2 General purpose receptacle distribution. In every kitchen, family room, dining room, living room, parlor, library, den, sun room, bedroom, recreation room, or similar room or area of dwelling units, receptacle outlets shall be installed in accordance with the general provisions specified in Sections E3901.2.1 through E3901.2.3 (see Figure E3901.2).
- E3901.2.1 Spacing. Receptacles shall be installed so that no point measured horizontally along the floor line of any wall space is more than 6 feet (1829 mm), from a receptacle outlet. [210.52(A)(1)]
- E3901.2.2 Wall space. As used in this section, a wall space shall include the following: [210.52(A)(2)]
  - 1.Any space that is 2 feet (610 mm) or more in width, including space measured around corners, and that is unbroken along the floor line by doorways and similar openings, fireplaces, and fixed cabinets that do not have countertops or similar work surfaces.
  - 2.and 3. No change to text.



Cabinets with countertops or work surfaces are counted as wall space

© International Council

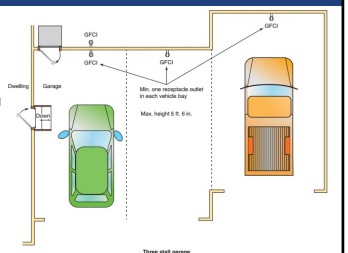
105

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

105

E3901.9 – Garage Receptacle Outlet Location

- **Change Type:** Modification
- **Change Summary:** A receptacle outlet must be located in each vehicle bay in a garage.
- E3901.9 Basements, garages and accessory buildings. Not less than one receptacle outlet, in addition to any provided for specific equipment, shall be installed in each separate unfinished portion of a basement,; in each vehicle bay not more than 5.5 feet above the floor in attached garages; in each vehicle bay not more than 5.5 feet above the floor in detached garages that are provided with electrical power and in accessory buildings that are provided with electric power. [210.52(G)(1), (2), and (3)]



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

106

Questions?

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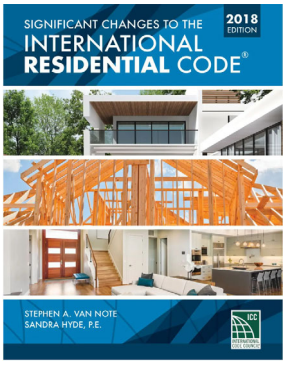
Today's Information

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



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References

- 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.
- International Code Council. (2017). *2018 International Residential Code*, ICC, Country Club Hill, Ill.
- International Code Council. (2018). *2018 Significant Changes to the International Residential Code*, ICC, Country Club Hill, Ill.

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PA UCC Residential Code Update: Part 2

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Adapting to Tighter Enclosures through Scopes of Work

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Learning Objectives

1. Review the code provisions that are changing within Pennsylvania's Uniform Construction Code that address enclosure airtightness.
2. Discuss the challenges associated with aiming for 3 ACH50 instead of 5 ACH50 based on past experiences from other jurisdictions and case studies.
3. Analyze the role of scopes of work in subcontractor selection and management.
4. Examine ways to improve the air sealing process overall to maximize energy and cost efficiency in residential structures.

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UCC Energy Code Summary: 2/14/22

Chapter 11

+

Residential Provisions

+

PA Alternative Residential Energy Provisions

Coming Soon!

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114

Why Does Air Sealing Matter?

115

115

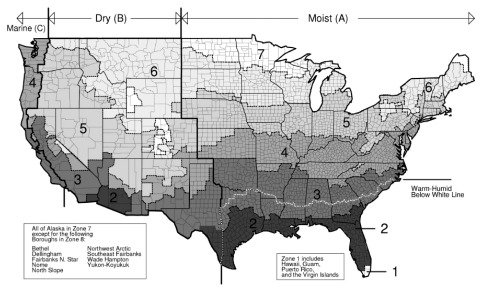
2018 IRC N1102.4.1.2 (R402.4.1.2) Testing

