Beyond Prescriptive: Evaluating Energy Code Compliance Paths

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Description

Energy code requirements continue to introduce challenges and complexity to the residential construction industry. As building professionals continue to weigh options to achieve code compliance, the various energy code compliance paths that are written into the PA Uniform Construction Code (UCC) should be considered. This webinar will focus on the varying levels of "performance" paths that are available to permit applicants in the UCC. The scope of this webinar will range from simulated performance to ERI pathways while using case studies to illustrate the options available within these pathways.

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Learning Objectives

1. Examine the energy code compliance paths currently available to permit applicants in the UCC.
2. Discuss the benefits of choosing performance pathways including simulated performance and the ERI path.
3. Understand the performance and cost implications of electing to pursue performance pathways.
4. Identify future code implications on available energy code compliance pathways.

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Background

Michael Arblaster

Harmony Home Energy

- RESNET Certified HERS Rater
- ICC Commercial/Residential Energy Inspector
- BPI Certified Building Analyst
- LEED Green Associate
- EPA 608 Universal Certified

- Associates of Applied Science HVAC
- Bachelors Marketing
- Masters Sustainable Systems & High Efficiency Buildings

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Today's Agenda

- Energy Code Compliance Pathways
- Focus on R405 Performance Path
- Pursuing Performance by Stage of Construction
- Future Code Implications

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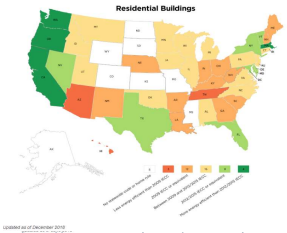
PA Code Change - 2018

- 2009 to 2015 I-Codes
- Date of change: October 1, 2018
- Homes entered into contract prior to October 1, 2018 will have 180 days to begin construction under the prior code



https://www.energycodes.gov/state-portal

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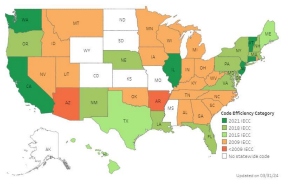
PA Code Change - 2022

- 2015 to 2018 I-Codes
- Date of change: February 1, 2022
- Homes entered into contract prior to February 1, 2022 will have 180 days to begin construction under the prior code

State: Pennsylvania
Adopted State Residential Code: 2018 IECC with amendments
Efficiency Impact of Amendments (vs. model adopted code): -0.6%
Residential Code Efficiency Category: 2018 IECC



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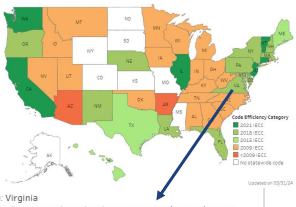
Code Change – 2025

- 2018 to 2021 I-Codes
- **RAC Deliberation starts now. May 2nd, 2024**
- Estimated Date of change: July 13, 2025
- Homes entered into contract prior to July 13, 2025 will have (180 Days) until January 13, 2026 to begin construction under the prior code



State: Virginia
Adopted State Residential Code: 2021 IECC with amendments
Efficiency Impact of Amendments (vs. model adopted code): -12.8%
Residential Code Efficiency Category: 2018 IECC

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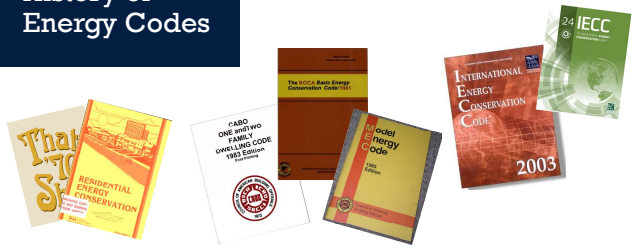
History of Energy Codes



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2018 IECC - R401.2 Compliance

Projects shall comply with one of the following:

1. Sections R401 through R404.

2. Section R405 and the provisions of Sections R401 through R404 labeled "Mandatory."

3.An energy rating index (ERI) approach in Section R406.

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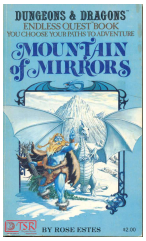
Compliance Approaches

Approach 1: Prescriptive Paths

- What does code prescribe, piece by piece? (walls, doors, windows, ceiling)
- IECC Sections R401.1 through R404.5 (including a Total UA RESCHECK)
- 2018 PA Alternative

Approach 2: Performance Paths

- How does the home perform, as a system? (overall energy performance)
- IECC Sections R405 and R406
- Uses Computer Simulation Software (REM/Rate or Ekotrope)



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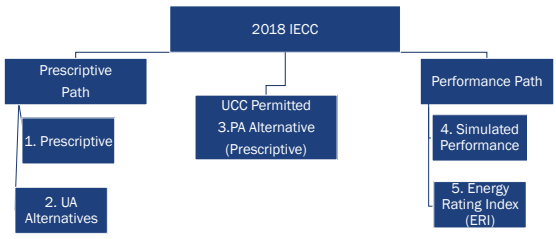
Compliance Pathways



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2018 IECC Performance Backstops

4.) R405 - Simulated Performance

- Backstop - 2006 IECC Prescriptive

5.) R406 - Energy Rating Index

- Backstop - 2009 IECC Prescriptive

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Similarities

- Efficiency
- Durability
- Health

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Differences

Prescriptive
- Labels and Tables

Performance
- Tests, Measurements and Installation Verification

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SECTION R405 SIMULATED PERFORMANCE ALTERNATIVE (PERFORMANCE)

- Section R405 requires demonstrating through simulated performance
- Proposed design ≤ Prescriptive and Mandatory—requirements of Sections 401 through 404
- Flexibility to show that the proposed residence meets the overall code requirement.

