U.S. Department of Energy
Building Energy Codes Program

2024 National Energy Codes Conference
May 8, 2024
Sacramento, CA

Third Parties and Residential Energy Code Compliance

AIA Provider # 1014
AIA Course # 24NECC-D2S5

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Course Description

This session explores the effective use of residential third-party professionals in the design, construction and enforcement processes to achieve compliance with modern energy codes (e.g., 2021 International Energy Conservation Code). Attendees will explore the roles of third parties and the benefits of using these professionals in the code compliance process; discuss the concerns, challenges and successes of third parties from the Code Official's perspective; and explore how third parties are used to verify code compliance while also meeting the needs the jurisdictions they serve. This session will offer insights on best practices and lessons learned with the goal of enhancing the relationship and communication between third parties and Code Officials.

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Learning Objectives

Identify the roles of common third parties in energy code compliance and the code provisions within the IECC that require or allow the use of third parties.

Describe how third parties enhance code compliance in rural and other areas.

Examine common questions, concerns, and lessons learned from Code Officials using third parties for energy code compliance.

Integrate best practices and improved processes into energy code enforcement to enhance the relationship between third parties and Code Officials.

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Third Parties and Residential Energy Code Compliance

Based on the *International Energy Conservation Code*® (IECC®)

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TIME
FOR
INTRODUCTIONS

GOAL & OBJECTIVES

This session explores the effective use of residential third-party professionals in the design, construction and enforcement processes to achieve compliance with modern energy codes.

1) Identify the roles of common third parties in energy code compliance and the code provisions within the IECC that require or allow the use of third parties
2) Describe how third parties enhance code compliance in rural and other areas
3) Examine common questions, concerns, and lessons learned from Code Officials using third parties for energy code compliance
4) Integrate best practices and improved processes into energy code enforcement to enhance the relationship between third parties and Code Officials

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REALITY CHECK

Why Does This Matter?

- Energy code compliance is increasingly complex
- Jurisdictions may lack resources for energy code compliance
  - Staff
  - Time
  - Equipment
- Third parties are available to verify energy code compliance and continue to be an effective resource for jurisdictions

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COURSE OUTLINE

- Roles of third parties in the IECC
- Circuit riders and other third parties in rural areas
- HERS raters and energy code compliance
- Third parties from the Code Official's perspective
- Discussion

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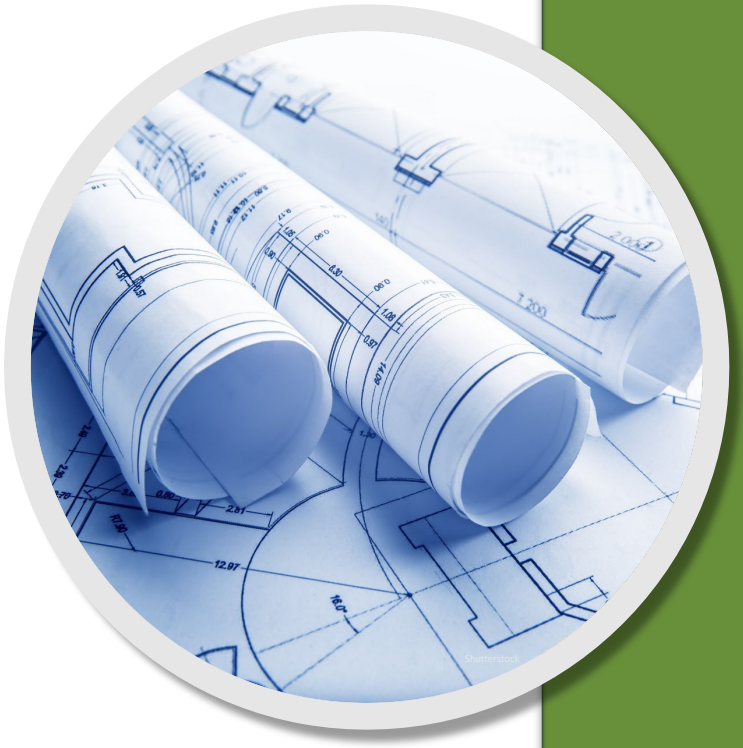
Third Parties

Overview of the roles third parties serve within the IECC



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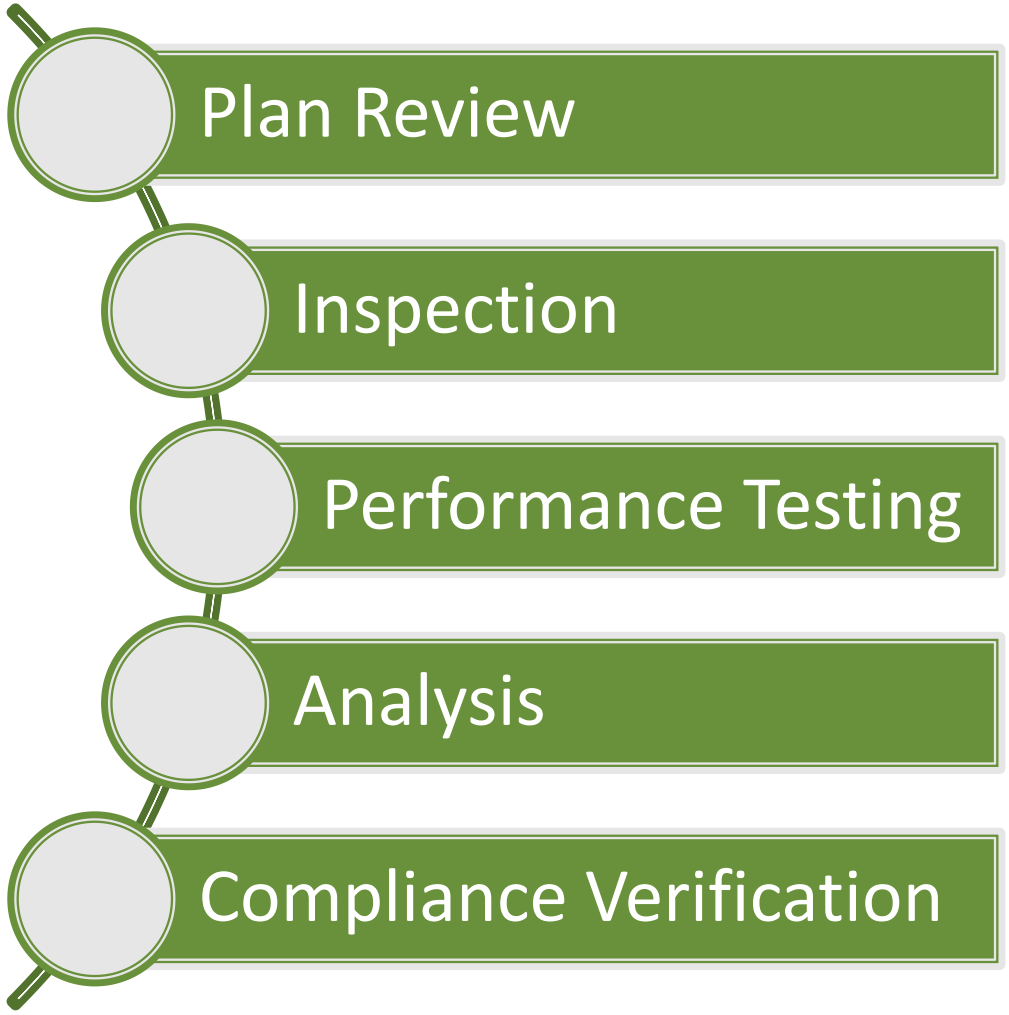
What is a third party?

An individual or company without a vested interest in the project



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Definitions to consider

Approved	Acceptable to the *code official.*
Approved Agency	An established and recognized agency that is regularly engaged in conducting tests, furnishing inspection services, or furnishing product certification, where such agency has been *approved* by the *code official*.

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Who are these professionals?

Registered Design Professionals

Building Performance Specialists

Duct and Envelope Tightness Verifiers

Energy Raters

Material Suppliers

Private Providers

Circuit Riders

Who Else?

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Third Parties in the IECC – Administration and Enforcement

- **R103.3 Examination of documents**
- Approved entity not affiliated with the building design or construction may review plans and specifications for compliance

Plan Review

- **R107.4 Approved third-party inspection agencies**
- Not affiliated with the building design or construction
- Approved qualifications and reliability relevant to the building components and systems they are inspecting or testing

Inspection

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Approved Third-Party Inspection Agencies

- Independence
- Equipment
- Personnel
- Delegated Authority
- Reporting

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Third Parties in the IECC – Building Thermal Envelope

- Air Leakage
  - **R402.5.1.1 Installation**
  - *Approved* third party may inspect all components and verify compliance

~~TABLE R402.4.1.1~~TABLE R402.5.1.1
AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION[a]

COMPONENT	AIR BARRIER, AIR SEALING CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building thermal envelope. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	~~The~~An air barrier shall be installed in any dropped ceiling or soffit to separate it from unconditioned space. ~~shall be aligned with the insulation and any gaps in the air barrier shall be sealed~~. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed with gasketing materials that allow for repeated entrance over time.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier. Access hatches and doors shall be installed and insulated in accordance with **{ Section R402.2.5 }**. Eave baffles shall be installed in accordance with **{ Section R402.2.4 }**.
Walls	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.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, *R*-value, of not less than R-3 per inch. Exterior building thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.
Knee wall	Knee walls shall have an air barrier between conditioned and unconditioned space	Insulation installed in a knee wall assembly shall be installed in accordance with **{ Section R402.2.3 }**. Air-permeable insulation shall be enclosed inside an air barrier assembly.
Windows, skylights and doors	~~The space~~The rough opening gap between framing and the frames of skylights, ~~and the jambs of~~ windows and doors, shall be sealed in accordance with fenestration manufacturer's instructions.	Insulation shall not be required in the rough opening gap except as required by the fenestration manufacturer's instructions.

partial table

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Third Parties in the IECC – Building Thermal Envelope

- Air Leakage
  - R402.5.1.2 Air leakage **testing**
  - *Approved* third party may conduct air leakage test
  - Requires written report
- Heated attached and detached garages
  - Exempt from testing
  - *Approved* third party independent from the installer may inspect air barrier and insulation installation criteria

