



PNNL-SA-198591

Filling Out the Residential Field Study Data Collection Form



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Agenda

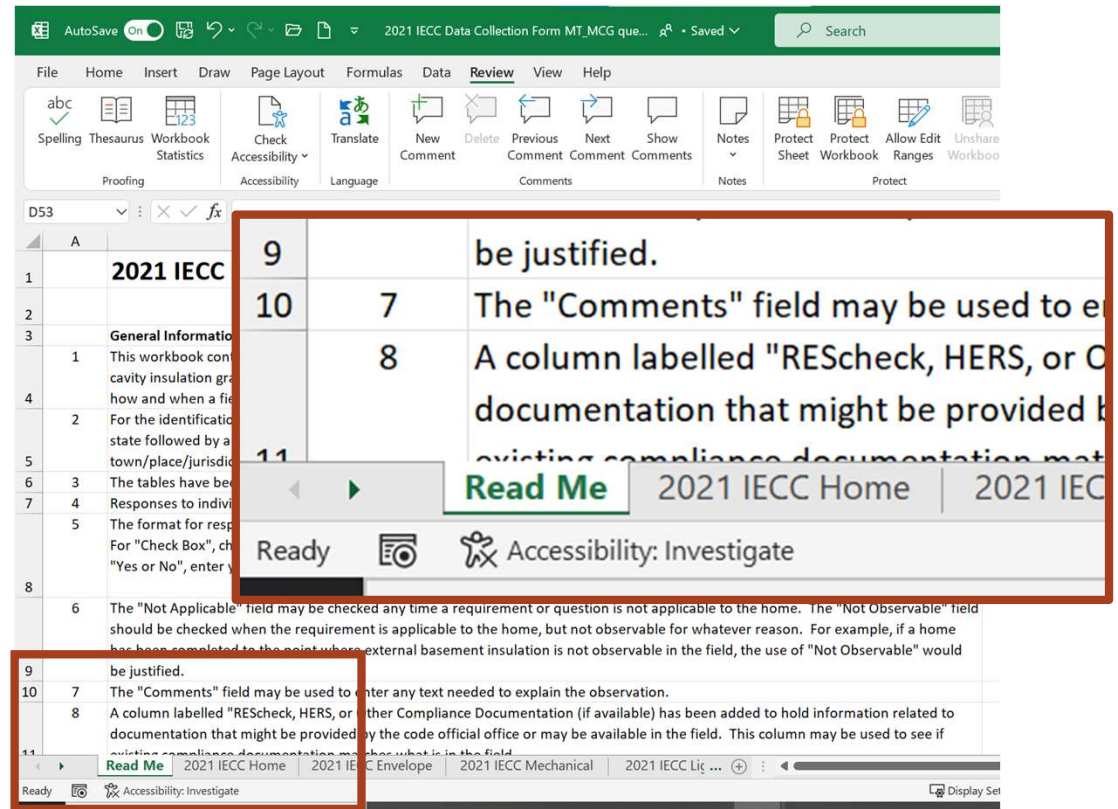
- READ ME Tab review
- Data completeness
- Data consistency
- Data QA overview
- File naming and storage

| | A | B |
|----|---|--|
| 1 | | 2021 IECC Residential Compliance Evaluation Forms |
| 2 | | |
| 3 | | General Information |
| 4 | 1 | This workbook contains tabs for Home, Envelope, Mechanical, and Lighting data entries. The fourth-to-last tab contains definitions for cavity insulation grades for use in response to the cavity insulation questions on the Envelope tab. The next tab contains a discussion of how and when a field team member should put a "0" value in a field for insulation R-values. |
| 5 | 2 | For the identification code in LOC6 on the Home tab, please use the following format for the code: The two-digit abbreviation for the state followed by a unique number assigned by the Project Team. The ID number may also include a unique identifier for the town/place/jurisdiction but should not use the name of the town/place/jurisdiction to maintain privacy. |
| 6 | 3 | The tables have been set up to mimic the data entry screens in the web-based tool. |
| 7 | 4 | Responses to individual questions or requirements that are not allowed are grayed out in the tables. |
| 8 | 5 | The format for responses is shown in the Format column in each table. Formats include "Check Box", "Text", "Yes or No", and "Number". For "Check Box", check if the home meets or does not meet the requirement. For "Text", enter the answer in the Observation field. For "Yes or No", enter yes or no in the Observation field. For "Number", enter the appropriate number in the Observation field. |
| 9 | 6 | The "Not Applicable" field may be checked any time a requirement or question is not applicable to the home. The "Not Observable" field should be checked when the requirement is applicable to the home, but not observable for whatever reason. For example, if a home has been completed to the point where external basement insulation is not observable in the field, the use of "Not Observable" would be justified. |
| 10 | 7 | The "Comments" field may be used to enter any text needed to explain the observation. |
| 11 | 8 | A column labelled "REScheck, HERS, or Other Compliance Documentation (if available)" has been added to hold information related to documentation that might be provided by the code official office or may be available in the field. This column may be used to see if existing compliance documentation matches what is in the field. |
| 12 | 9 | Fields with drop down menus have been locked so that only drop down values may be selected. Users should pick the most appropriate answer and may provide additional information in the Comment field. |
| 13 | | |
| 14 | | Special Directions for Printing of Paper Forms for Use in the Field |
| 15 | 1 | The worksheets have been formatted to allow printing. Sizing to print on legal size paper may be needed. Margins may need to be adjusted. |
| 16 | 2 | Users may choose to hide some columns in the form to facilitate printing. Columns E and F in particular may not be needed by field personnel. |
| 17 | 3 | Users of the paper form should enter "Yes" or "No" in the "Meets Requirement" column (Column H). Electronic data entry for this field will utilize drop downs for "complies" and "does not comply". The reason for this direction is the Column H combines what were originally two separate columns in the form - one for "Meets Requirement" and one for "Does not meet Requirement". |
| 18 | 4 | Users of the paper form should enter the compliance path used in response to Comp2 on the Home tab. Electronic data entry for this field will utilize prescriptive, performance, REScheck, or ERI or HERS Index |