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

116

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

116



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

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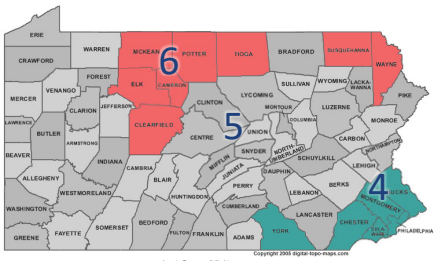
Climate Zones in PA



= NOT EXCEEDING

3 ACH_{50}

Copyright 2005 digital-topo-maps.com

Image Source: digital-topo-maps.com

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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_{50} = Air Changes per Hour at pressure difference of 50 Pa**
  - Current limit in Pennsylvania is 5 ACH_{50} if tested
  - 50 Pa simulates roughly a 20 mph wind on all sides of the home

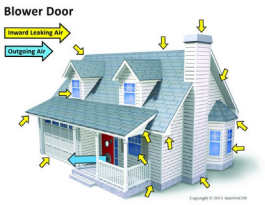

Image Source: https://www.naeci.com/blower-door-testing

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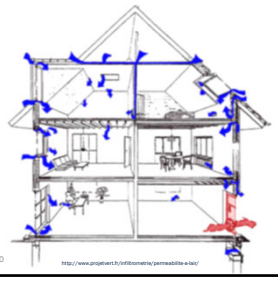
Airtightness Requirement: 3 ACH50



http://www.projetvert.fr/infiltrometrie/permeabilite-a-lair/

- Measured in Air Changes Per Hour at 50 Pascals (ACH50 / ACH_{50})
  - 50 pascals – equivalent to 20 MPH wind on the house

Value we need (Air Changes Per Hour @ 50 Pascals) ↓ ACH_{50} = **Value from the blower door pressure gauge** (Cubic Feet Per Minute @ 50 Pascals) ↓ CFM_{50} x **Constant** (60 minutes per hour) ↓ 60 / **Volume of the House** (Cubic Feet) ↑ V < 3

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How Do We Air Seal?

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General Air Barrier *Methods*

- Drywall Method
- Spray Foam Method
- Sheathing/Framing Method
- Housewrap Method

122

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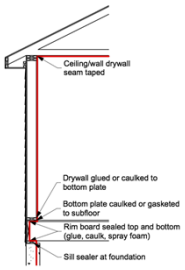
Drywall Method

- Notes:
  - Majority of homes utilize this method at ceilings (unless unvented attics installed).



123

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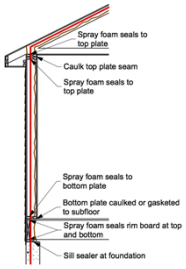
Spray Foam Method

- Notes:
  - Spray foam only effective in cavities and relies on sealed framing joints.



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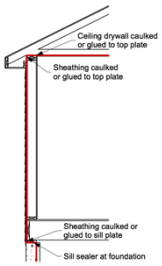
Sheathing/ Framing Method

- Notes:
  - Attention to detail!



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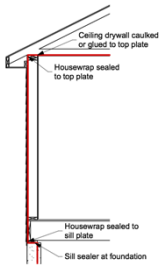
Housewrap Method

- Notes:
  - Many builders believe this is their method but are forgetting some of the key details.



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What Do We Seal?

127

127

N1102.4 Air Leakage

- The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections R1102.4.1 through R1102.4.5.

128

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

128

N1102.4.1 Building Thermal Envelope

- The building thermal envelope shall comply with Sections N1102.4.1.1 and N1102.4.1.2. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.
  - N1102.4.1.1 – Installation
  - N1102.4.1.2 – Testing

129

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

129

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.

130

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

130

N1102.4.1.1 Installation

- The components of the building thermal envelope as listed in Table N1102.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria listed in Table N1102.4.1.1, as applicable to the method of construction. Where required by the building official, an approved third party shall inspect all components and verify compliance.