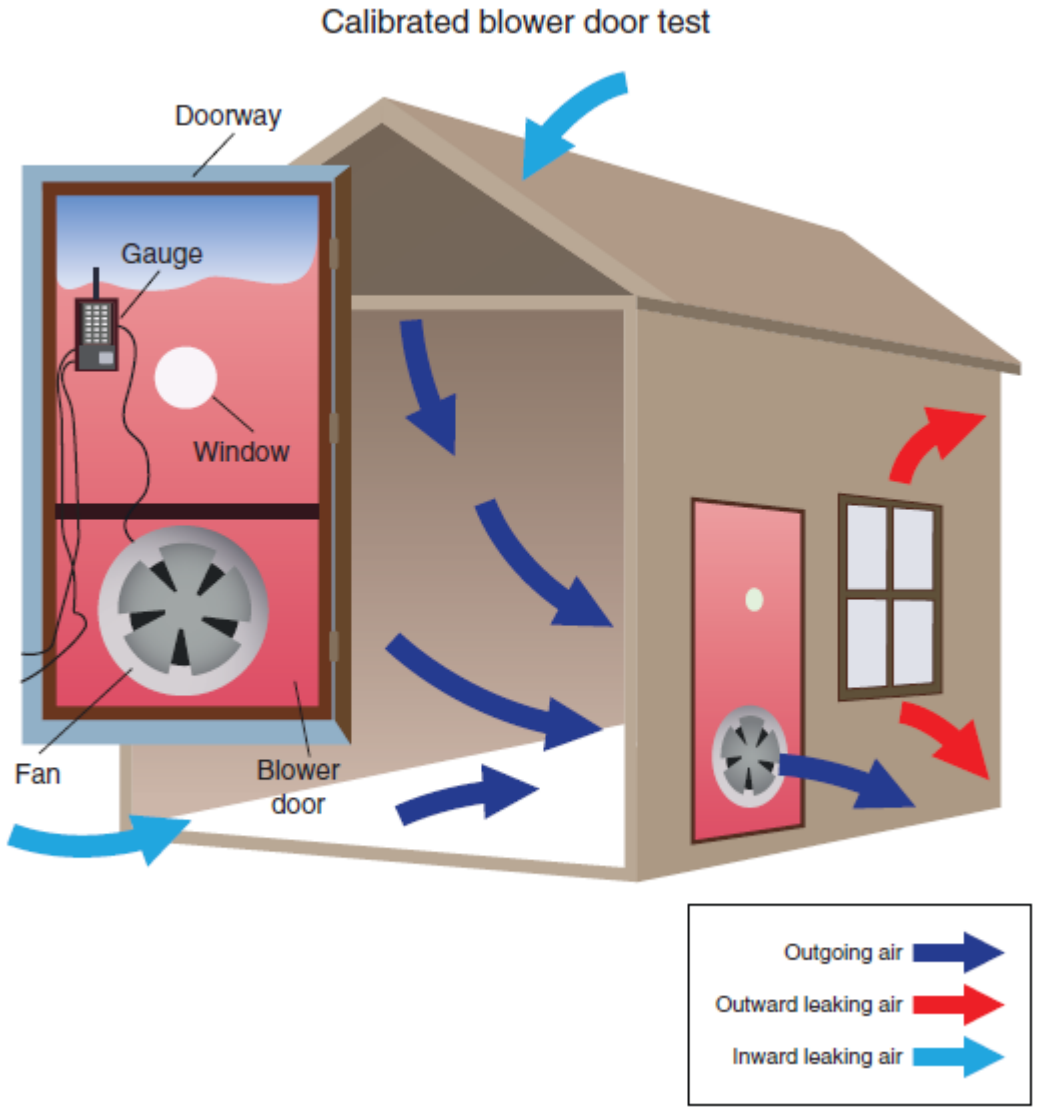

Photo courtesy of Building Performance Institute Inc.

Third Parties in the IECC – Duct Testing

- Duct Testing
  - R403.3.7 **Duct System Testing**
  - Third party not specifically called out, but often turned to for testing
  - Requires written report

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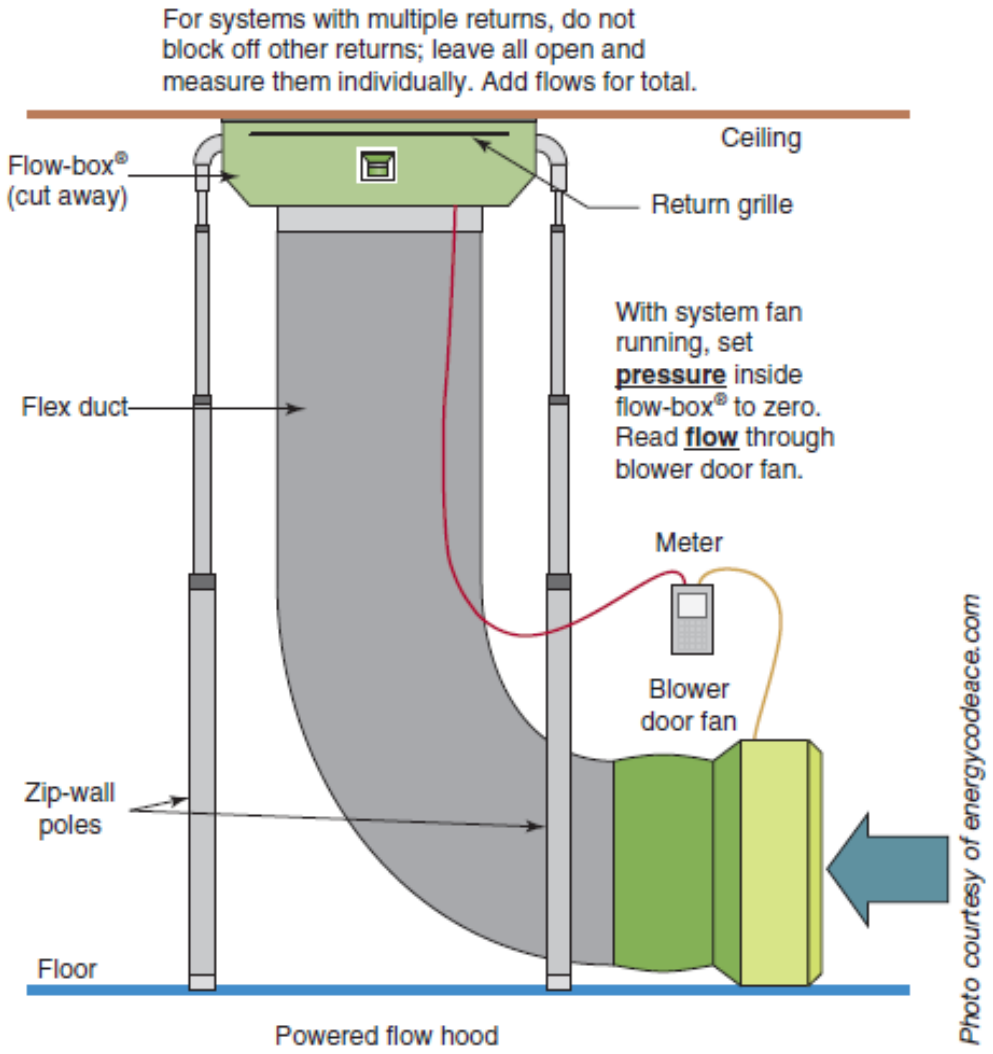
Third Parties in the IECC – Building Systems



- Mechanical ventilation testing
  - **R403.6.3 Testing**
  - *Approved* third party may conduct testing of mechanical ventilation systems
    - Whole-house ventilation and spot (local) ventilation
  - Requires written report

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Third Parties in the IECC – Total Building Performance

- Compliance documentation
  - **R405.3 Documentation**
  - Analysis
    - Two compliance reports required
      - Initial with permit application
      - Final for Certificate of Occupancy
  - Performance testing required in Table R405.2

TABLE R405.2
REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE

SECTION[a]	TITLE
General	
R401.2.5	Additional energy efficiency
R401.3	Certificate
Building Thermal Envelope	
R402.1.1	Vapor retarder
R402.2.3	Eave baffle
R402.2.4.1	Access hatches and doors
R402.2.10.1	Crawl space wall insulation installations
R402.4.1.1	Installation
R402.4.1.2	Testing
R402.5	Maximum fenestration *U*-factor and SHGC
Mechanical	
R403.1	Controls
R403.3, including R403.3.1, except Sections R403.3.2, R403.3.3 and R403.3.6	Ducts
R403.4	Mechanical system piping insulation
R403.5.1	Heated water circulation and temperature maintenance systems
R403.5.3	Drain water heat recovery units
R403.6	Mechanical ventilation

partial table

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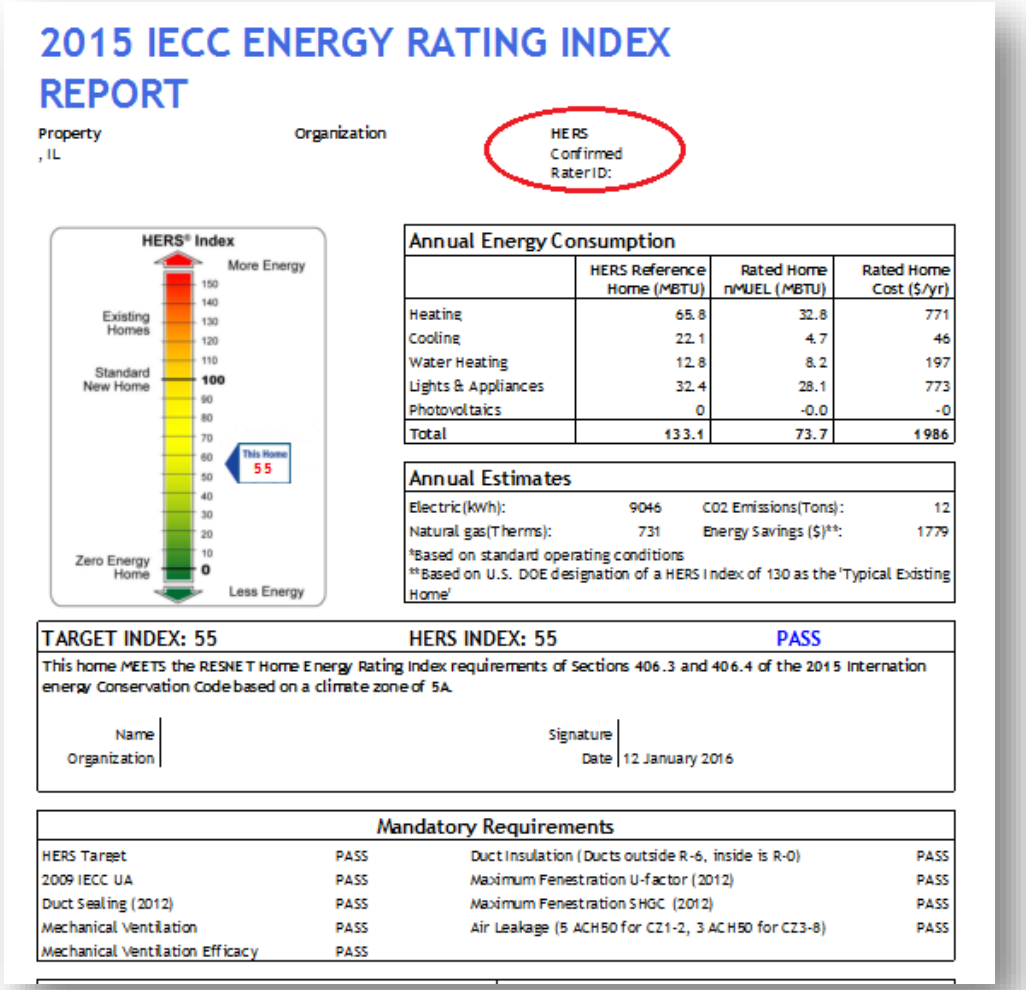
Third Parties in the IECC – Energy Rating Index



2015 IECC ENERGY RATING INDEX REPORT

Property
, IL

Organization

HERS Confirmed Rater ID:

HERS® Index

More Energy

Existing Homes

Standard New Home

Zero Energy Home

Less Energy

This Home 55

Annual Energy Consumption	HERS Reference Home (MBTU)	Rated Home nMUEL (MBTU)	Rated Home Cost ($/yr)
Heating	65.8	32.8	771
Cooling	22.1	4.7	46
Water Heating	12.8	8.2	197
Lights & Appliances	32.4	28.1	773
Photovoltaics	0	-0.0	-0
Total	133.1	73.7	1986

Annual Estimates

Electric (kWh):	9046	CO2 Emissions (Tons):	12
Natural gas (Therms):	731	Energy Savings ($)**:	1779

*Based on standard operating conditions
**Based on U.S. DOE designation of a HERS Index of 130 as the 'Typical Existing Home'

TARGET INDEX: 55 HERS INDEX: 55 PASS

This home MEETS the RESNET Home Energy Rating Index requirements of Sections 406.3 and 406.4 of the 2015 Internation energy Conservation Code based on a climate zone of 5A.