READ ME Tab

READ ME Tab

- Start with the READ ME tab
 - Anyone involved in any aspect of data collection or QA should **read** the READ ME tab



READ ME Tab – Overview

- General Information
- Special Directions for Printing Paper Forms
- Special Directions for Combining Tabs
- Special Directions for Data Entry
- Special Directions for States Needing State-specific Forms
- List of fields added between the 2018 and 2021 IECC versions
- Hidden Columns

| | A | B |
|----|---|--|
| 1 | | 2018 IECC Residential Compliance Evaluation Forms |
| 2 | | |
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| 10 | 7 | The "Comments" field may be used to enter any text needed to explain the observation. |
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| 17 | 3 | Users of the paper form should enter "Yes" or "No" in the "Meets Requirement" column (Column H). Electronic data entry for this field will utilize drop downs for "complies" and "does not comply". The reason for this direction is the Column H combines what were originally two separate columns in the form - one for "Meets Requirement" and one for "Does not meet Requirement". |
| 18 | 4 | Users of the paper form should enter the compliance path used in response to Comp2 on the Home tab. Electronic data entry for this field will utilize prescriptive, performance, REScheck, or ERI or HERS Index |
| 19 | 5 | Users of the paper form should enter check marks for the "Not Applicable" or "Not Observable" columns. Electronic data entry for this field will utilize "Not applicable" or "Not observable" as appropriate. |
| 20 | 6 | Comments have been inserted in all foundation related questions directing the user of the paper form which rows to fill out based on their response to question BG17 on predominant foundation type. These comments can be edit or over-ridden if the user has a comment to add to or replace this comment. |
| 21 | | |
| 22 | | Special Directions for Users wishing to Combine All Tabs in a Single Tab |
| | 1 | For users who wish to pull the Home, Envelope, Mechanical, and Lighting tabs on a single tab, perhaps for use with a tablet computer in the field, the process may be easier if you delete the header rows such as Rows 3 and 10 on the Home Tab. The information in these rows is duplicated in columns E and F. While it is possible to combine the tabs with these rows in place, sorting of the resulting |

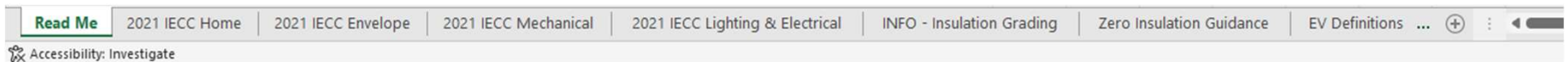
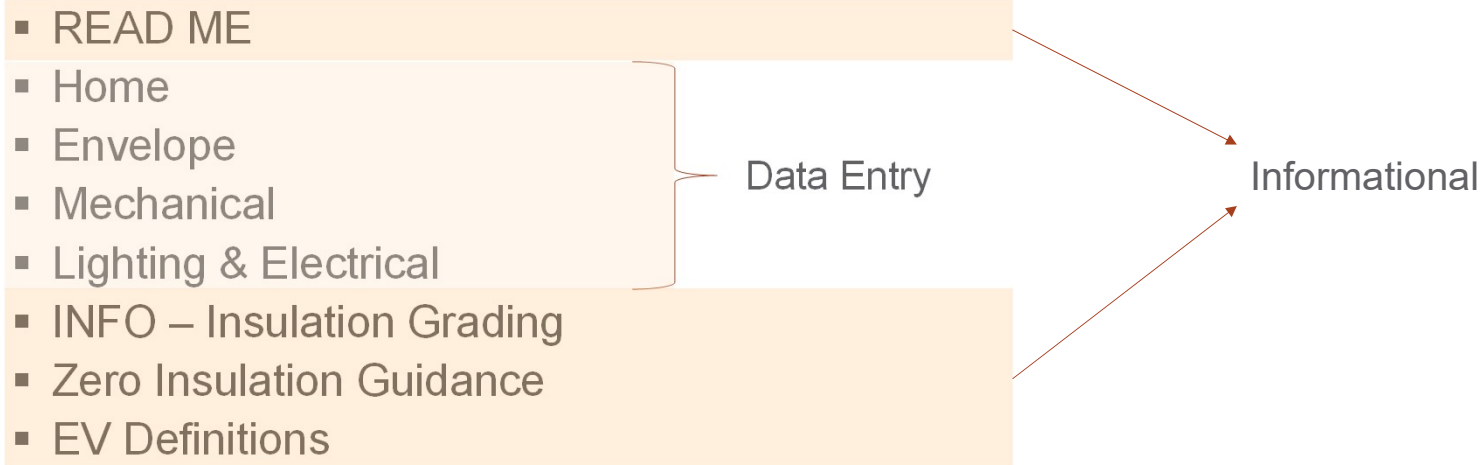