131

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

131

Table N1102.4.1.1 Air Barrier and Insulation Installation

- General requirements
- Ceiling/attic
- Walls
- Windows, skylights and doors
- Rim joists
- Floors
- Crawl space walls
- Shafts, penetrations
- Narrow cavities
- Garage separation
- Recessed lighting
- Plumbing and wiring
- Shower / tub on exterior wall
- Electrical / phone box on exterior walls
- HVAC register boots
- Concealed sprinklers

132

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

132

Walls

- **Air Barrier Criteria**
  - The junction of the foundation and sill plate shall be sealed.
  - The junction of the top plate and the top of exterior walls shall be sealed.
  - Knee walls shall be sealed.
- **Insulation Installation Criteria**
  - Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with material having an R-value of R-3 per inch min.
  - Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.

133

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

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133

134

Image Source: https://www.jlconline.com/how-to/exteriors/sealing-the-foundation-to-the-framing_o

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Windows, Skylights and Doors

- **Air Barrier Criteria**
  - The space between window/door jambs and framing, and skylights and framing shall be sealed.
- **Insulation Installation Criteria**

136

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

136

137

137

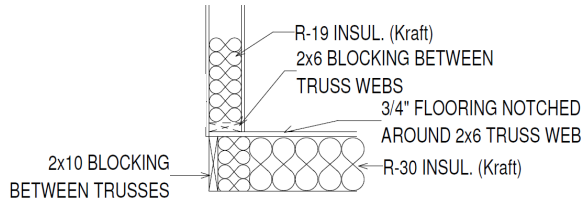
Floors

- **Air Barrier Criteria**
  - The air barrier shall be installed at any exposed edge of insulation.
- **Insulation Installation Criteria**
  - Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking, or floor framing cavity insulation shall be permitted to be in contact with the top side of sheathing or continuous insulation.

138

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

138



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ENERGY STAR Rater Checklist

4. Air Sealing (Unless otherwise noted below, "sealed" indicates the use of caulk, foam, or equivalent material)					
4.1 Ducts, flues, shafts, plumbing, piping, wiring, exhaust fans, & other penetrations to unconditioned space sealed, with blocking / flashing as needed.	☐	☐	☐	-
4.2 Recessed lighting fixtures adjacent to unconditioned space ICAT labeled and gasketed. Also, if in insulated ceiling without attic above, exterior surface of fixture insulated to ≥ R-10 in CZ 4-8.	☐	☐	☐	☐
4.3 Above-grade sill plates adjacent to conditioned space sealed to foundation or sub-floor. Gasket also placed beneath above-grade sill plate if resting atop concrete / masonry & adjacent to cond. space. [27,28]	☐	☐	☐	☐
4.4 Continuous top plate or blocking is at top of walls adjoining unconditioned space, and sealed.	☐	☐	☐	☐
4.5 Drywall sealed to top plate at all unconditioned attic / wall interfaces using caulk, foam, drywall adhesive (but not other construction adhesives), or equivalent material. Either apply sealant directly between drywall and top plate or to the seam between the two from the attic above.	☐	☐	☐	☐
4.6 Rough opening around windows & exterior doors sealed. [29]	☐	☐	☐	-
4.7 Walls that separate attached garages from occupiable space sealed and, also, an air barrier installed and sealed at floor cavities aligned with these walls.	☐	☐	☐	☐
4.8 In multifamily buildings, the gap between the common wall (e.g., the drywall shaft wall) and the structural framing between units sealed at all exterior boundaries.	☐	☐	☐	☐
4.9 Doors adjacent to unconditioned space (e.g., attics, garages, basements) or ambient conditions made substantially air-tight with weatherstripping or equivalent gasket.	☐	☐	☐	☐
4.10 Attic access panels, drop-down stairs, & whole-house fans equipped with durable ≥ R-10 cover that is gasketed (i.e., not caulked). Fan covers either installed on house side or mechanically operated. [30]	☐	☐	☐	☐

Source: https://www.energystar.gov/sites/default/files/asset/document/National%20Rater%20Field%20Checklist%20ENERGY%20STAR%20Certified%20Homes_Rev10.pdf

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Checklists Everywhere!