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SECTION R405 SIMULATED PERFORMANCE ALTERNATIVE (PERFORMANCE)

- **Proposed Design**
  - Building as it is proposed to be built
- **Standard Reference Design**
  - Building configuration and orientation same as the proposed design
  - Includes the minimum requirements of the code for Envelope / Mechanicals / Water Hearing
  - Does not include Lighting / Appliance Efficiency / Service Water Distribution)

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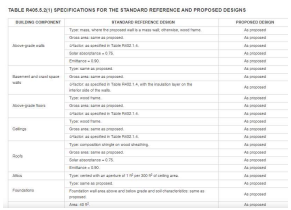
Trade-offs 21 Items

- **5** - Same as Design Reference
- **6** – Reference Table R402.1
- **5** – Mechanicals and Measuring Air
- **5** – Orientation, Windows, Roofs, Attics, Structural Mass



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FIVE

Items Reference matches Proposed Design

- Foundations (Type and relationship to grade)
- Internal Gains (People / Appliances)
- Internal Mass (Couch / Waterbed)
- Service Water Heating (Size and EF)
- Thermostat (Setpoints)

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Reference the Prescriptive Table R402.1.4

- Basement and crawlspace walls
- Above Grade Walls
- Above Grade Floors
- Ceilings
- Opaque Doors (40 sf / oriented North)
- Windows (but there's more)

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Items deal with Mechanicals and Air Testing

- Mech Ventilation & Flow Rate Testing
- Heating System
- Cooling System
- Thermal Distribution System & Duct Testing
- Infiltration / Blower Door Testing

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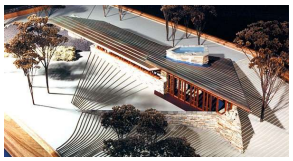
Vertical Fenestration (Windows)



- Total Area
- Orientation
- SHGC
- U-Factor
- Interior Shading Fraction
- Exterior Shading

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Roofs and Attics

- Roofs - Shingles on Wood
- Absorptance 0.75
- Attics **(Vented – Could be sealed)**

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Skylights

- Pretty much always hurt performance
- Desing Reference has none
- Shaft walls are considered walls to attic

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Thermally Isolated Sunrooms

- Provide a buffer unconditioned space
- Can Help in Cold Climate

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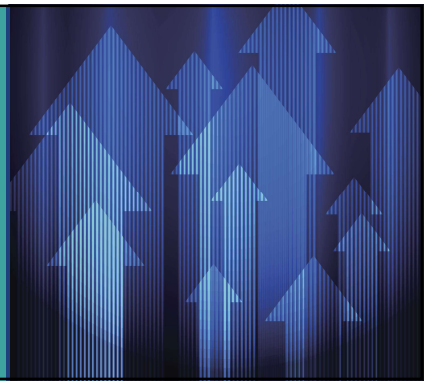
Performance Path at Stages of Construction



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Verification

1	2	3	4
Quality of insulation installation (Insulation Grading)	Ducts (Total Leakage vs to Outside)	Ventilation (Measured Air Flow Rate and Fan Wattage)	Infiltration (Better or Worse than 3 ACH50)

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Design (Plan Review) Energy Model

- Alterative to prescriptive insulation
  - Backstop is 2006 IECC
- Duct Testing
  - Large House with some duct in attic
  - Small house difficult to meet leakage

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Pre-Drywall for Performance

- Fully Aligned Air Barrier
- Insulation Grading and Verification
- Ducts Installation and Insulation
- Ventilation Duct Installation

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Final Testing

- Infiltration (Blower Door)
- Duct Leakage to Outside
- Mechanical Ventilation

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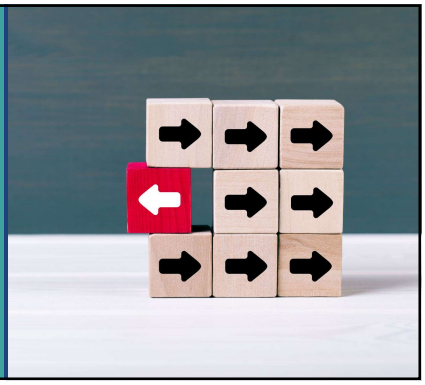
Can you change path part way?

Answer: NO ?



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Future Code Implications – IECC 2021 Considerations

- Alternative to Continuous Insulation
- Additional 5% Reduction with Performance
- Performance Backstops
- Possible Tradeoffs for 3 ACH50

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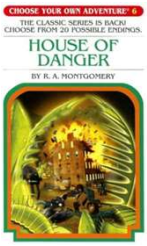
Benefits of Simulated Performance

- Flexibility
  - Lower Performance in one area
  - Higher Performance in another
- Reduced Costs
- Quality Assurance
  - Peace of mind
  - Reduced call backs



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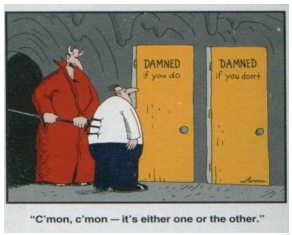
Drawbacks to Simulated Performance

- More time upfront involved in energy model
- Additional Field Verification
- Learning Curve & Cost



"C'mon, c'mon — it's either one or the other."

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