READ ME Tab – General Information

1. Description of tabs
2. Creating a unique identification code
3. Restrictions on modifying the form
4. Data should not be entered in **gray** cells
5. Data entry format (Check Box, Text, Yes or No, Number)
6. Not Applicable versus Not Observable
7. Comments field – Enter text to explain the observation (if necessary)
8. Data validation – Fields with dropdown menus restrict inputs to menu options

READ ME Tab – Description of Tabs


- The Data Collection Form has 8 tabs





READ ME Tab – Unique Identifiers

- Prior to collecting data, create an index of addresses and unique identifiers.
- Use the two-digit state code and a unique identifier
- Do NOT use the place/town/jurisdiction name in the code (e.g., Mlannarbor)
- NEVER share this document with PNNL, DOE, or anyone outside of the project team.
- In the data collection form
 - Fill in the unique ID in the ‘Identification for the home’ field.
 - Never enter the builder’s name, site address, or jurisdiction name.
 - County is OK (and required).
- Raw data will be available to the public online.



| Address | Unique ID |
|----------------------|-----------|
| 123 Main St | MI001 |
| 999 Peninsula Dr | MI002 |
| 1212 Arbor Way | MI003 |
| 987 Oak Ln | MI004 |
| 4242 E Wolverine Ave | MI005 |
| 1029 W Spartan St | MI006 |
| 3847 Dune Dr | MI007 |
| 5656 Big Lake Ln | MI008 |
| 2020 Motor City Blvd | MI009 |




File and Folder Naming Protocols

| Naming Protocol for | Protocol Description | Example |
|----------------------|--|----------------------------|
| Building Identifier | [State Abbreviation] [Triple Digit Number] | FL001 |
| Photos | [Building Identifier]_[Measure Number from the Data Collection Form]_[Double Digit Number] | FL001_5012_01 |
| Site Photos Folder | [Building Identifier]_[“Site Photos”] | FL001_SitePhotos |
| Data Collection Form | [Building Identifier]_[“Data Collection Form”] | FL001_Data Collection Form |

READ ME Tab – Data Collection Tool Format

- All data needs to be provided to PNNL as laid out in the data collection form.
- PNNL uses an automated process to extract data from individual forms and combines it for analysis.
- Project teams wishing to modify the form in any way **must consult with PNNL**.
- **Project teams may NOT modify the form** other than hiding and unhiding rows and columns. PNNL will make agreed-upon changes.



2021 IECC Residential Data Collection Form - Mechanical

| ID | Code | Section | Description | Phase of Construction | Building System | Building System Subcategory | Key Item or Key Item Modifier or Result Weight | Min | Max | Not Applicable | Not Observed | Units | Comments |
|---------------------------------|----------|---------|--|-----------------------|-----------------|-----------------------------|--|-----|-----|----------------|--------------|-----------|-------------------------|
| Mechanical Documentation | | | | | | | | | | | | | |
| F118 | R303.3 | | Manufacturer manuals for mechanical and water heating systems have been provided | Final Inspection | Mechanical | Documentation | | | | | | Check Box | |
| Mechanical Controls | | | | | | | | | | | | | |
| F012 | R403.9 | | Snow- and ice-melting system controls installed | Final Inspection | Mechanical | Controls | | | | | | Check Box | |
| F19 | R403.1.1 | | Programmable thermostat installed on primary heating or cooling system | Final Inspection | Mechanical | Controls | | | | | | Check Box | |
| F110 | R403.1.2 | | Heat pump supplemental heat controls installed on heat pumps | Final Inspection | Mechanical | Controls | | | | | | Check Box | |
| Mechanical Ducts | | | | | | | | | | | | | |
| F14a | R403.3.5 | | First Duct System - Duct tightness test result (postconstruction total leakage) by Project Team using RESNET Protocol (CFM/100 ft ² floor area @ 25 Pa) | Final Inspection | Mechanical | Ducts | Key Item | | | | | Number | CFM/100 ft ² |
| DT1a | NA | | First Duct System - Duct tightness test result from previous tests (CFM/100 ft ² floor area @ 25 Pa) (describe previous duct tightness test in comments - postconstruction or rough-in, air handler installed or not) | Final Inspection | Mechanical | Ducts | | | | | | Number | CFM/100 ft ² |
| DFaA | NA | | First Duct System - Approximate Floor Area of Home Served | Final Inspection | Mechanical | Ducts | | | | | | Number | CFA |
| DP5a | NA | | First Duct System - Rough percentage of supply duct in | Framing Rough-In | Mechanical | Ducts | Key Item Modifier | | | | | Number | Percent |