- IRC and above-code programs make it easy to develop a checklist of common areas to seal.
- However, not every home is achieving the same level of performance. Where is the disconnect?
  - How does a builder take this to the next level?

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Status Check: Where Are You Now?

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Don't Forget Who is Involved

- Which contractors impact overall air sealing (aside from the primary air sealing sub)?
  - Framing crew
  - MEP contractors
  - Exterior cladding/siding crew
- If a contractor is contributing to the overall airtightness of the building, do they have the materials and techniques to do this well?

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NAHB Study

- Average New Home Uses 24 Different Subcontractors
  - *"The top-line results show that subcontracting remains as common as ever, with builders on average employing two dozen different subcontractors and subcontracting out 84 percent of their construction costs in the typical home they build."*

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Source: https://www.nahb.org/-/media/NAHB/news-and-economics/docs/housing-economics-plus/special-studies/2020/special-study-average-new-home-uses-24-different-subcontractors.pdf

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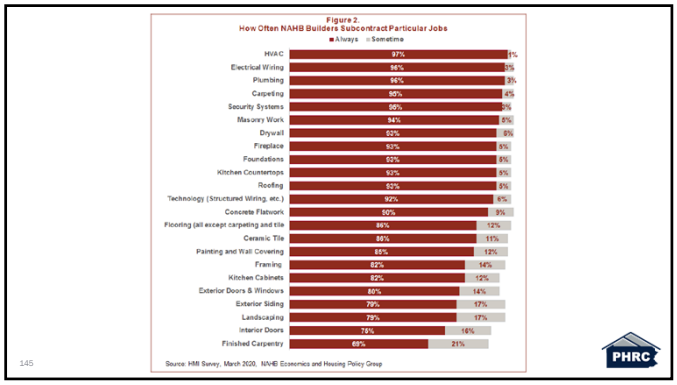
Figure 2.
How Often NAHB Builders Subcontract Particular Jobs
Always
Sometime
HVAC 97% 1%
Electrical Wiring 96% 3%
Plumbing 96% 3%
Carpeting 95% 4%
Security Systems 95% 3%
Masonry Work 94% 5%
Drywall 93% 6%
Fireplace 93% 6%
Foundations 93% 6%
Kitchen Countertops 93% 6%
Roofing 93% 6%
Technology (Structured Wiring, etc.) 92% 6%
Concrete Flatwork 90% 9%
Flooring (all except carpeting and tile 86% 12%
Ceramic Tile 86% 11%
Painting and Wall Covering 85% 13%
Framing 82% 14%
Kitchen Cabinets 82% 12%
Exterior Doors & Windows 80% 14%
Exterior Siding 79% 17%
Landscaping 79% 17%
Interior Doors 76% 16%
Finished Carpentry 69% 21%
Source: HMI Survey, March 2020. NAHB Economics and Housing Policy Group
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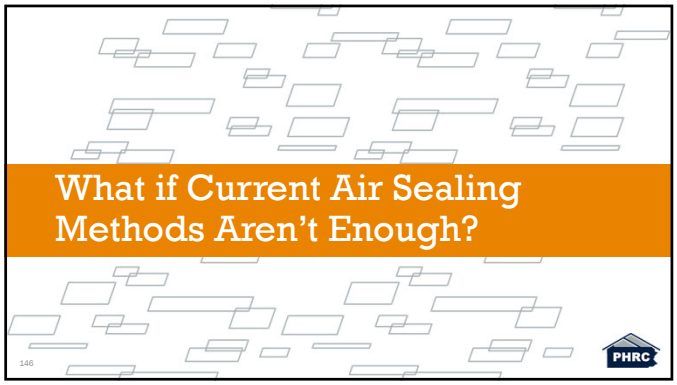
What if Current Air Sealing Methods Aren't Enough?
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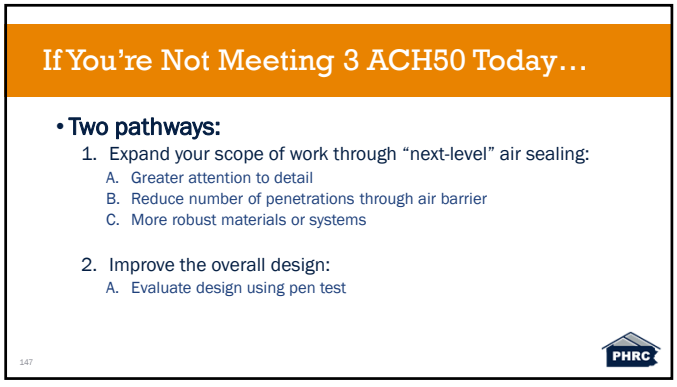
If You're Not Meeting 3 ACH50 Today…
• Two pathways:
1. Expand your scope of work through "next-level" air sealing:
A. Greater attention to detail
B. Reduce number of penetrations through air barrier
C. More robust materials or systems
2. Improve the overall design:
A. Evaluate design using pen test
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Expand Scope of Work through "Next-Level" Air Sealing