Name
Organization

Signature
Date 12 January 2016

Mandatory Requirements			
HERS Target	PASS	Duct Insulation (Ducts outside R-6, inside is R-0)	PASS
2009 IECC UA	PASS	Maximum Fenestration U-factor (2012)	PASS
Duct Sealing (2012)	PASS	Maximum Fenestration SHGC (2012)	PASS
Mechanical Ventilation	PASS	Air Leakage (5 ACH50 for CZ1-2, 3 ACH50 for CZ3-8)	PASS
Mechanical Ventilation Efficacy	PASS		

- Compliance documentation
  - **R406.6 Verification by approved agency**
  - Compliance with ERI path requires third party verification
    - Documentation and analysis
  - Approved third party may be used to verify compliance with R406.2
    - Table of mandatory requirements
    - Maximum ERI score

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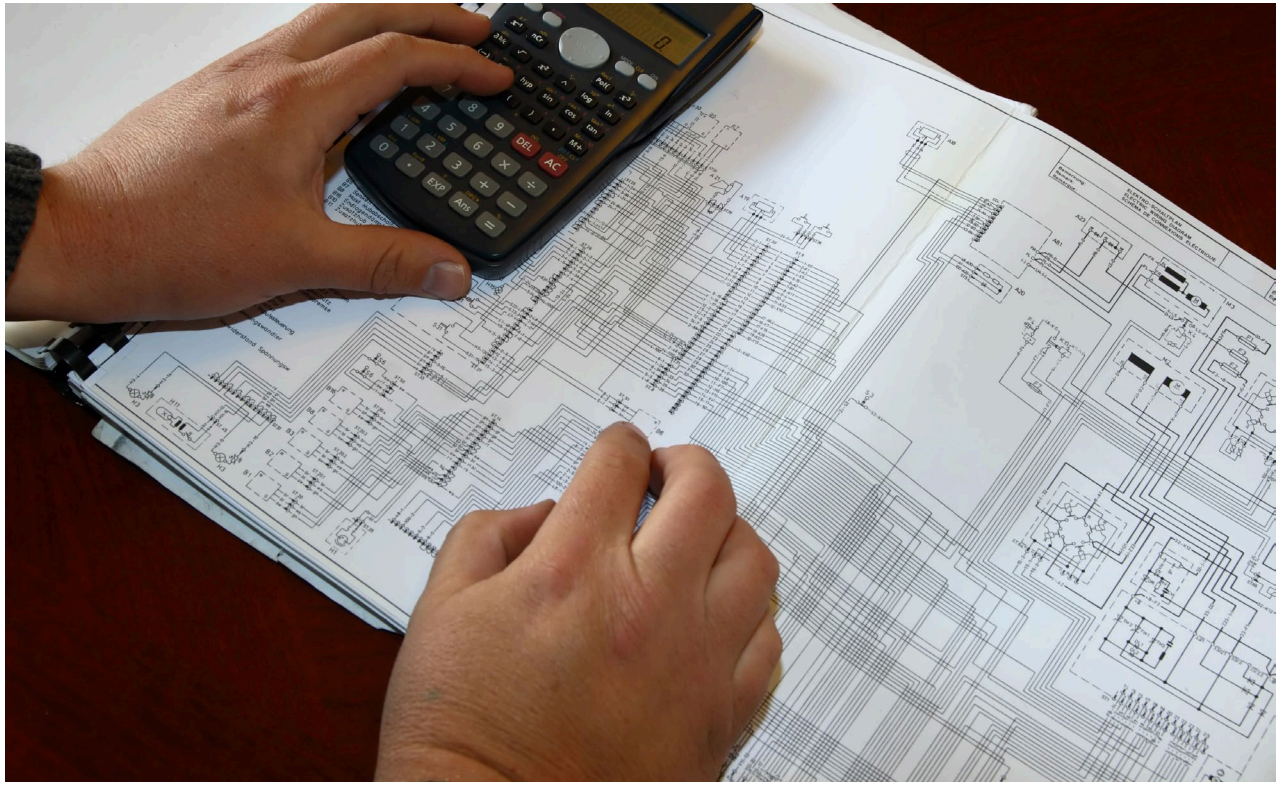
Third Parties in the IECC – Other Services

- Manual J, D and S preparation
- Specifying code compliant products
- Documentation
- Others?



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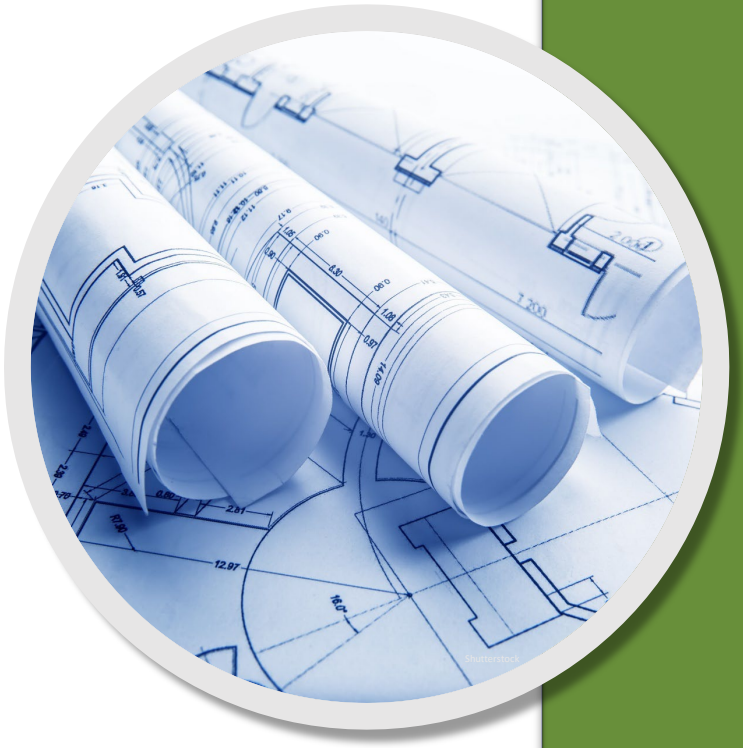
Rural Areas

The role of circuit riders and other third parties



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Not Everyone Has Time, Or A Backup

- Most rural departments end up being one-person-shops
- Many can't leave without shutting everything down
- You have to go to them
  - In-person
  - Virtually
  - By phone
  - By email

We'll Come To You

- Sit with them for a day
- Inspect with them for a day
- Plan review with them for a day
- Write codes with them for a day

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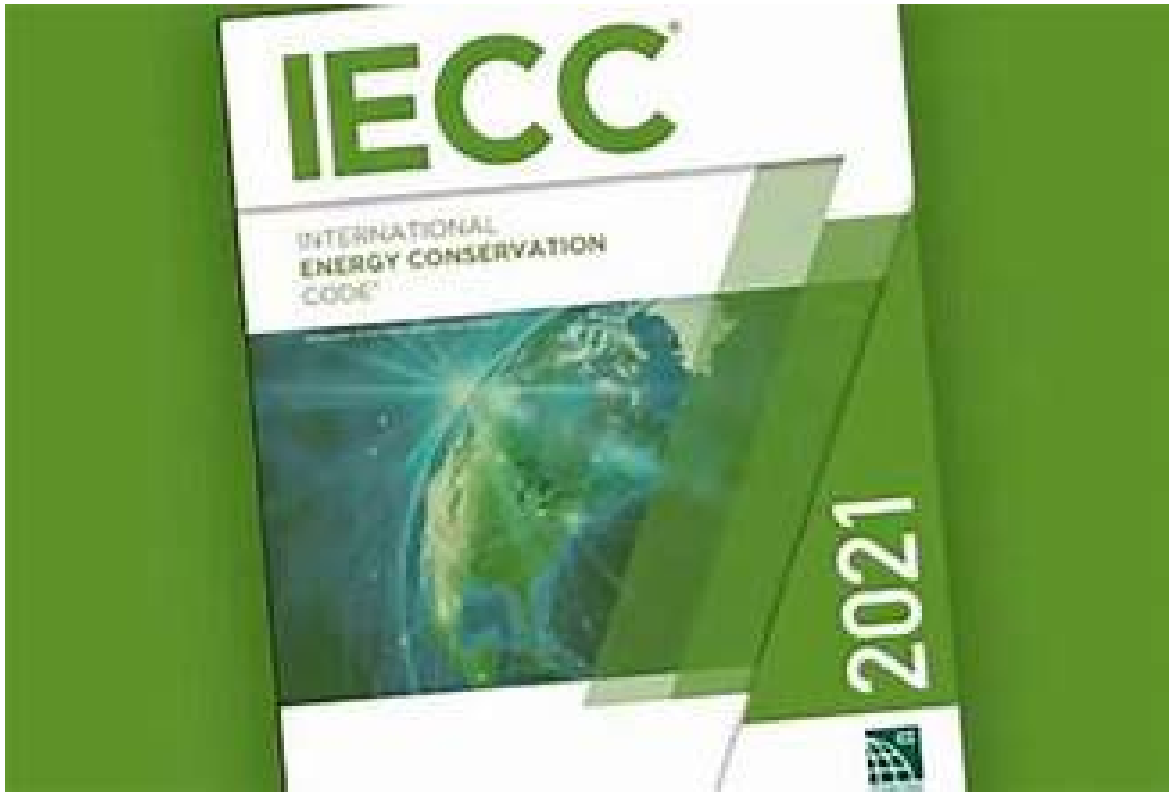
Meeting Their Needs

- Code Training
- Resources
- Surveys
- Code Adoption Assistance
- Phone a friend

Once it isn't so scary, the code starts getting enforced

Better Compliance Together



Discussion

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HERS Raters

The role of HERS Raters in energy code compliance

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What is a HERS Rater?

An individual who is certified by an accredited Rating Provider to inspect and test a home in order to evaluate each of the minimum rated features and complete a Home Energy Rating according to the RESNET Standards.

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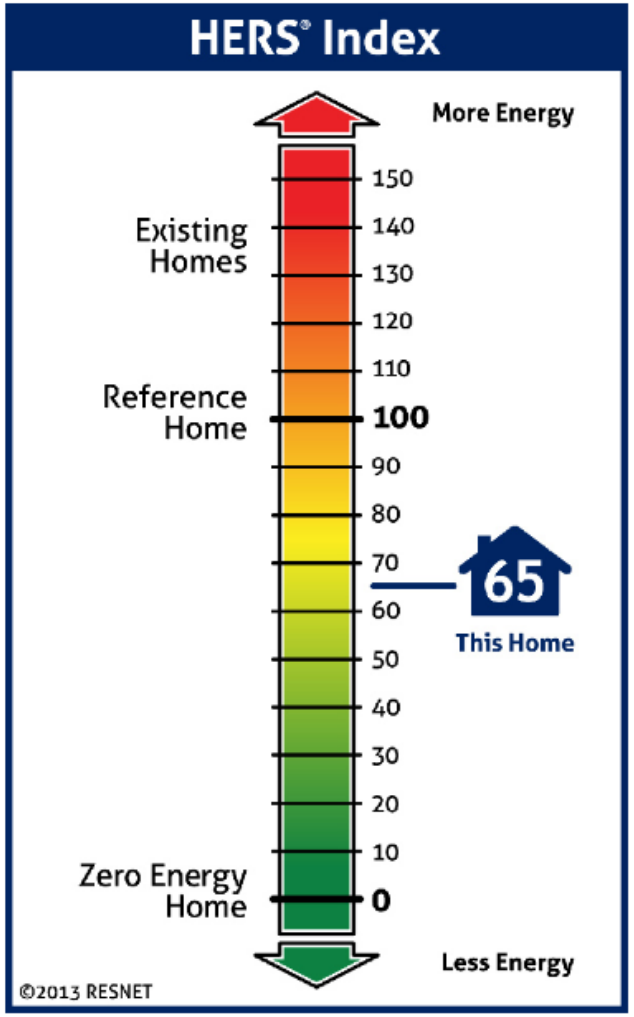
What is a HERS Rating?