READ ME Tab – Gray Cells

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|---|--|--------------|--|-----------------------|-----------------|-----------------------------|--|-------------------|----------------|----------------|-------------------|---|-------|----------|
| 1 | 2021 IECC Residential Data Collection Form - Envelope | | | | | | | | | | | <i>Key Items marked in bold and italics</i> | | |
| 2 | ID | Code Section | Description | Phase of Construction | Building System | Building System Subcategory | Key Item or Key Item Modifier or Result Weighter | Meets Requirement | Not Applicable | Not Observable | Field Observation | Format | Units | Comments |
| 3 | Envelope Air Leakage: 402.4 | | | | | | | | | | | | | |
| 4 | FI17 | R402.4.1.2 | Blower door test results from Project Team test using RESNET Protocol (ACH @ 50 PA) | Final Inspection | Envelope | Air Leakage | Key Item | | | | | Number | ACH50 | |
| 5 | BD1 | NA | Blower door test results from previous test by other parties (ACH @ 50 PA) (for comparison only) | Final Inspection | Envelope | Air Leakage | | | | | | Number | ACH50 | |
| 6 | AB&I1 | R402.4.1.1 | Air barrier and thermal barrier per Table R402.4.1.1 | Insulation | Envelope | Air Leakage | | | | | | Check Box | | |
| 7 | AB&I2 | R402.4.1.1 | Ceiling and attic per Table R402.4.1.1 | Final Inspection | Envelope | Air Leakage | | | | | | Check Box | | |
| 8 | AB&I3 | R402.4.1.1 | Walls per Table R402.4.1.1 | Framing Rough-In | Envelope | Air Leakage | | | | | | Check Box | | |
| | AB&I4 | R402.4.1.1 | Windows, skylights, and doors per | Insulation | Envelope | Air | | | | | | Check | | |

Do not enter data in gray cells

READ ME Tab – Data Entry Format

- The Format column (Column L) describes the format of the data to be entered in the appropriate column to the left
 - Check Box = check the box (or don't)
 - Text = Written words (electronic form may contain dropdown menus)
 - Yes or No
 - Number = Arabic numeral, e.g., 8 (not eight)

| 2021 IECC Residential Data Collection Form - Envelope | | | | | | | | | | | <i>Key Items marked in bold and italics</i> | | |
|---|-------------------|--|-----------------------|-----------------|-----------------------------|--|-------------------|----------------|----------------|-------------------|---|---------------------|----------|
| ID | Code Section | Description | Phase of Construction | Building System | Building System Subcategory | Key Item or Key Item Modifier or Result Weighter | Meets Requirement | Not Applicable | Not Observable | Field Observation | Format | Units | Comments |
| Envelope Air Leakage: 402.4 | | | | | | | | | | | | | |
| <i>F117</i> | <i>R402.4.1.2</i> | <i>Blower door test results from Project Team test using RESNET Protocol (ACH @ 50 PA)</i> | Final Inspection | Envelope | Air Leakage | Key Item | | | | | <i>Number</i> | <i>ACH50</i> | |
| BD1 | NA | Blower door test results from previous test by other parties (ACH @ 50 PA) (for comparison only) | Final Inspection | Envelope | Air Leakage | | | | | | Number | ACH50 | |
| AB&I1 | R402.4.1.1 | Air barrier and thermal barrier per Table R402.4.1.1 | Insulation | Envelope | Air Leakage | | | | | | Check Box | | |

Field Observation Units

- Fields with a data format of “Number” include the Units in the column immediately to the right.
- It is important to enter data using the correct units. For example:
 - ‘Blower door test result’ is in ACH50, do not enter CFM50
 - ‘Heating system capacity’ is in Btu/h, do not enter kBtu/h

| 2021 IECC Residential Data Collection Form - Envelope | | | | | | | | | | | <i>Key Items marked in bold and italics</i> | | |
|---|-------------------|--|-----------------------|-----------------|-----------------------------|--|-------------------|----------------|----------------|-------------------|---|---------------------|----------|
| ID | Code Section | Description | Phase of Construction | Building System | Building System Subcategory | Key Item or Key Item Modifier or Result Weighter | Meets Requirement | Not Applicable | Not Observable | Field Observation | Format | Units | Comments |
| Envelope Air Leakage: 402.4 | | | | | | | | | | | | | |
| <i>F117</i> | <i>R402.4.1.2</i> | <i>Blower door test results from Project Team test using RESNET Protocol (ACH @ 50 PA)</i> | Final Inspection | Envelope | Air Leakage | Key Item | | | | | <i>Number</i> | <i>ACH50</i> | |
| BD1 | NA | Blower door test results from previous test by other parties (ACH @ 50 PA) (for comparison only) | Final Inspection | Envelope | Air Leakage | | | | | | Number | ACH50 | |
| AB&I1 | R402.4.1.1 | Air barrier and thermal barrier per Table R402.4.1.1 | Insulation | Envelope | Air Leakage | | | | | | Check Box | | |



READ ME Tab – Not Applicable Vs Not Observable

Not Applicable

- The home design *does not include* the item.