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A. Greater Attention to Detail

- In other words, keep going!
- Examples:
  - Ensure fully-aligned air barriers
  - Properly detail kneewalls and bonus rooms
  - Develop robust details at interior partitions
  - Reminder: Duct leakage outside of conditioned space = enclosure air leakage

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ENERGY STAR – Fully-Aligned Air Barriers

2. Fully-Aligned Air Barriers[7] - At each insulated location below, a complete air barrier is provided that is fully aligned as follows:				
Ceilings: At interior or exterior horizontal surface of ceiling insulation in Climate Zones 1-3; at interior horizontal surface of ceiling insulation in Climate Zones 4-8. Also, at exterior vertical surface of ceiling insulation in all climate zones (e.g., using a wind baffle that extends to the full height of the insulation in every bay or a tabbed baffle in each bay with a soffit vent that prevents wind washing in adjacent bays).[8]				
2.1 Dropped ceilings / soffits below unconditioned attics, and all other ceilings.	☐	☐	☐	☐
Walls: At exterior vertical surface of wall insulation in all climate zones; also at interior vertical surface of wall insulation in Climate Zones 4-8.[9]				
2.2 Walls behind showers, tubs, staircases, and fireplaces.	☐	☐	☐	☐
2.3 Attic knee walls and skylight shaft walls. [10]	☐	☐	☐	☐
2.4 Walls adjoining porch roofs or garages.	☐	☐	☐	☐
2.5 Double-walls and all other exterior walls.	☐	☐	☐	-
Floors: At exterior vertical surface of floor insulation in all climate zones and, if over unconditioned space, also at interior horizontal surface including supports to ensure alignment. Alternatives in Footnotes 12 & 13. [11, 12, 13]				
2.6 Floors above garages, floors above unconditioned basements or crawlspaces, and cantilevered floors.	☐	☐	☐	☐
2.7 All other floors adjoining unconditioned space (e.g., rim / band joists at exterior wall or at porch roof).	☐	☐	☐	☐

Source: https://www.energystar.gov/sites/default/files/asset/document/National%20Rater%20Field%20Checklist%20ENERGY%20STAR%20Certified%20Homes_Rev10.pdf

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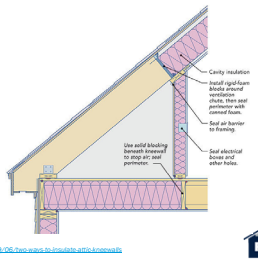
Kneewalls and Bonus Rooms

- Ensure full encapsulation of fibrous insulation
- "An insulated kneewall should be air-sealed as if it were an exterior wall."



