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Residential Data Collection

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PNNL-SA-106471

Guidance Document

- A guidance document was prepared for the Project Teams
  - Not a full-blown methodology
    - Coming soon
  - Lays out an 8-step process for conducting the evaluations
- Highlights
  - Only new, site-built single-family homes
  - Single site visit
  - Focus on review of individual code requirements rather than homes
  - Sample size of 63 observations of key items
  - Energy savings metric

Activities and Responsibilities

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Step	Activity	Responsibility
1	Develop initial sampling plan	PNNL
2	Conduct stakeholder meeting	Project Team
3	Develop final sampling plan	PNNL
4	Contact jurisdictions and identify homes to sample	Project Team
5	Collect field data	Project Team
6	Analyze and report field data	PNNL
7	Conduct education, training and outreach	Project Team
8	Re-evaluate	PNNL and Project Team

Sample Size Determination

- Identified building components with largest direct impact on energy use
  - Tens of thousands of simulations were conducted to derive the list of key items
- Determined sample size of 63 observations of each of the key items
  - Needed to achieve the goal of detecting statistically significant differences in energy use pre- and post-evaluation
- Designed sampling protocol to enable a statewide energy metric

Key Items

- Envelope tightness (ACH50)
- Window SHGC
- Window U-factor
- Exterior wall insulation
- Ceiling insulation
- High-efficiency lighting
- Foundation insulation (floor / basement wall / slab)
- Duct leakage

Items collected in field to calculate energy metric

Sample Size Bottom Line

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63 observations of each key item in each state

Think # of observations rather than # of homes

State-Specific Sampling Plan

- Initial sampling plan
  - based on Census Bureau permit database using latest 3 years of permit data by place within the state
- Final sampling plan
  - developed after Project Team and Stakeholder meetings in case any changes or additions to the sampling plan are needed
- 63 observations will require visiting more than 63 homes per state
  - due to practical limitations of being able to observe all key items in a single site visit

State-Specific Sampling Plan (cont'd)

- Sampling is done on a proportional random sample approach
  - Places with more permits per year are more likely to be sampled than places with fewer permits.
  - But there is a random element involved.
- The process of re-drawing a state sample and creating a new sample plan is relatively easy and PNNL is available to make changes as needed.

State-Specific Data Collection Form

- Combination of
  - RES*check* checklists (essentially all of the applicable code requirements),
  - Any items added or subtracted for state-specific codes, and
  - Additional items needed for energy simulation (including key items)

Some Specific Details of the Data Collection Form

- Project team will perform blower door tests
- Project team will perform duct leakage tests
- Observation of frame cavity insulation installation grade will be done

Example Section of Envelope Form

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2009 IECC Residential Data Collection Form - Envelope

Key Items marked in bold and italics

ID	Code Section	Description	Meets Requirement	Does Not Meet Requirement	Not Applicable	Not Observable	Field Observation	REScheck or HERS Value*	Format	Units	Comments
Envelope Ceiling and Attic											
BG15	NA	Is the insulation located in the ceiling or the rafters?							Text		
FI1	***402.1.1, 402.2.1, 402.2.2, 402.2.5***	***Predominant ceiling insulation Total R-value (cavity and continuous insulation)***							***Number***	***R-value***	
M1	NA	What is the attic framing material - wood or steel?							Text		
IQ1	NA	What is the roof cavity insulation quality? (I,II,III) - see INFO - Insulation Grading tab							Text		
FI3	402.2.3	Attic access hatch and door insulation ≥R-value of the adjacent assembly							Check Box		