Example:

- Foundation type: Slab-on-grade

Basement wall insulation

=

Not Applicable

Not Observable

- The home design *includes* the item, but it cannot be observed at the time of the inspection.

Example:

- Foundation type: Heated basement
 - Drywall is covering insulation

Basement wall insulation

=

Not Observable

In either case, do NOT enter “0” in the Observation column.

READ ME Tab – Comments

- Use the comments field to
 - Support unusual findings (e.g., values outside of normal ranges)
 - Document anything you want to remember or convey to your project team or PNNL

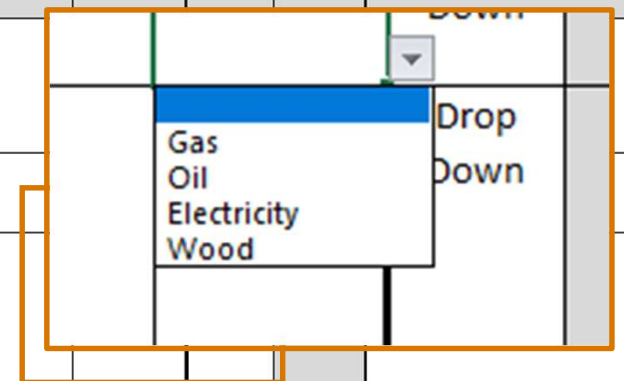
| | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|----|--|-----------------|---|--------------------------|--------------------|-----------------------------------|---|--------------------|-----------------|-----------------|------------------|---|-------------------------------|----------|
| 1 | 2021 IECC Residential Data Collection Form - Mechanical | | | | | | | | | | | <i>Key Items marked in bold and italics</i> | | |
| 2 | ID | Code Section | Description | Phase of Construction | Building System | Building System Subcategory | Key Item or Key Item Modifier or Result Weigh | Meets Requireme | Not Applicab | Not Observab | Not Observati | Forma | Units | Comments |
| 3 | Mechanical Documentation | | | | | | | | | | | | | |
| 4 | FI18 | R303.3 | Manufacturer manuals for mechanical and water heating systems have been provided | Final Inspection | Mechanical | Documentation | | | | | | Check Box | | |
| 5 | Mechanical Controls | | | | | | | | | | | | | |
| 6 | FO12 | R403.9 | Snow- and ice-melting system controls installed | Final Inspection | Mechanical | Controls | | | | | | Check Box | | |
| 7 | FI9 | R403.1.1 | Programmable thermostat installed on primary heating or cooling system | Final Inspection | Mechanical | Controls | | | | | | Check Box | | |
| 8 | FI10 | R403.1.2 | Heat pump supplemental heat controls installed on heat pumps | Final Inspection | Mechanical | Controls | | | | | | Check Box | | |
| 9 | Mechanical Ducts | | | | | | | | | | | | | |
| 10 | FI4a | R403.3.5 | <i>First Duct System - Duct tightness test result (postconstruction total leakage) by Project Team using RESNET Protocol (CFM/100 ft² floor area @ 25 Pa)</i> | Final Inspection | Mechanical | Ducts | Key Item | | | | | Number | CFM/100 ft² | |



READ ME Tab – Data Validation

- Cells with dropdown menus are locked to restrict entries to a limited set of choices
- No other data may be entered in these cells
- Use the Comments field if you need to elaborate

| | | | | | | | | | | | | |
|----|-----------------------------|-------------------|---|------------------|------------|-----------|-------------------|--|--|--------|--------------|--|
| 37 | Mechanical Equipment | | | | | | | | | | | |
| | PR2 | R302.1, R403.7 | Heating and cooling equipment is sized per ACCA Manual S based on loads calculated per ACCA Manual J or other methods approved by the code official | Pre-Inspection | Mechanical | Equipment | | | | | | |
| 38 | EQ1 | NA | Predominant heating Source - gas, oil, electricity, wood | Pre-Inspection | Mechanical | Equipment | | | | | | |
| 39 | EQ2a | NA | First Heating System - Heating system type - furnace, boiler, radiant, heat pump, electric resistance strip heat | Pre-Inspection | Mechanical | Equipment | Result Weighter | | | | | |
| 40 | EQ3a | NA | First Heating System - Heating system efficiency in HSPF or AFUE | Final Inspection | Mechanical | Equipment | Key Item Modifier | | | | | |
| 41 | | | | | | | | | | Number | HSPF or AFUE | |





READ ME Tab – Printing and Using Paper Forms

- Printing paper forms
 - Legal size paper may be necessary
 - Margins may need to be adjusted
 - Columns E and F (Building System and Building System Subcategory) may be hidden for extra space
 - Delete preloaded instructional comments
- Using paper forms
 - For the “Meets Requirement” column (Column H), enter “yes” or “no”
 - For Compliance Path in Comp2, input should be “prescriptive”, “performance”, “REScheck”, or “ERI or HERS Index”.
 - Use checkmarks in Not Applicable and Not Observable columns
- A printable version is available from PNNL
- All data must be transferred to the electronic form



Insulation Grading

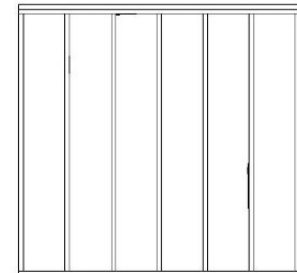
- Grade I (Minor Defects)