Determines the efficiency of a home based on type and efficiency of components and appliances

- Exterior walls
- Floors over unconditioned spaces
- Ceilings and roofs
- Attics, foundations and crawlspaces
- Windows and doors, vents and ductwork
- HVAC and water heating systems
- Air leakage of the home
- Leakage in the heating and cooling distribution system



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Energy Rating Index (ERI)

- ERI Compliance Alternative
- HERS rating permitted as ERI score
- Home must meet ERI score AND Table R406.2

- HERS Raters also are often the vendor providing compliance documentation for R405 (Performance), as well as performance testing results.

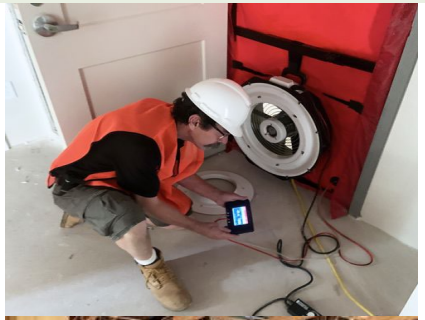
TABLE R406.2
REQUIREMENTS FOR ENERGY RATING INDEX

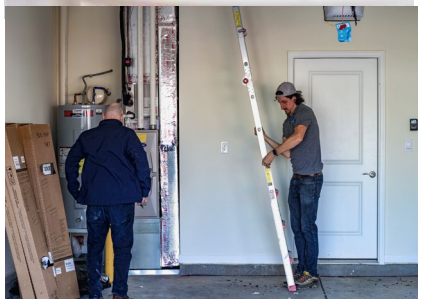
SECTION[a]	TITLE
General	
R401.2.5	Additional efficiency packages
R401.3	Certificate
Building Thermal Envelope	
R402.1.1	Vapor retarder
R402.2.3	Eave baffle
R402.2.4.1	Access hatches and doors
R402.2.10.1	Crawl space wall insulation installation
R402.4.1.1	Installation
R402.4.1.2	Testing
Mechanical	
R403.1	Controls
R403.3 except Sections R403.3.2, R403.3.3 and R403.3.6	Ducts
R403.4	Mechanical system piping insulation
R403.5.1	Heated water calculation and temperature maintenance systems
R403.5.3	Drain water heat recovery units
R403.6	Mechanical ventilation
R403.7	Equipment sizing and efficiency rating
R403.8	Systems serving multiple dwelling units
R403.9	Snow melt and ice systems
R403.10	Energy consumption of pools and spas
R403.11	Portable spas
R403.12	Residential pools and permanent residential spas
Electrical Power and Lighting Systems	
R404.1	Lighting equipment
R404.2	Interior lighting controls
R406.3	Building thermal envelope

a. Reference to a code section includes all of the relative subsections except as indicated in the table.

Types of RESNET Professionals

- Home Energy Rating Systems (HERS Rater)
- Rating Field Inspector (RFI)
- HERS Modeler (Modeler)
- Quality Assurance Designee





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Quality Assurance

How Does RESNET Provide for Quality Assurance within the Rating Industry?

- Each Rating Provider must employ a certified Quality Assurance Designee (QAD).
- The Quality Assurance Designee must independently verify internal consistency of a minimum 10% of all building input files.
- The QAD must independently field verify the accuracy of a minimum of 1% of each certified Raters' homes for compliance, including field and file results.
- RESNET monitors the Rating Providers compliance with quality assurance requirements through annual quality assurance report submissions from each Rating Provider.
- RESNET Staff also does enhanced quality assurance monitoring with 50% of all rating providers each year through online reviews and in-field site visits.
- Tracking QA reviews in real time in the RESNET Registry

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https://youtu.be/ylhTRNCHAoY

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Discussion

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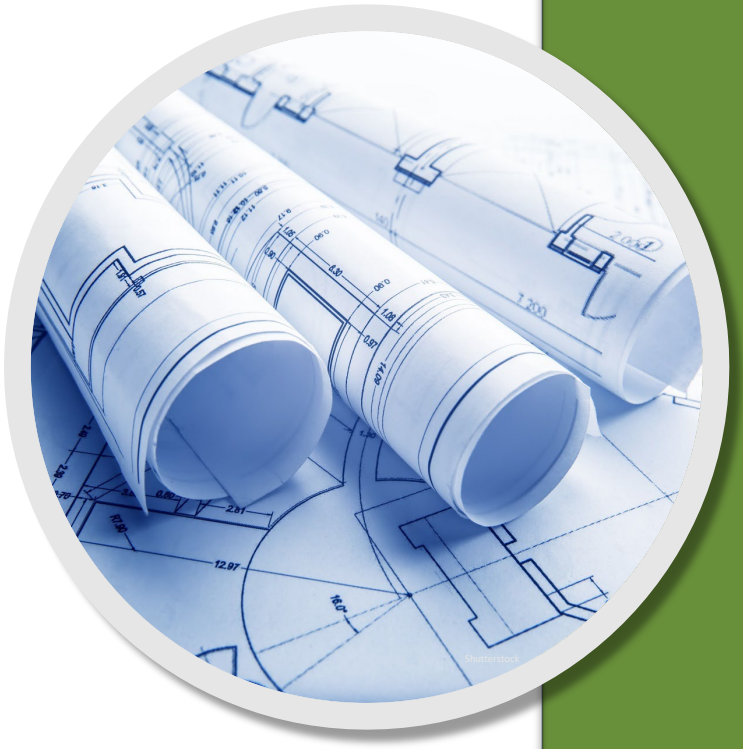
The Code Official's Perspective

Best practices, improved processes, potential digital solutions



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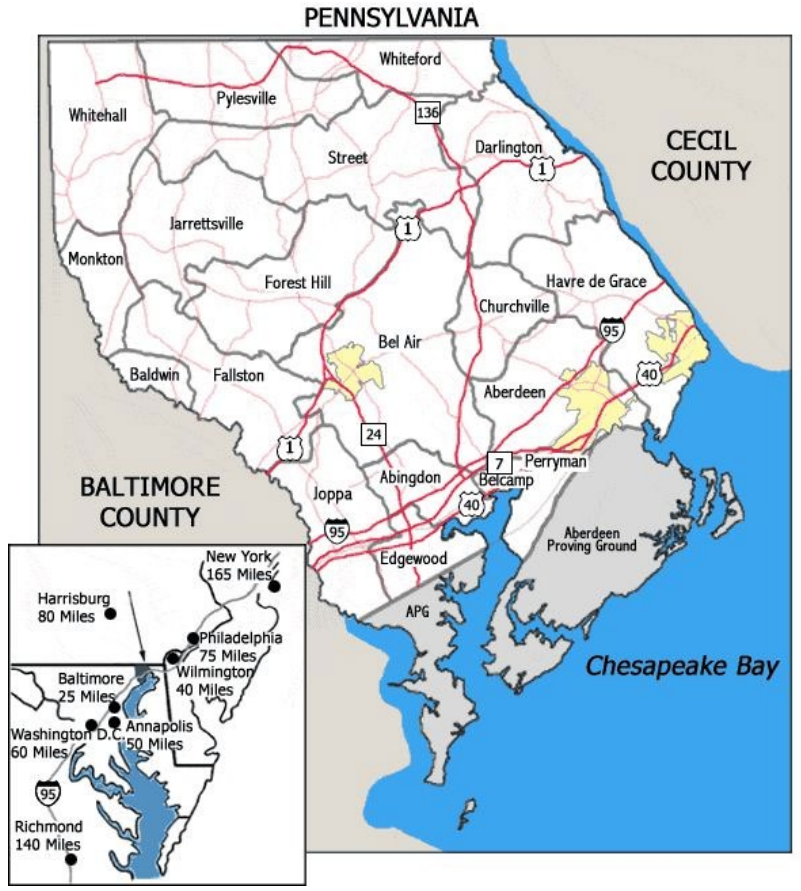
Harford Demographics

- Population = 263,867
- Area = 527 m2
- Building Permits = 2,017 FY23
- Provide service to 3 municipalities.
- 14,338 Building Inspections FY 23.
- 5 Inspectors, 1 Division Chief, 3 Plan Reviewers.
- Enforcing 2018 I-Codes. 2021 I-Codes Effective May 29,2024.



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Develop New or Update Existing Policies

Best Practices

- Develop policies on the approval and acceptance of third-party inspectors
- Develop policies on criteria required to be part of third-party inspection report contents
- Collect, distribute and document
- Implement communication portals

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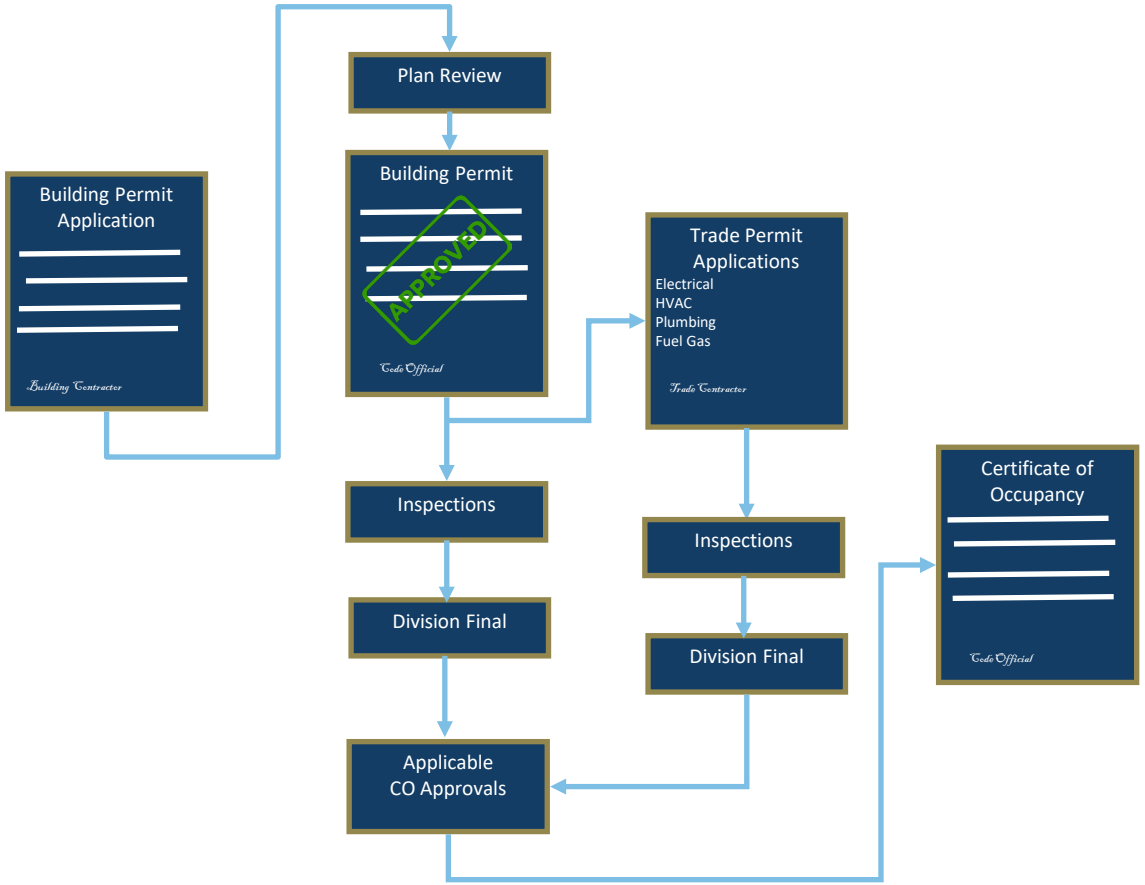
Permit Workflow

From Building Permit Application to Issuance of Certificate of Occupancy



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Compliance and Testing Documents

Approved Third Parties

1. An architect licensed by the Maryland State Board of Architects,
2. an engineer licensed by the Maryland State Board of Professional Engineers, or
3. an entity issued credentials relative to the subject matter being certified by an accreditation body where the accrediting body is independently verified through a formal independent verification process, validating that the program or institution meets established quality standards and is competent to carry out specific conformity assessment tasks. Conformity assessment tasks may include, but are not limited to, compliance design, testing, inspection, or certification.