Section of Envelope Form

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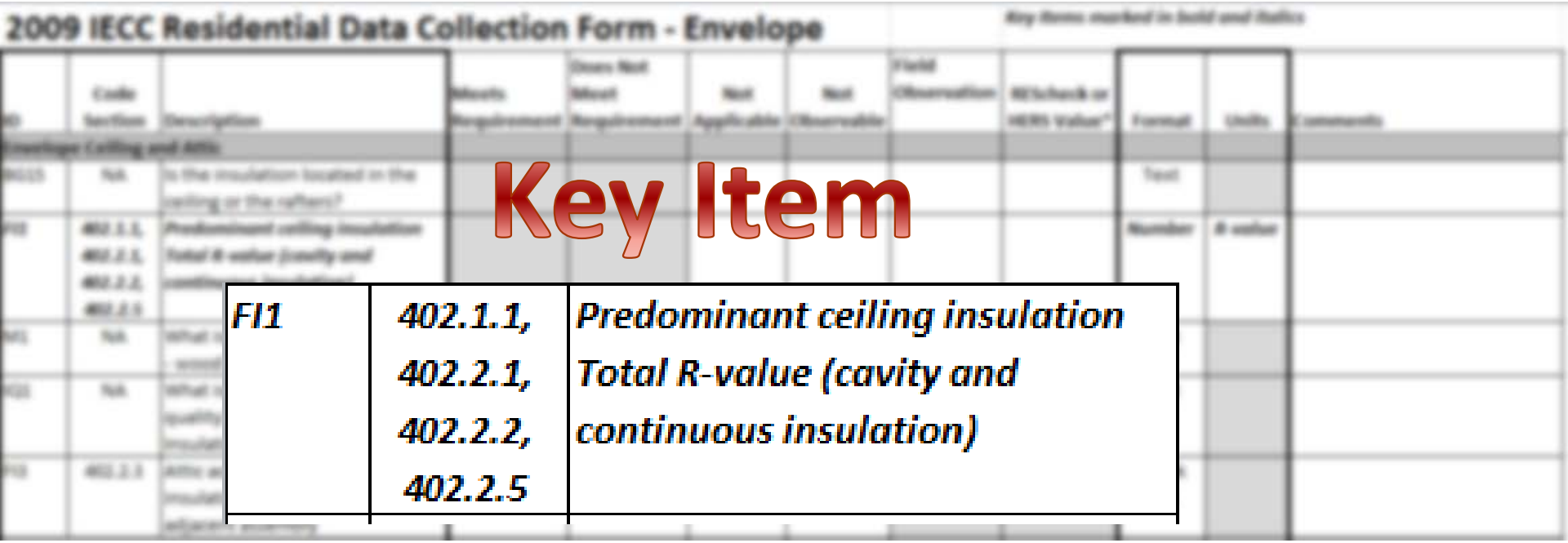

Section of Envelope Form

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2009 IECC Residential Data Collection Form - Envelope

Key items marked in bold and italics

Code Requirement

FI3	402.2.3	Attic access hatch and door insulation ≥R-value of the adjacent assembly

Section of Envelope Form

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Key items marked in bold and italics

ID	Code Section	Description	Meets Requirement	Does Not Meet Requirement	Not Applicable	Not Observable	Field Observation	REScheck or HERS Value*	Format	Units	Comments
Envelope Ceiling and Attic											
IN115	NA	Is the insulation located in the ceiling or the rafters?							Text		
I10	402.1.1, 402.2.1, 402.2.2, 402.2.3	Predominant ceiling insulation; Total R-value (cavity + continuous insulation)							Number	R-value	
M1	NA	What is the attic framing material - wood or steel?									
I11	NA										
I12	402.2.3	Insulation cR-value of the adjacent assembly							Box		

Simulation Input

M1	NA	What is the attic framing material - wood or steel?