- Installation per manufacturer's instructions
- Uniformly fills each cavity side-to-side and top-to-bottom
- No substantial gaps around obstructions (e.g., blocking)
- Split neatly around wiring, plumbing, etc.
- Enclosed on all six sides
- No more than 2% of area with compression or incomplete fill
- Compression limits (1/2" to 3/4" depending on material)

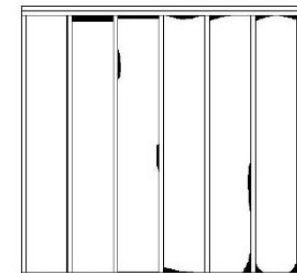
- Grade II (Moderate Defects)

- Moderate to frequent gaps around wiring/plumbing, rounded edges, or incomplete fill or compression
- No more than 15% area with compression or incomplete fill

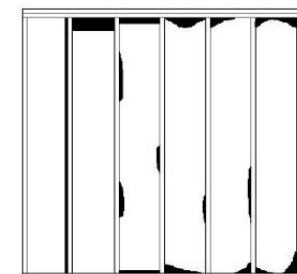
- Grade III: Anything not meeting Grade I or Grade II



Grade I



Grade II



Grade III

Source: Mortgage Industry National Home Energy Rating Standards

ANSI/RESNET/ICC 301: <https://codes.iccsafe.org/content/RESNET3012019P1/normative-appendix-a-inspection-procedures-for-insulation-grading-and-assessment>



“Zero” Insulation

- If insulation is not required, do not enter a zero.
- If insulation is required but missing, and the construction phase would indicate it should have been installed, enter a zero.





Zero Insulation Guidance

- An input of “0” in the R-value column means there *should have been* insulation at the time of observation, but none was observed.
- An observation of R-0 is rare. Usually, Not Applicable or Not Observable should be selected instead.
- Problems with entering “0”:
 - Entering “0” causes the item to get counted as one of the 63 required observations.
 - Entering “0” instead of NA or NO could bias the results.

Zero Insulation Guidance – Slab Example

Observation: Uninsulated slab

Climate Zone 2

IECC Prescriptive: No Requirement (NR)

- Entry 1: R-0
- Entry 2: Not Observable
- Entry 3: Not Applicable

Climate Zone 5

IECC Prescriptive: R-10

- Entry 1: R-0
- Entry 2: Not Observable*
- Entry 3: Not applicable

*Not observable would be correct if the home was not at a phase of construction where slab insulation could be observed.

Zero Insulation Guidance – Wall Insulation

- If cavity insulation DOES NOT meet the prescriptive requirement on its own, and no continuous insulation is observed, the continuous R-value should be entered as “R-0”.
- If cavity insulation MEETS the prescriptive requirement on its own, and no continuous insulation is observed, the continuous R-value should be entered as NA.

Wall insulation example:

Green entries are correct

Climate Zone 5

IECC Prescriptive: R-20 or R-13+5

Observation: R-13 Cavity insulation

- Entry 1: R-13 + NA
- Entry 2: R-13+0

Observation: R-20 Cavity insulation

- Entry 1: R-20 + NA
- Entry 2: R-20+0

Climate Zone 6

IECC Prescriptive: R-20+5 or R-13+10

Observation: R-13 Cavity insulation

- Entry 1: R-13 + NA
- Entry 2: R-13+0

Observation: R-20 Cavity insulation

- Entry 1: R-20 + NA
- Entry 2: R-20+0

Data Collection Example - Windows

For both windows and skylights:

- Verify the window U-factor and solar heat gain coefficient (SHGC).
- Take a photo of the manufacturer's NFRC label on the glass.





Onsite Data Collection Example - Air Leakage

Air leakage of the envelope is tested with a blower door test.

- Pressurize the unit to 50 pascals and document the CFM.





Mechanical Systems Example

Document each of the HVAC system types.

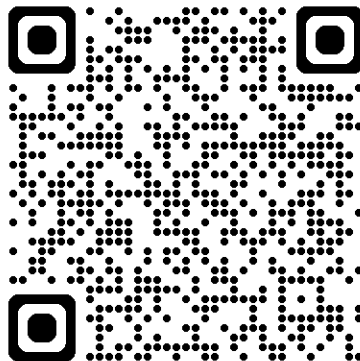
Common system types include:

- Gas furnace
- Heat pump
- Mini-split

Document the fuel type.

Using the model number from nameplate you can find the capacity and efficiency at www.ahridirectory.org

AHRI



CONFORMS TO UL STD 1995
CERTIFIED TO CSA STD.
C22. 2 No. 236

ELECTRIC CHARACTERISTICS ARE ONLY FOR OUTDOOR UNIT.

ETL LISTED US
Intertek
3070293

AHRI CERTIFIED
www.ahridirectory.org
Unitary Small HP
AHRI Standard 210/240
Certification applies only when the complete system is listed with AHRI.