Permitting and CO Compliance Reports

- Permitting Compliance Reports and CO Compliance Reports required by Sections R405.3 and R406.7 shall be completed by an approved third party and shall be generated from approved software. Submitted reports shall include the original signature of the certified or licensed individual generating the report, their printed name, their applicable certification or license number issued by the accrediting or licensing entity, and date of signature.

Building Thermal Envelope Air Leakage Testing, Duct Pressure Testing and Mechanical Ventilation Testing

- All third-party reports submitted to the Department shall be a complete automated testing report produced from the testing equipment manufacturer. All submitted reports shall also include the certified or licensed individuals' signature, printed name, the applicable certification or license number by the accrediting or licensing entity, and signature date.

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Ensure Third Parties Meet Established Credentials

- Third parties have qualifications specific to the services they provide

Qualifications Example: Building performance specialists

One or more of the following:

- RESNET HERS certification
- RESNET Quality Assurance Designee
- BPI Building Analyst certification
- ENERGY STAR Home Performance Contractor
- LEED for Homes certification
- DET Verification or similar certification

- Experienced in modeling, load calculations, code-related software
- Building science and compliance expertise

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Identify Third Parties and Know Where to Find Them

Registry Example: Online Databases

Find a HERS Rater on the RESNET website: https://www.hersindex.com/find-a-hers-rater/

Find a Building Performance Specialist on the BPI website: https://www.bpi.org/locator-tool

Verify architect and engineer licenses and registrations on state websites

- Create a master list of qualified third parties in your jurisdiction.
  - Certified professionals are typically listed in a registry, or their professional credentials are available online.
  - Ask for referrals from others.
  - Ask for references.
  - **Liability/Accountability and accuracy of reporting?**

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Expand Permit Database

- Include fields to record compliance documentation
  - Compliance path
  - Compliance results
  - Additional energy features selected from R408

- Harford County is developing additional information fields
  - Collect data at the building permit stage with intent to map that data to trade permits as applicable
  - Establish internal validation process. Include reporting to identify mismatched data
  - **Leverage Technology**

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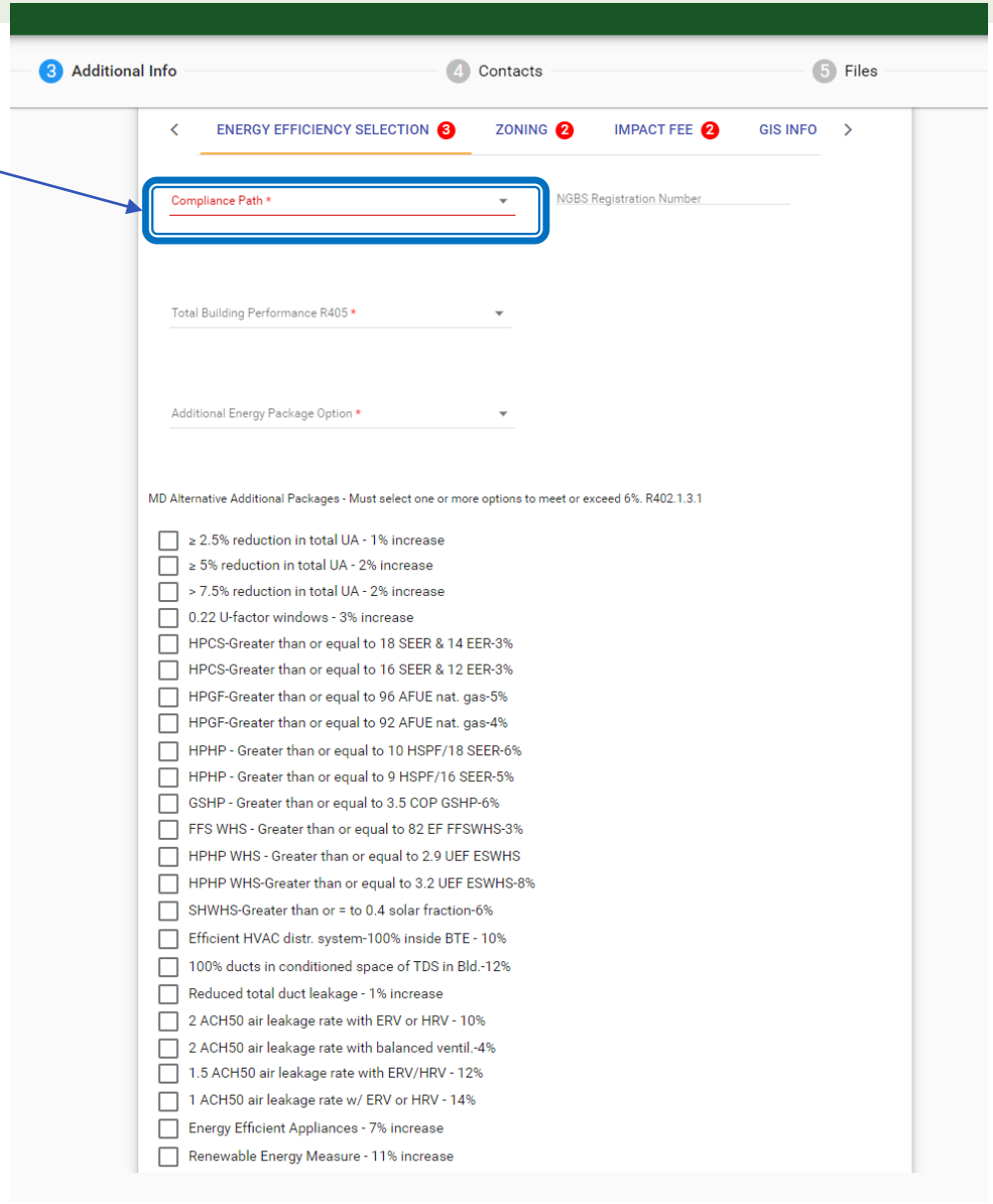
Example: Harford County Permitting System

Drop Down box indicating compliance path selected.

Desktop Screenshot



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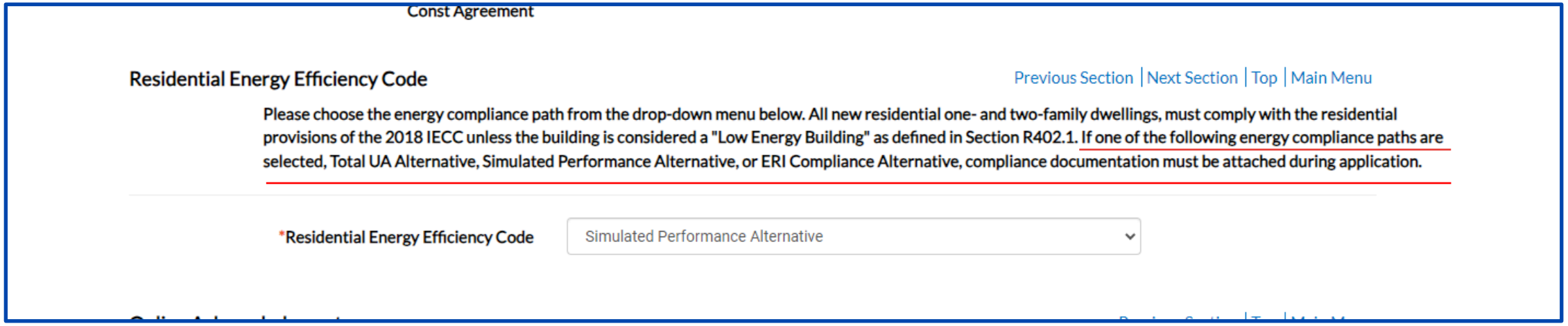
Example: Harford County Permitting System Online application process.



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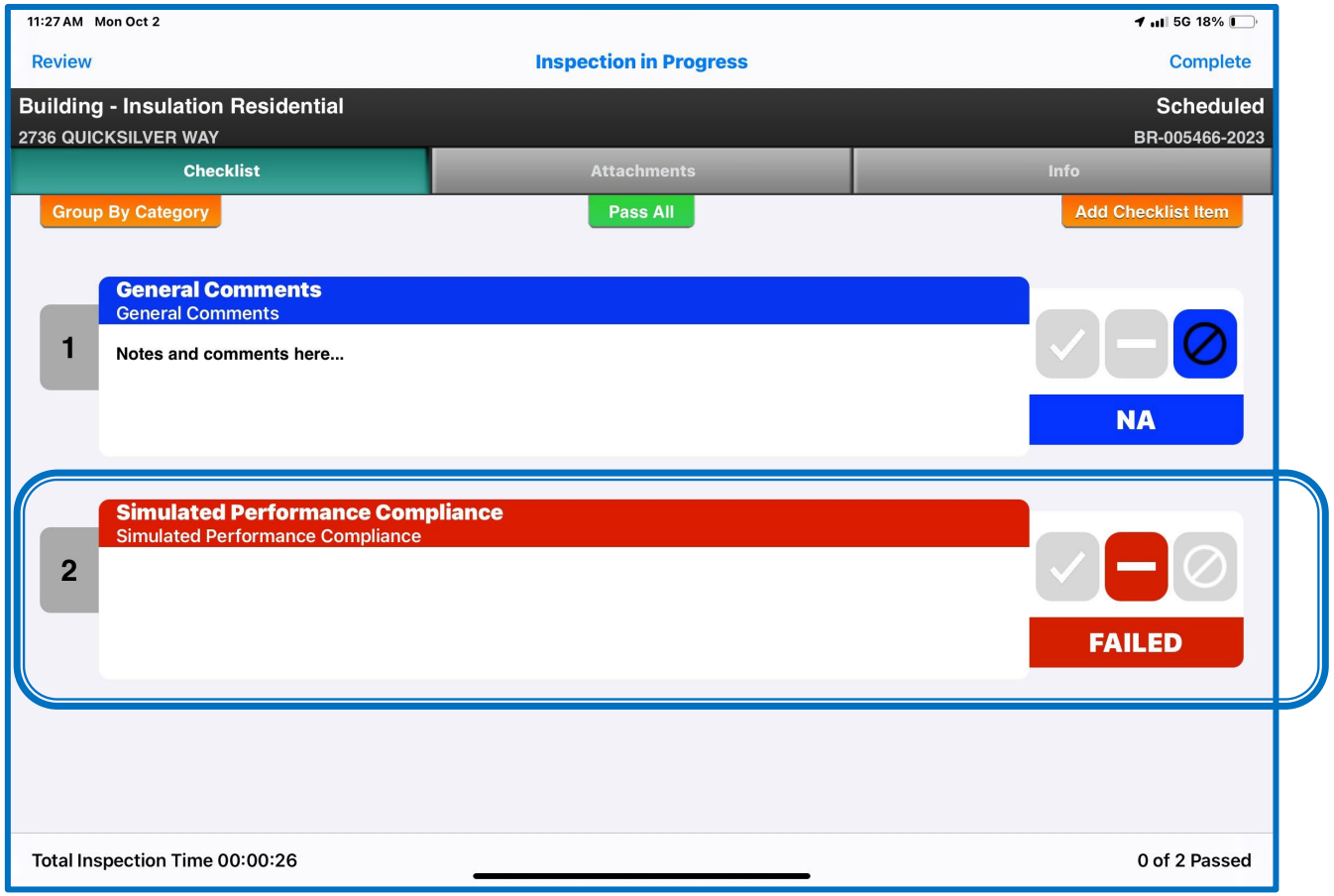
Example: Harford County Permitting System