Data Confidentiality

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- No personally identifiable information to be reported to DOE/PNNL
- Data collection form and online tool use an identification code to identify individual homes
  - Format: Two-digit state abbreviation + a unique number assigned by the Project Team
- DOE/PNNL reporting will be done only on a STATE basis, not at the jurisdictional or home level

PNNL National Prototype

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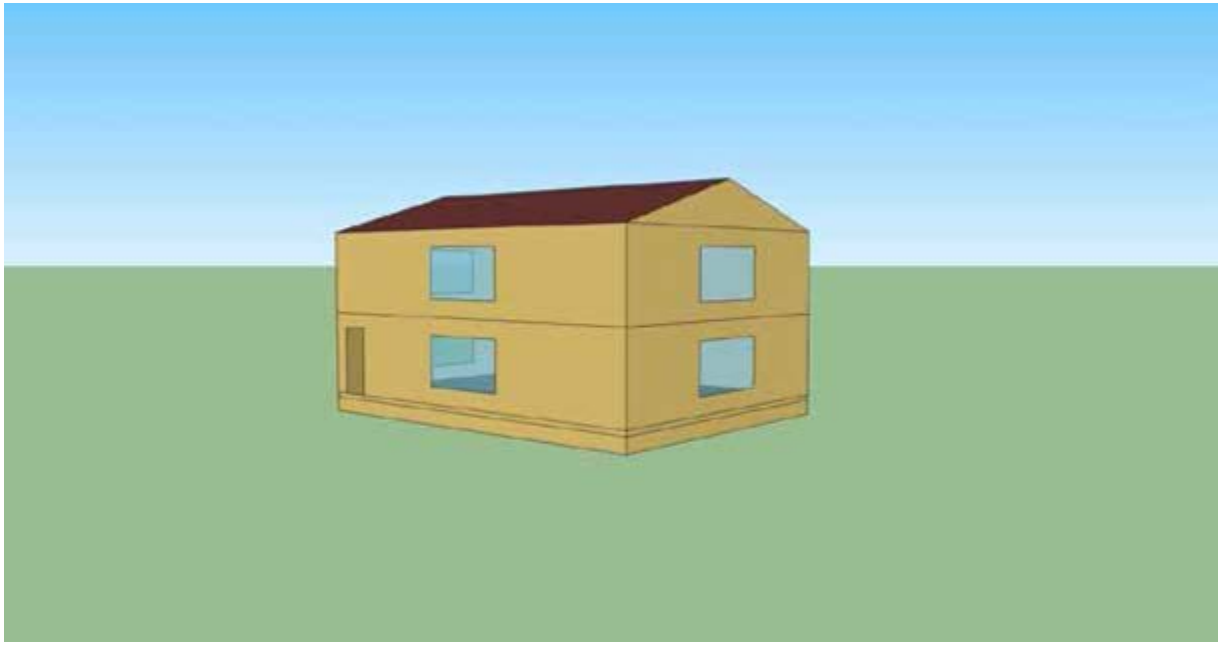

Table 2.1. Single-Family Prototype Characteristics

Parameter	Assumption	Notes
Conditioned floor area	2,400 ft^2 (plus 1,200 ft^2 of conditioned basement, where applicable)	Characteristics of New Housing, U.S. Census Bureau
Footprint and height	30-ft-by-40 ft, two-story, 8.5-ft-high ceilings	
Area above unconditioned space	1,200 ft^2	Over a vented crawlspace or unconditioned basement
Area below roof/ceilings	1,200 ft^2, 70% with attic, 30% cathedral	
Perimeter length	140 ft	
Gross exterior wall area	2,380 ft^2	
Window area (relative to gross wall area)	Fifteen percent equally distributed to the four cardinal directions (or as required to evaluate glazing-specific code changes)	
Door area	42 ft^2	
Internal gains	91,436 Btu/day	2006 IECC, Section 404
Heating system	Natural gas furnace, heat pump, electric furnace, or oil-fired furnace	Efficiencies will be based on prevailing federal minimum manufacturing standards.
Cooling system	Central electric air conditioning	Efficiency will be based on prevailing federal minimum manufacturing standards.
Water heating	Natural gas, or as required to evaluate domestic hot water-specific code changes	

Btu = British thermal units.
IECC = International Energy Conservation Code.