Source: https://www.finehomebuilding.com/2012/09/06/two-ways-to-insulate-attic-kneewalls

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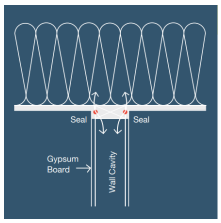
Sealing Interior Partitions

- This is often sealed at the exterior wall
- Often missed on interior partitions
- More than tape and compound needed



Source: https://insulationinstitute.org/wp-content/uploads/2019/03/NAIMA_5-Priority-Air-Sealing-Locations-for-New-Homes.pdf

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B. Reduce Number of Penetrations Through Air Barrier

- **Examples:**
  - Replace can lights with surface-mounted fixtures
  - Install service cavities or plenum spaces

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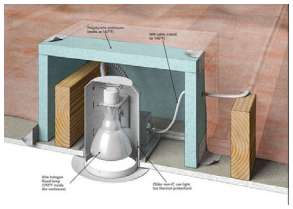
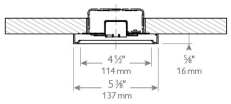
Replace Can Lights with Surface-Mounted Fixtures





Source: https://www.finehomebuilding.com/project-guides/insulation/air-sealing-can-lights-safely

Source: https://www.greenbuildingadvisor.com/article/rethinking-recessed-lighting

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Install Service Cavities or Plenum Spaces

- **"A service cavity is a "wall-within-a-wall" — a secondary wall on the inside of an exterior wall.**
  - It can be framed conventionally, using vertical 2x4s or 2x3s, or it can be created by installing horizontal 2x2 or 2x3 strapping.
  - The main purpose of a service cavity (also called a "service core") is to provide room to run wiring, plumbing, and ductwork.
  - Most proponents of service cavities recommend the installation of an air barrier between the service cavity and the wall insulation."
  - Goal: *disentangling the various functions of a wall*. – Tedd Benson

Source: https://www.greenbuildingadvisor.com/article/service-cavities-for-wiring-and-plumbing

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Install Service Cavities or Plenum Spaces

Source: https://foursevenfive.com/blog/the-service-cavity-making-airtight-construction-easy-2/

Source: https://foursevenfive.com/intello-plus/

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C. Consider More Robust Materials or Systems

- **Examples:**
  - Proprietary sealants and gaskets
  - Spray foam insulation
  - Aerobarrier
  - Many others available!

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Proprietary Sealants and Gaskets

Source: https://www.greatstuff.dupont.com/products/greatstuff-pro-gasket.html

Source: https://southern-energy.com/5-tips-build-efficient-homes/

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Spray Foam Insulation

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AeroBarrier

- AeroBarrier is an interior applied air sealing system that seals building envelope leaks up to 1/2".
- The waterborne sealant is aerosolized and injected into a pressurized home.
- The sealant is self-guided to the edges of visible and invisible leaks to create a seal by accumulating across the leak surface.

Source: https://aeroseal.com/aerobarrier/how-aerobarrier-works/

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Improve the Overall Design

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2. Better Design

- What are some ways to improve the overall design?
  - Avoid unnecessary corners, intersections, and junctions
  - Bring ductwork into conditioned space
  - Use strategies such as the "pen test" to identify challenging details

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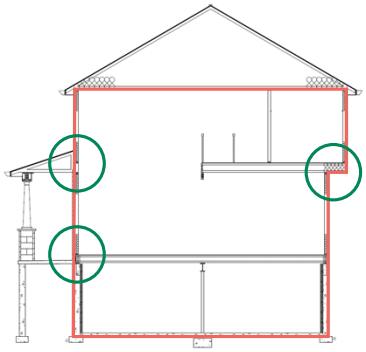
A. Pen Test

- Identify air barriers and intersections



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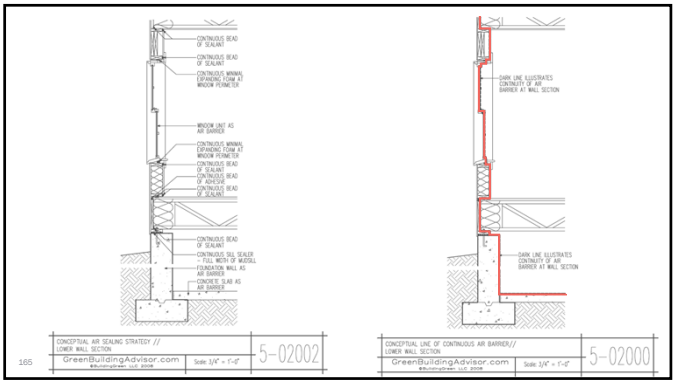