- Check list item indicates current compliance path.
- Checklist is provided on Footing, Slab, Insulation and Final Inspection types.
- Updated for each scheduled inspection based on Desktop selection art time of scheduling.

Field Inspection Device Screenshot (I-pad)

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Harford County Inspections, Licenses and Permits

(410) 638-3122

IECC Residential Compliance Path Requirements

		Permitting Requirements		Post Issuance Requirements						
	Compliance Path	Permit Application Submittal	Compliance Report for Permitting[4]	Air Tightness Testing[2]	Maximum ACH	Duct Testing[2]	Whole House Mechanical Ventilation Design[2]	Mechanical Ventilation Testing2	Inspections[3]	Final Compliance Report For CO Issuance[2]
Prescriptive	Prescriptive Compliance Option — R402.1	County IECC Residential Compliance Path Form	N/A	ATP[1] Testing R402.4.1.2	3 R402.4.1.3	ATP[1] Testing R403.3.5	Per IRC M1505	ATP[1] Testing R403.6.3 County Form	County	N/A
	Prescriptive R–Value Alternative — R402.1.3	County IECC Residential Compliance Path Form	N/A	ATP[1] Testing R402.4.1.2	3 R402.4.1.3	ATP[1] Testing R403.3.5	Per IRC M1505	ATP[1] Testing R403.6.3 County Form	County	N/A
	MD Prescriptive R–Value Alternative — R402.1.3.1	County IECC Residential Compliance Path Form	N/A	ATP[1] Testing R402.4.1.2	3 R402.4.1.3	ATP1 Testing R403.3.5	Per IRC M1505	ATP1 Testing R403.6.3 County Form	County	N/A
	Total UA Alternative R402.1.5	County IECC Residential Compliance Path Form	Submitted Design (ResCheck or similar calculation) R402.1.5	ATP[1] Testing R402.4.1.2	3 R402.4.1.3	ATP[1] Testing R403.3.5	Per IRC M1505	ATP[1] Testing R403.6.3 County Form	County	N/A
Performance	Total Building Performance R405	County IECC Residential Compliance Path Form	ATP[1] Analysis R405.3.2.1	ATP[1] Testing R402.4.1.2	5 R402.4.1.2	ATP[1] Testing R403.3.5	ATP[1] Per IRC M1505	ATP[1] Testing R403.6.3 County Form	County + ATP[1]	ATP[1] R405.3.2.2
	Energy Rating Index Compliance Alternative R406	County IECC Residential Compliance Path Form	ATP[1] Analysis R406.7.2.1	ATP[1] Testing R402.4.1.2	5 R402.4.1.2	ATP[1] Testing R403.3.5	ATP[1] Per IRC M1505	ATP[1] Testing R403.6.3 County Form	County + ATP[1]	ATP[1] R406.7.2.2
Above Code Program	NGBS ICC-700—Silver Rating or Better R102.1.1	County IECC Residential Compliance Path Form	Accepted Submittal Document from Home Innovation Lab for silver level	As required for Certification	As required for Certification	As required for Certification	As required for Certification	As required for Certification	County + ATP[1]	Accepted Approval From Home Innovation Certifying Silver Level

1 - Approved Third Party - Approved Third Parties are designated as an architect licensed by the Maryland State Board of Architects, an engineer licensed by the Maryland State Board of Professional Engineers, or an entity issued credentials relative to the subject matter being certified by an accreditation body where the accrediting body is independently verified through a formal independent verification process, validating that the program or institution meets established quality standards and is competent to carry out specific conformity assessment tasks. Conformity assessment tasks may include, but are not limited to, compliance design, testing, inspection, or certification.

2 - Prior to Final Approval by Building Services Division.

3 - See Required Residential Energy Inspection List with Division Responsibility.

4 - Submitted at time of Building Permit Application or prior to Building Services Division Approval.

Harford County Inspections, Licenses and Permits

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2021 IECC Residential Energy Efficiency Selection for New Construction

All new residential one and two family dwellings must comply with the residential provisions of the 2021 IECC unless the building is considered a "Low Energy Building" as defined in Section R402.1

Applicants must select one compliance path option from page 1 along selecting applicable additional energy feature from tables on Page 2. Additional compliance documentation must be submitted with this form for the Total UA Alternative, Total Building Performance or Energy Rating Index Compliance Alternative path options.

☐ **Prescriptive Compliance Option — R402.1**

Table R402.1.2 Maximum Assembly *U*-Factors and Fenestration Requirements (2021 IECC)

Climate Zone	Fenestration *U*-Factor	Skylight *U*-Factor	Glazed Fenestration *SHGC*	Ceiling *U*-Factor	Wood Frame Wall *U*-Factor	Mass Wall *U*-Factor	Floor *U*-Factor	Basement Wall *U*-Factor	Crawl Space Wall *U*-Factor
4 Except Marine	0.30	0.55	0.40	0.024	0.045	0.098	0.047	0.059	0.065

Must select Additional Energy Feature from Table 1.

☐ **Prescriptive *R*-Value Alternative — R402.1.3**

Table R402.1.3 Insulation minimum R-values and Fenestration Requirements by Component (2021 IECC)

Climate Zone	Fenestration *U*-Factor	Skylight *U*-Factor	Glazed Fenestration SHGC	Ceiling *R*-value	Wood Frame Wall R-value	Mass Wall *R*-value	Floor *R*-value	Basement Wall *R*-value	Slab *R*-value & Depth	Crawl Space Wall *R*-value
4 Except Marine	0.30	0.55	0.40	60 or R49 with raised heel	30 or 20 & 5ci or 13 & 10ci or 0 & 20 ci	8/13	19	10 ci or 13	10 ci, 4ft	10ci or 13

Must select Additional Energy Feature from Table 1.

☐ **MD Prescriptive *R*-Value Alternative — R402.1.3.1**

Table R402.1.3.1 MD Alternative Insulation minimum R-values and Fenestration Requirements by Component (2021 IECC)

Climate Zone	Fenestration *U*-Factor	Skylight *U*-Factor	Glazed Fenestration SHGC	Ceiling *R*-value	Wood Frame Wall R-value	Mass Wall *R*-value	Floor *R*-value	Basement Wall *R*-value	Slab *R*-value & Depth	Crawl Space Wall *R*-value
4 Except Marine	0.30	0.55	0.40	49 or R38 with raised heel	20 or 15 & 3 ci	8/13	19	10 ci or 13	10 ci, 4ft	11ci or 13

Must select Additional Energy Feature(s) to equal or exceed 6% from Table 2.

☐ **Total UA Alternative R402.1.5** | Select Additional Energy Feature from Table 1. | Additional compliance report required.

☐ **Total Building Performance R405** | Must Select option from Table 3. | Additional compliance report required.

☐ **Energy Rating Index Compliance Alternative R406** | Energy Rating Index Value must be 5% less than the Energy Rating Index Target | Additional compliance report required.

☐ **NGBS ICC-700—Silver Rating or Better** | Proof of registration with Home Innovation Research Labs required.

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2021 IECC Residential Energy Efficiency Selection for New Construction

Table 1
Select only 1 option. R402.1, R402.1.3 or R402.1.5

☐ Option 1.	Enhanced Envelope Performance.
☐ Option 2A.	More Efficient HVAC Equipment Performance. Greater than or equal to 95 AFUE natural gas furnace and 16 SEER air conditioner.
☐ Option 2B.	More Efficient HVAC Equipment Performance. Greater than or equal to 10 HSPF/16 SEER air source heat pump.
☐ Option 2C.	More Efficient HVAC Equipment Performance. Greater than or equal to 3.5 COP ground source heat pump.
☐ Option 3A.	Reduced energy use in service water-heating. Greater than or equal to 0.82 EF fossil fuel service water-heating system.
☐ Option 3B.	Reduced energy use in service water-heating. Greater than or equal to 2.0 EF electric service water-heating system.
☐ Option 3C.	Reduced energy use in service water-heating. Greater than or equal to 0.4 solar fraction solar water-heating system.
☐ Option 4A.	More efficient duct thermal distribution system option. 100 percent of ducts and air handlers located entirely within the building thermal envelope.
☐ Option 4B.	More efficient duct thermal distribution system option. 100 percent of ductless thermal distribution system or hydronic thermal distribution system located completely inside the building thermal envelope.
☐ Option 4C.	More efficient duct thermal distribution system option. 100 percent of duct thermal distribution system located in conditioned space as defined by Section R403.3.2.
☐ Option 5.	Improved air sealing and Efficient Ventilation System option.