**MULTI ZONE HEAT PUMP
OUTDOOR UNIT**

OUTDOOR MODEL MLA030S4M-1P

POWER SUPPLY 208/230V~60Hz 1Ph

DESIGN PRESSURE

| | |
|------|---------|
| HIGH | 550PSIG |
| LOW | 340PSIG |

REFRIGERANT

| | |
|-------|---------|
| R410A | 105.8oz |
|-------|---------|

TOTAL LOAD

FAN MOTOR LOAD

| | |
|-----------------|-------|
| OUTDOOR | 1.3A |
| COMPRESSOR LOAD | 19.0A |

COMPRESSOR LOCKED ROTOR AMPS

| | |
|----------------------|-------|
| MIN CIRCUIT AMPACITY | 30.0A |
| MAX FUSE | 45.0A |

S6921J01144

LENNOX
DALLAS, TEXAS
MADE IN CHINA

Use Copper Conductors Only.
UTILISER DES FILS
D'ALIMENTATION EN CUIVRE.
Short-circuit current: 2.4 kA rms
symmetrical, 240 V maximum



Whole-house Mechanical Ventilation

- Do not enter fan information unless it is intended for *whole-house* ventilation.
- The intent of the methodology is *not* to measure fan airflow or record fan efficacy for *spot* ventilation fans.





READ ME Tab – State-specific Forms

- If a project team wants a state-specific form, they must consult with PNNL
- Removing fields – Provide justification to PNNL
- Adding fields – Provide the following to PNNL
 - Justification
 - Relevant code section number in state code
 - Link to state code (if available)
- Modifying fields – Provide justification to PNNL

**All changes
will be made
by PNNL,
NOT the
project team**



READ ME Tab – Hidden Columns

1. The 1st rule about hidden columns is, don't unhide hidden columns
2. The 2nd rule about hidden columns is, don't unhide hidden columns

- There are hidden columns to the right of each table in the data collection form.
- Hidden columns contain the lists used in the dropdown menus.
- Ignore them. Do not unhide them.



Form Modifications

- Data collection forms submitted to PNNL must be in the *exact* format of the form provided by PNNL
- Do not create hidden tabs
- Do not add formulas to calculate values



Above-code Programs

- Above-code programs typically involve certifications and/or rebates
- Example programs:
 - Local utility rebate programs
 - ENERGY STAR Homes
 - LEED for Homes
 - Enterprise Green Communities
- Note that a HERS Rating by itself is not an above-code program, it is merely a description of what has been built.





Additional Efficiency Package Options

2021 IECC only

At final inspection:

- If construction documents are available, and the choice is specified, record the choice. If not, mark the choice as not observable.
- Regardless, the project team will determine compliance with one or more of the options.
- Additional efficiency option questions are found directly under the applicable measure including a brief description of the requirement.
- Mark as compliant, not compliant, or not observable.
- Identification of compliance with the “enhanced envelope performance” option is not expected.
 - However, if a REScheck is available, and the enhanced envelope option was selected, installed R-values could be compared to the REScheck (rare).



Completeness

- PNNL and DOE expect that all observable data is collected while on site – not just the key items.
- All rows should have an entry
 - Meets Requirement,
 - Not Applicable,
 - Not Observable, or
 - Field Observation
- When an item is observed, all related fields should be completed.
- Example:
 - If you enter a cavity R-value, the following should also have values...
 - ✓ Framing material
 - ✓ Framing spacing
 - ✓ Framing depth
 - ✓ Insulation type
 - ✓ Insulation quality



Key Items, Key Item Modifiers, and Result Weighters

It is essential to fill out every applicable key item modifier and result weighter for each key item.

| Key Item | Key Item Modifier |
|--|--|
| Additional Efficiency Package Option or Credits* | <ul style="list-style-type: none"> Compliance Value (various) |
| Blower Door Test Result | <ul style="list-style-type: none"> None |
| Ceiling R-value | <ul style="list-style-type: none"> Insulation Installation Quality |
| Window U-factor and SHGC | <ul style="list-style-type: none"> None |
| Foundation R-value | <ul style="list-style-type: none"> Foundation type Insulation Installation Quality |
| Wall R-value | <ul style="list-style-type: none"> Framing Spacing Framing Material Insulation Installation Quality |
| Duct Tightness Test Result | <ul style="list-style-type: none"> Percent of Supply Duct in Conditioned Space Percent of Return Duct in Conditioned Space |
| Lighting Efficacy | <ul style="list-style-type: none"> None |

*NA for IECC versions prior to the 2021 IECC



Key Items, Key Item Modifiers, and Result Weighters

It is essential to fill out every applicable key item modifier and result weighter for each key item.

| Non-key Item | Key Item Modifier or Result Weighter |
|---------------------------------------|--------------------------------------|
| Predominant Foundation Type | Result Weighter |
| Heating System Type | |
| Heating System Efficiency | Key Item Modifier |
| Cooling System Efficiency | |
| Hot Water Heating Source | |
| Water Heater Efficiency | |
| Mechanical Ventilation System Type | |
| HRV/ERV Sensible Recovery Efficiency | |
| HRV/ERV Defrost Strategy | |
| ERV Latent Recovery Moisture Transfer | |