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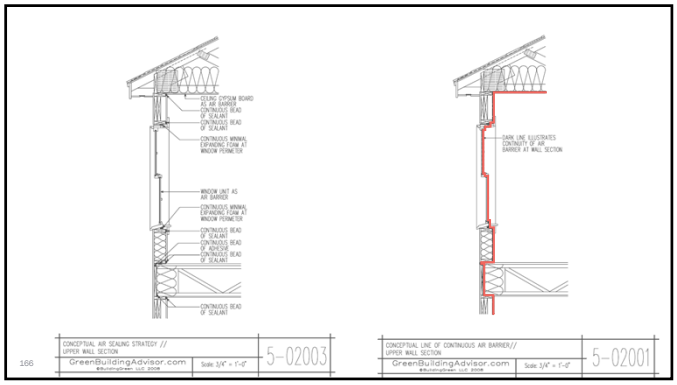

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A Note on Whole-House Mechanical Ventilation

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2018 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 a pressure of 0.2 inch w.c (50 Pa) in accordance with Section N1102.4.1.2, the dwelling unit shall be provided with whole-house mechanical ventilation in accordance with Section M1505.4.

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

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M1505.4: Whole-House Mechanical Ventilation System

- **M1505.4.1System design.** The whole-house ventilation system shall consist of one or more supply or exhaust fans, or a combination of such, and associated ducts and controls. Local exhaust or supply fans are permitted to serve as such a system. Outdoor air ducts connected to the return side of an air handler shall be considered as providing supply ventilation.

169

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

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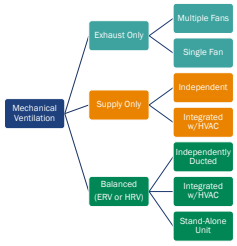
3 Design Solutions For Whole-House Mechanical Ventilation

- Exhaust-only
- Supply-only
- Balanced system



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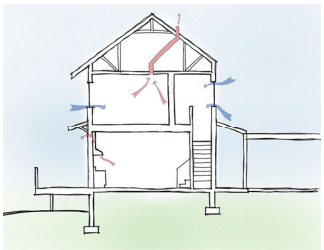
Exhaust-Only Ventilation



Source: Ventilation Requirements & Code Changes, Ventilation Science & Requirements; Hamer Center

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The Challenge

If unbalanced ventilation strategies rely on fresh air entering or exiting the home through gaps and cracks in the enclosure, what happens when fewer gaps and cracks are available?

or

If unbalanced ventilation is a common strategy but builders must tighten up enclosures per new codes, when does this strategy reach its limit?

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Other Resources

- https://www.greenbuildingadvisor.com/article/air-sealing-an-attic
- https://www.greenbuildingadvisor.com/green-basics/air-barriers
- https://www.greenbuildingadvisor.com/article/questions-and-answers-about-air-barriers

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Questions?

www.phrc.psu.edu

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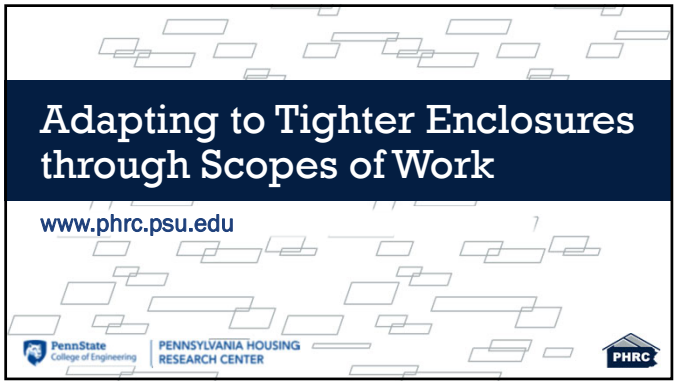
Adapting to Tighter Enclosures through Scopes of Work
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