Table 2
MD Alternative Additional Packages—Must select one or more options to meet or exceed 6%. R402.1.3.1

☐1	≥2.5% reduction in total UA	1%
☐2	≥5% reduction in total UA	2%
☐3	>7.5% reduction in total UA	2%
☐4	0.22 U-factor windows	3%
☐5	High performance cooling system (Greater than or equal to 18 SEER and 14 EER air conditioner)	3%
☐6	High performance cooling system (Greater than or equal to 16 SEER and 12 EER air conditioner)	3%
☐7	High performance gas furnace (Greater than or equal to 96 AFUE natural gas furnace)	5%
☐8	High performance gas furnace (Greater than or equal to 92 AFUE natural gas furnace)	4%
☐9	High performance heat pump system (Greater than or equal to 10 HSPF/18 SEER air source heat pump.)	6%
☐10	High performance heat pump system (Greater than or equal to 9 HSPF/16 SEER air source heat pump.)	5%
☐11	Ground source heat pump (Greater than or equal to 3.5 COP ground source heat pump.)	6%
☐12	Fossil fuel service water heating system (Greater than or equal to 82 EF fossil fuel service water-heating system.)	3%
☐13	High performance heat pump water heating system option (Greater than or equal to 2.9 UEF electric service water -heating system.)	8%
☐14	High performance heat pump water heating system. (Greater than or equal to 3.2 UEF electric service water-heating system.)	8%
☐15	Solar hot water heating system (Greater than or equal to 0.4 solar fraction solar water-heating system.)	6%
☐16	More efficient HVAC distribution system. (100 percent of ductless thermal distribution system or hydronic thermal distribution system located completely inside the building thermal envelope.)	10%
☐17	100% of ducts in conditioned space. (100 percent of duct thermal distribution system located in conditioned space as defined by Section R403.3.2.)	12%
☐18	Reduced total duct leakage. (When ducts are located outside conditioned space, the total leakage of the ducts, measured in accordance with R403.3.5, shall be in accordance with one of the following: a. Where air handler is installed at the time of testing, 2.0 cubic feet per minute per 100 square feet of conditioned floor area. b. Where air handler is not installed at the time of testing, 1.75 cubic feet per minute per 100 square feet Of conditioned floor area.)	1%
☐19	2 ACH50 air leakage rate with ERV or HRV installed. (Less than or equal to 2.0 ACH50, with either an Energy Recovery Ventilator (ERV) or Heat Recovery Ventilator (HRV) installed.)	10%
☐20	2 ACH50 air leakage rate with balanced ventilation. (Less than or equal to 2.0 ACH50, with balanced ventilation as defined in Section 202 of the 2021 International Mechanical Code.)	4%
☐21	1.5 ACH50 air leakage rate with ERV or HRV installed. (Less than or equal to 1.5 ACH50, with either an ERV or HRV installed.)	12%
☐22	1 ACH50 air leakage rate with ERV or HRV installed. (Less than equal to 1.0 ACH50, with either an ERV or HRV installed.)	14%
☐23	Energy Efficient Appliances (Minimum 3 appliances not to exceed 1 form each type with follow efficiencies. Refrigerator - Energy Star Program Requirements, Product Specification for Consumer Refrigeration Products, Version 5.1 (08/05/2021), Dishwasher - Energy Star Program Requirements for Residential Dishwashers, Version 6.0 (01/29/2016), Clothes Dryer - Energy Star Program Requirements, Product Specification for Clothes Dryers, Version 1.1 (05/05/2017) and Clothes Washer - Energy Star Program Requirements, Product Specification for Clothes Washers, Version 8.1 (02/05/2018)	7%
☐24	Renewable Energy Measure.	11%

Table 3
Select Only 1 Option R405

☐ Option 1.	One of the additional efficiency package options in Table 1 shall be selected without including such measures in the proposed design under Section R405.
☐ Option 2 .	The proposed design of the building under Section R405.3 shall have an annual energy cost that is less than or equal to 95 percent of the annual energy cost of the standard reference design.

This document shall become part of the official permit record. Any deviation from the original submittal will require the permit to be amended along with the submission of applicable documentation supporting the new selections. An amending fee of $120.00 will be assessed at time of submittal.

Project Address:_____

Applicant Signature:_____ Date:_____

Permit Number:_____ Department Approval:_____

Additional documentation received: ☐

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MD Prescriptive Alternative Compliance Path

MD Prescriptive *R*–Value Alternative — R402.1.3.1

Table R402.1.3.1 MD Alternative Insulation minimum R-values and Fenestration Requirements by Component (2021 IECC)

Climate Zone	Fenestration *U-Factor*	Skylight *U-Factor*	Glazed Fenestration SHGC	Ceiling *R-value*	Wood Frame Wall R-value	Mass Wall *R-value*	Floor *R-value*	Basement Wall *R-value*	Slab *R-value & Depth*	Crawl Space Wall *R-value*
4 Except Marine	0.30	0.55	0.40	49 or R38 with raised heel	20 or 15 & 3 ci	8/13	19	10 ci or 13	10 ci, 4ft	11ci or13

Must select Additional Energy Feature(s) to equal or exceed 6% from Table 2.

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MD Prescriptive Alternative Compliance Path

Table 2 MD Alternative Additional Packages—Must select one or more options to meet or exceed 6%. R402.1.3.1		
☐ 1	≥ 2.5% reduction in total UA	1%
☐ 2	≥ 5% reduction in total UA	2%
☐ 3	> 7.5% reduction in total UA	2%
☐ 4	0.22 U-factor windows	3%
☐ 5	High performance cooling system (Greater than or equal to 18 SEER and 14 EER air conditioner)	3%
☐ 6	High performance cooling system (Greater than or equal to 16 SEER and 12 EER air conditioner)	3%
☐ 7	High performance gas furnace (Greater than or equal to 96 AFUE natural gas furnace)	5%
☐ 8	High performance gas furnace (Greater than or equal to 92 AFUE natural gas furnace)	4%
☐ 9	High performance heat pump system (Greater than or equal to 10 HSPF/18 SEER air source heat pump.)	6%
☐ 10	High performance heat pump system (Greater than or equal to 9 HSPF/16 SEER air source heat pump.)	5%
☐ 11	Ground source heat pump (Greater than or equal to 3.5 COP ground source heat pump.)	6%
☐ 12	Fossil fuel service water heating system (Greater than or equal to 82 EF fossil fuel service water-heating system.)	3%
☐ 13	High performance heat pump water heating system option (Greater than or equal to 2.9 UEF electric service water -heating system.)	8%
☐ 14	High performance heat pump water heating system. (Greater than or equal to 3.2 UEF electric service water- heating system.)	8%
☐ 15	Solar hot water heating system (Greater than or equal to 0.4 solar fraction solar water-heating system.)	6%
☐ 16	More efficient HVAC distribution system. (100 percent of ductless thermal distribution system or hydronic thermal distribution system located completely inside the building thermal envelope.)	10%
☑ 17	100% of ducts in conditioned space. (100 percent of duct thermal distribution system located in conditioned space as defined by Section R403.3.2.)	12%
☐ 18	Reduced total duct leakage. (When ducts are located outside conditioned space, the total leakage of the ducts, measured in accordance with R403.3.5, shall be in accordance with one of the following: a. Where air handler is installed at the time of testing, 2.0 cubic feet per minute per 100 square feet of conditioned floor area. b. Where air handler is not installed at the time of testing, 1.75 cubic feet per minute per 100 square feet Of conditioned floor area.)	1%
☐ 19	2 ACH50 air leakage rate with ERV or HRV installed. (Less than or equal to 2.0 ACH50, with either an Energy Recovery Ventilator (ERV) or Heat Recovery Ventilator (HRV) installed.)	10%
☐ 20	2 ACH50 air leakage rate with balanced ventilation. (Less than or equal to 2.0 ACH50, with balanced ventilation as defined in Section 202 of the 2021 International Mechanical Code.)	4%
☐ 21	1.5 ACH50 air leakage rate with ERV or HRV installed. (Less than or equal to 1.5 ACH50, with either an ERV or HRV installed.)	12%
☐ 22	1 ACH50 air leakage rate with ERV or HRV installed. (Less than equal to 1.0 ACH50, with either an ERV or HRV installed.)	14%
☐ 23	Energy Efficient Appliances (Minimum 3 appliances not to exceed 1 form each type with follow efficiencies. Refrigerator - Energy Star Program Requirements, Product Specification for Consumer Refrigeration Products, Version 5.1 (08/05/2021), Dishwasher - Energy Star Program Requirements for Residential Dishwashers, Version 6.0 (01/29/2016), Clothes Dryer - Energy Star Program Requirements, Product Specification for Clothes Dryers, Version 1.1 (05/05/2017) and Clothes Washer - Energy Star Program Requirements, Product Specification for Clothes Washers, Version 8.1 (02/05/2018)	7%
☐ 24	Renewable Energy Measure.	11%

Compliance and Testing Documents

- See May 29, 2024 Department Memorandum – Building Thermal Envelope Testing, Duct Pressure Testing and Mechanical Ventilation Testing. **Established criteria that reporting must be an automated testing report from the manufacturers testing equipment software.**

Required Third Party Compliance and Testing Documentation.

- Total Building Performance R405 - Permitting Compliance Report and CO Compliance Report
- Energy Rating Index R406 - Permitting Compliance Report and CO Compliance Report
- Building Thermal Envelope Air Tightness Testing per Section R402.4.1.3
  - ANSI/RESNET/ICC 380 or ASTM E1554, ASTM E779 or ASTM E1827.
- Duct Pressure Testing per Section R403.3.5.
  - ANSI/RESNET/ICC 380 or ASTM E1554.
- Mechanical Ventilation Testing per Section R403.6.3.
  - Home Ventilation Institute HVI 916 - Section 7 Reporting.

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Director of Inspections, Licenses and Permits

2021 IECC Residential Mechanical Ventilation Testing Certification Form

Section R403.6.3 of the 2021 International Energy Conservation Code as adopted by Chapter 82 of the Harford County Code requires that verification testing be performed for the whole-dwelling mechanical ventilation System. This form shall be completed by an approved third party conducting the testing to certify the testing results along with verification of compliance with system cfm design.

Building Permit Number:_____ Address:_____

Bedrooms: _____ Total Square Feet:_____

Whole-Dwelling Ventilation System Design

Step 1 - Select design type.

☐ Option1-1 Exhaust Only ☐ Option 1-2 Supply Only ☐ Option 1-3 Combination System

Step 2 – Select CFM Design Rate Calculation Method

☐ Step 2 Option -1: Airflow based upon 2021 IRC Table M1505.4.3(1): _____ CFM

or

☐ Step 2 Option -2: Airflow based upon 2021 IRC Section M1505 Equation 15-1:

CFM = (0.01 x total square footage) + [7.5 x (number of Bedrooms +1)] _____ CFM

Step 3 – Optional Adjustments

☐ Exemption 1 - 30% Reduction credit[1] _____ CFM

☐ Exemption 2 - System Controls for intermittent operation[2].

Adjusted by Table M1505.4.3(2) Duration %_____ Adjustment Factor _____ _____ CFM

=

Final Design CFM _____

Footnotes:

1. System balancing must be certified by a Licensed HVAC Contractor installing the system. The certification shall verify that each bedroom and one or more living room, dining room or kitchen are supplied with ventilation air per Exception 1 within Section M1505.4.3 of the 2021 IRC.
2. The intermittent control system certification by Licensed HVAC Contractor that system is operating in accordance with Exception 2 within Section M1505.4.3 of the 2021 IRC.

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2021 IECC Residential Mechanical Ventilation Testing Certification Form

Page 2

Ventilation Fan Listing and Testing Table

Fan Number	Fan Location	Type: Local Exhaust (LE) or Whole-House Mechanical Ventilation (WHMV)	Fan Manufacturer[3]	Fan Model[3]	Listed Airflow (CFM)[1,3]	Field-Verified Airflow (CFM)[2,3]
1		☐LE ☐WHMV				
2		☐LE ☐WHMV				
3		☐LE ☐WHMV				
4		☐LE ☐WHMV				
5		☐LE ☐WHMV				
6		☐LE ☐WHMV				

Table Footnotes:

1. IRC Section M1505.3 requires that "Exhaust fans and whole-house mechanical ventilation fans shall be listed and labeled as providing the minimum required airflow in accordance with ANSI/AMCA 210-ANSI/ASHRAE 51." IRC Section N1103.6.2 (R403.6.2) requires that, "Fans shall be tested in accordance with HVI 916 and listed." The HVI Certified Products Directory is an approved directory for confirming listed airflows.
2. IRC Section N1103.6.3 (R403.6.3) requires airflow to be field-tested and verified. Testing shall be in accordance with ANSI/RESNET/ICC 380.
3. Verification pictures shall be provided of the testing equipment display screen showing CFM testing results for each fan that is tested along with pictures of each fan data plate. When multiple fans require testing to satisfy certification requirement, each picture shall be clearly testing multiple Pictures shall be geo-coded with location, date and time. This verification form and all required pictures shall be uploaded through the Harford County ePermit Center by completing the Third-Party Certification Submittal option.