Completeness

Example: If a duct leakage test result has been entered, the area served and duct locations must also be entered.

| ID | Code Section | Description | Phase of Construction | Building System | Building System Subcategory | Key Item or Key Item Modifier or Result Weight | Meets Requirement | Not Applicable | Not Observable | Observation | Form | Units |
|------|--------------|--|-----------------------|-----------------|-----------------------------|--|-------------------|----------------|----------------|-------------|--------|-------------------------|
| FI4a | R403.3.5 | First Duct System - Duct tightness test result (postconstruction total leakage) by Project Team using RESNET Protocol (CFM/100 ft ² floor area @ 25 Pa) | Final Inspection | Mechanical | Ducts | Key Item | | | | | Number | CFM/100 ft ² |
| DT1a | NA | First Duct System - Duct tightness test result from previous tests (CFM/100 ft ² floor area @ 25 Pa) (describe previous duct tightness test in comments - postconstruction or rough-in, air handler installed or not) | Final Inspection | Mechanical | Ducts | | | | | | Number | CFM/100 ft ² |
| DFAa | NA | First Duct System - Approximate Floor Area of Home Served | Final Inspection | Mechanical | Ducts | | | | | | Number | CFA |
| DP5a | NA | First Duct System - Rough percentage of supply duct in conditioned space | Framing Rough-In | Mechanical | Ducts | Key Item Modifier | | | | | Number | Percent |
| DP9a | NA | First Duct System - Rough percentage of return duct in conditioned space | Framing Rough-In | Mechanical | Ducts | Key Item Modifier | | | | | Number | Percent |



Consistency

- Related inputs should be consistent
 - The predominant foundation type should align with the insulation R-values
 - ✓ For example, if the foundation type is a heated basement, insulation observations should be for basement walls (not crawl space walls, floors, or slabs)
 - ✓ *Vented* crawl spaces should have floor insulation and *unvented* crawlspaces should have wall insulation
 - If an R-value is entered as *cavity* insulation (only), the insulation grade for *cavity* insulation should be completed (not continuous)
 - Insulation R-values and framing depths should make sense together
 - ✓ For example, do not enter R-20 in a 4-inch (nominal) cavity, or substantiate unusual R per inch in comments.
 - Heating fuel matches heating equipment.
 - ✓ For example, if you enter a heat pump, the fuel should be electricity.



Units

- Enter values in the correct units

| | Correct Units | Correct Example | Incorrect Units | Incorrect Example |
|--------------------|----------------|-----------------|-----------------|-------------------|
| Air Leakage | ACH50 | 2.9 | CFM50 | 1,543 |
| Equipment Capacity | Btu/h | 78,000 | kBtu/h | 78 |
| Duct Leakage | CFM25 / 100 sf | 4.3 | CFM25 | 545 |
| Fan Efficacy | CFM / W | 1.8 | CFM | 150 |

Market Characterization Measures

Market characterization measures

- Affordable vs. market-rate vs. high-end
- All-electric property
- Cooking fuel and type
- Interior fireplace and fuel
- Onsite renewable energy generation systems
- Electric Vehicle Service Equipment (EVSE) or EV ready
- Onsite Energy Storage Systems (ESS)
- Smart home devices





EV Definitions

Electric Vehicle: An automotive-type vehicle for on-road use, such as passenger automobiles, buses, trucks, vans, neighborhood electric vehicles, and electric motorcycles, primarily powered by an electric motor that draws current from a building electrical service, EVSE, a rechargeable storage battery, a fuel cell, a photovoltaic array, or another source of electric current.





EV Definitions Continued

Electric Vehicle Supply Equipment:

The conductors, including the ungrounded, grounded and equipment grounding conductors, and the EV connectors, attachment plugs, and all other fittings, devices, power outlets, or apparatuses installed specifically for the purpose of transferring energy between the premises wiring and the EV.





EV Definitions Continued

EV-Ready Space: A designated parking space which is provided with one 40-ampere, 208/240-volt dedicated branch circuit for future dedicated Level 2 EVSE servicing EVs.

The circuit shall terminate in a suitable termination point such as a receptacle, junction box, or an EVSE, and be located in close proximity to the proposed location of the EV parking spaces. The circuit shall have no other outlets.

The service panel shall include an over-current protective device and provide sufficient capacity and space to accommodate the circuit and over-current protective device and be located in close proximity to the proposed location of the EV parking spaces.





Section 6 – Quality Control and Assurance

6.1 Data QA/QC

- Ensure there is no personally-identifiable information
- All fields filled in
- Look for inconsistencies
- Create summary table
- Send in forms at 10%, 40%, 70%
- Supply all final forms to PNNL
- Answer any PNNL questions

For more information, see separate training on performing data quality assurance.

Document Storage

- Project teams should determine a central location to save data collection forms and photos
 - Cloud-based (shared) storage recommended
- Name data collection forms and folders with photos with two-digit state code and home ID





READ ME Tab – Reporting to PNNL

- All data must be provided to PNNL in the official Data Collection Form
- Data is automatically extracted and combined for analysis
- Following review by project team QA Lead, email spreadsheets for individual homes to PNNL.
- Email to: mike.turns@pnnl.gov





Thank you