By signing this form, I hereby certify that the information provided on this form is accurate and all results have been validated through appropriate testing methods.

Questions regarding the form may be directed to Department staff by calling (410) 638-3122.

Certification and testing conducted by;

Name: _____ Certification number_____ Issued By: _____

Date:_____ Signature:_____

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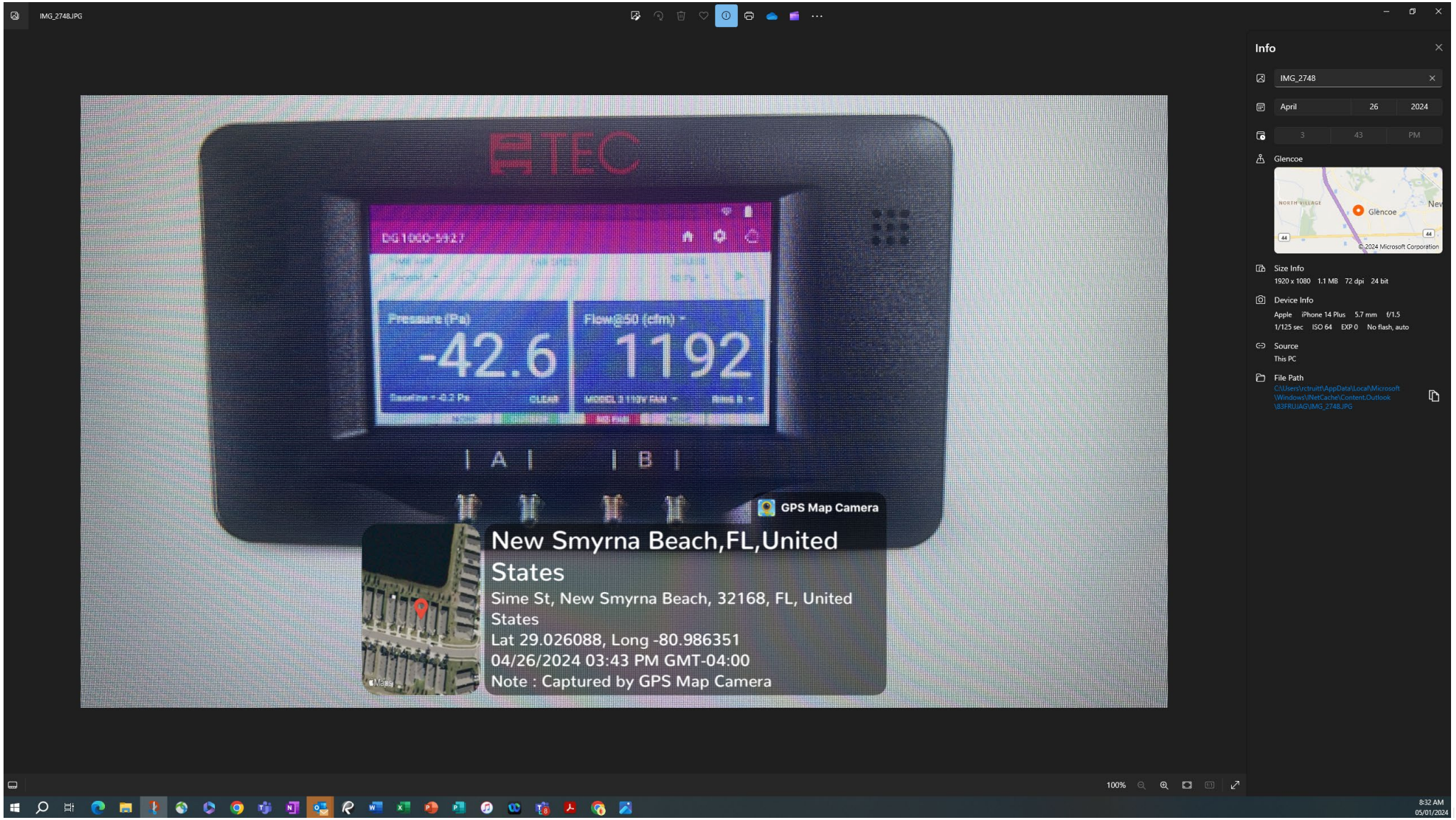
GEO Tagged Manometer Photo



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Required Residential Energy Code Inspections[1]

Footing, Foundation and Slab	Inspections associated with footings and foundations shall verify compliance with the code as to R-value, location, thickness, depth of burial and protection of insulation as required by the code and approved plans and specifications.	Building Service Division Plumbing Services Division
Framing and Rough In (insulation)	Inspections at framing and rough-in shall be made before application of interior finish and shall verify compliance with the code as to: types of insulation and corresponding R-values and their correct location and proper installation; fenestration properties such as U-factor and SHGC and proper installation; air leakage controls as required by the code; and approved plans and specifications.	Building Service Division Plumbing Services Division
Plumbing Rough In	Inspections at plumbing rough-in shall verify compliance as required by the code and approved plans and specifications as to types of insulation and corresponding R-values and protection, and required controls.	Plumbing Services Division
Mechanical Rough In	Inspections at mechanical rough-in shall verify compliance as required by the code and approved plans and specifications as to installed HVAC equipment type and size, required controls, system insulation and corresponding R-value, system air leakage control, programmable thermostats, dampers, whole-house ventilation, and minimum fan efficiency. Exception: Systems serving multiple dwelling units shall be inspected in accordance with Section C105.2.4.	Building Service Division Plumbing Services Division
Final Inspection	The building shall have a final inspection and shall not be occupied until approved. The final inspection shall include verification of the installation of all required building systems, equipment and controls and their proper operation and the required number of high-efficacy lamps and fixtures.	Building Service Division Plumbing Services Division

1 - Inspections - Upon approval by the County - Approved Third-Party Inspections may be accepted in lieu of County performed inspections for all categories except for final inspection. - Approved Third Parties are designated as an architect licensed by the Maryland State Board of Architects, an engineer licensed by the Maryland State Board of Professional Engineers, or an entity issued credentials relative to the subject matter being certified by an accreditation body where the accrediting body is independently verified through a formal independent verification process, validating that the program or institution meets established quality standards and is competent to carry out specific conformity assessment tasks. Conformity assessment tasks may include, but are not limited to, compliance design, testing, inspection, or certification.

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Develop Communication Paths

- Be clear about timelines, expectations, responsibilities
  - Internally between departments and with third parties
- Establish preferred mode of communication

- Example: method for plans reviewers and inspectors to distribute compliance documentation
- Example: method for how compliance selections are communicated to PMG and Electrical departments
  - If high efficiency hot water or HVAC units are selected in the design phase, how are the unit efficiencies verified to match the submitted documentation?

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Outline Roles and Expectations

Determine who is ultimately responsible

- Required documentation
- Supporting calculations
- Inspections
  - Internal departments and third parties
  - Determine what each division is responsible for inspecting
    - PMG division will inspect HVAC units. Will they also verify duct location tightness thermal resistance if required?
    - Will electrical division inspect air tightness for electrical boxes and lighting and lighting controls?
    - Who inspects piping insulation for hot water and mechanical system piping insulation?
- Correction notices.
- Compliance verification.
- Others?

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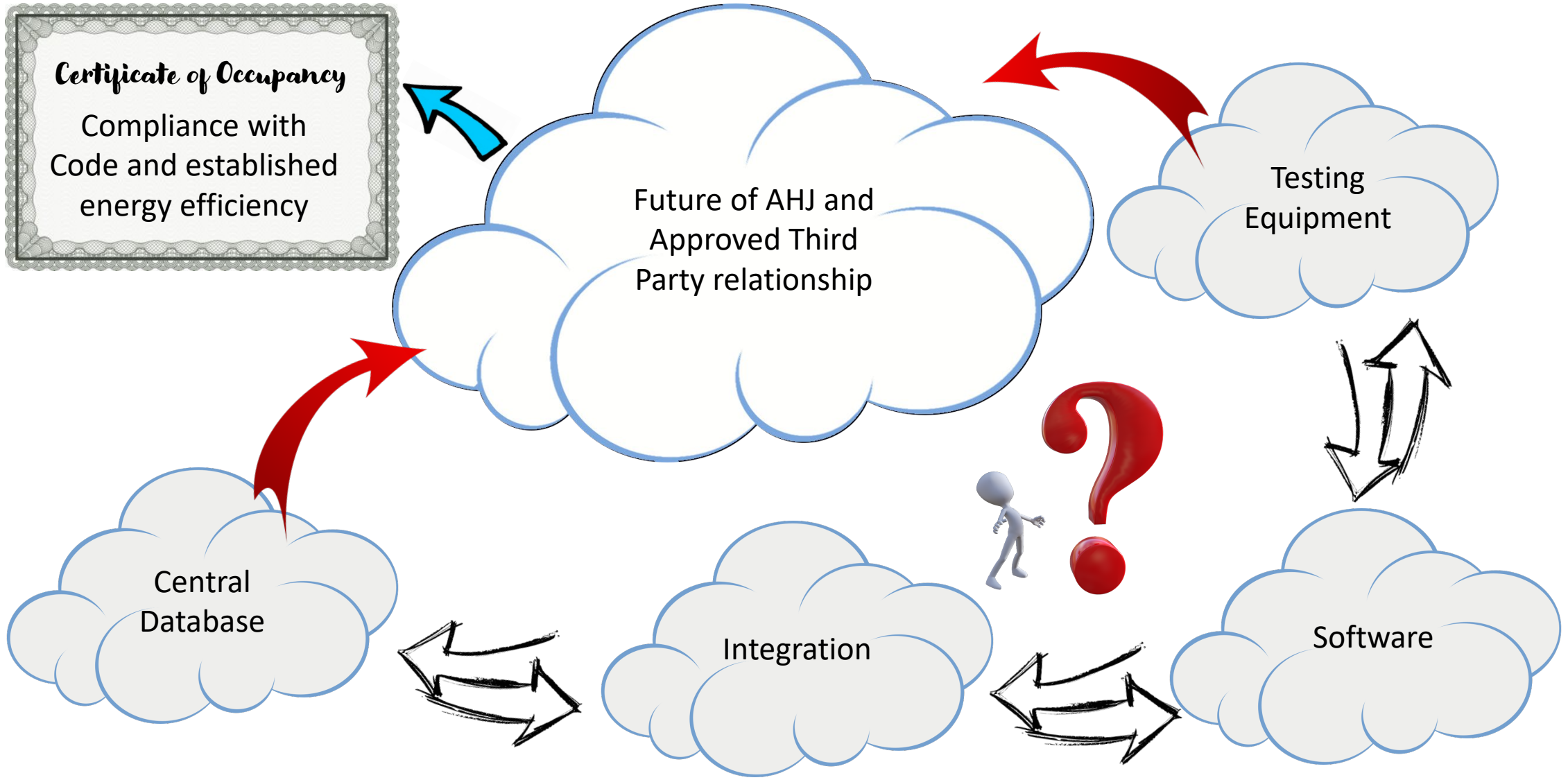
Discussion

Where do we go from here to achieve the Goal?



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KEY POINTS

1) Code officials can not assume that a third party will evaluate all parts of the energy code.
2) Code officials must understand the role the third party is playing, how the third party operates, and the responsibilities of the third party.

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Discussion

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EVALUATON

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Building Professional Careers!

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