



Building Performance Institute, Inc.  
BPI Standard

BPI-2101-S-2013  
Standard Requirements for a  
Certificate of Completion for  
Residential Energy Efficiency  
Upgrades



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# Building Performance Institute, Inc. Types of Standards (Informative)

The Building Performance Institute, Inc. (BPI) develops technical standards, certifications, accreditations, and related technical documents (e.g., Guidelines, Bulletins, Standard Work Specifications) to support the safe and effective improvement of energy performance in existing residential buildings (including multi-family). These elements reside within a family of related types where they build on each other.

The structure of BPI Standards is made up of six distinct types: Materials Standards, Material Test Methods, Installation Standards, Application Standards, Standard Practices and Standard Specifications. The following overview provides a description of each of these types, and how they relate to each other in order to create a comprehensive and unified structure.

**Materials Standards** are perhaps the easiest member of the family to understand. They define the performance requirements of particular materials. Material standards include methods of testing to confirm acceptability, as well as establishing the performance characteristics of materials under specific conditions. A material standard would be applicable to the manufacturers of the materials and would include all requirements that a manufacturer shall meet. A material standard includes requirements for material labeling and requirements for the documentation that a manufacturer would need to provide.

**Material Test Method Standards** are used to outline the process to conduct a standardized test to determine the performance of a material. Test methods are normally for laboratories and do not include performance requirements. (That is, test methods do not dictate how well a material shall perform, but simply how to test for its level of performance.) An example of a test method is the BPI standard on the air retarder properties of loose fill insulation. In a test method standard, the outcome would be a test report.

**Installation Standards** provide requirements for the installation of a specific material or product and are limited to that particular material or product. The installation standards are applicable no matter where the material would be installed and no matter what function the material is intended to provide. For example, loose fill fibrous insulation ALWAYS needs proper setup of the equipment to ensure that the fibers are adequately separated as they are being delivered. This is achieved by machine settings, length and configuration of hose, nozzle size and other factors that are covered in the installation standard. Installation standards cover everything that is needed for proper installation of the material, which may include health and safety requirements for the installer, other workers and occupants.

**Application Standards** are requirements for a specific function and would reference material standards and installation standards. For BPI application standards, the function will be identified along with all the materials that could provide that function for a specific location in a building. As an example, if you developed a Building Insulation Application standard, the standard would be broken down by location. In the location of attic floors, it would then lay out all of the requirements to provide the function of thermal insulation at that location. The Building

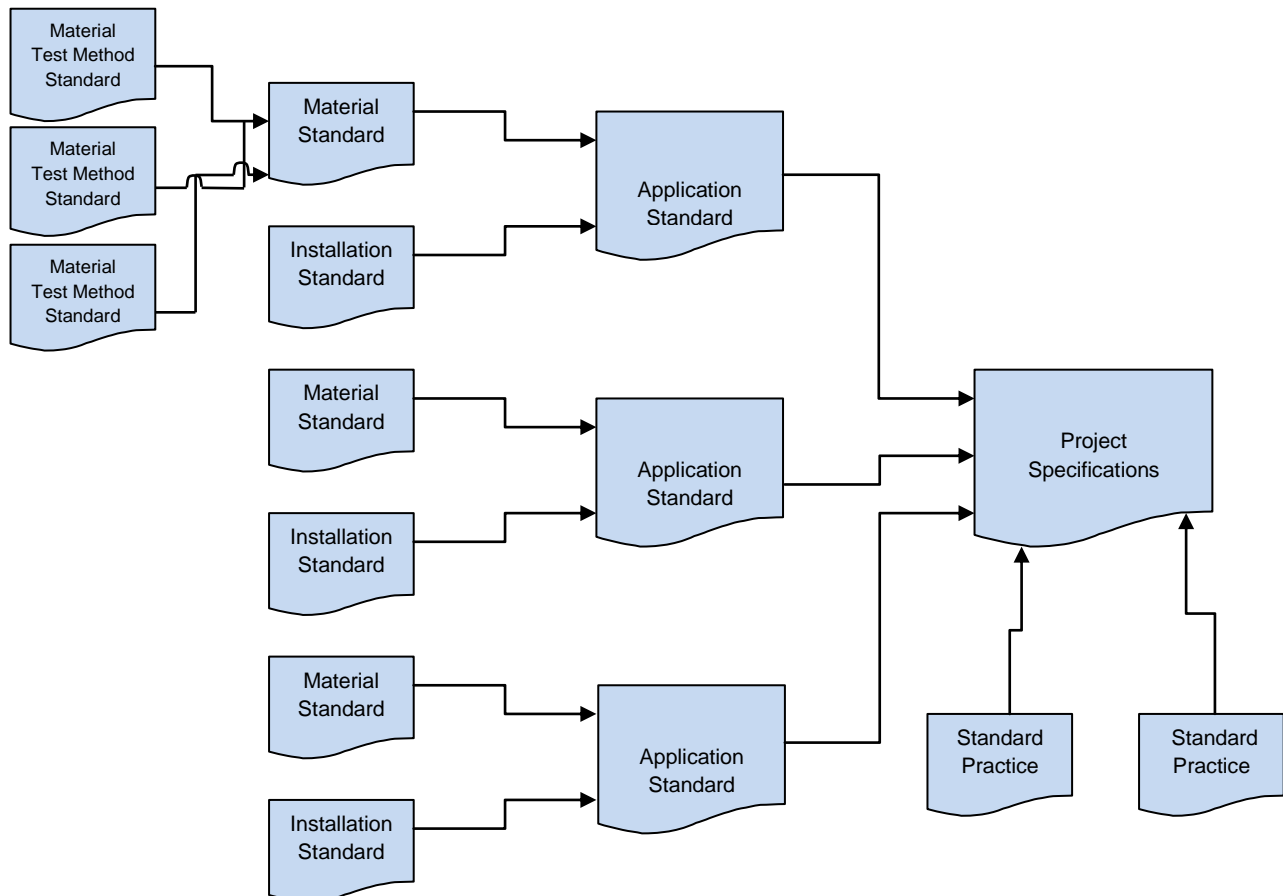
Insulation Application standard would require that the attic floor be prepared before the installation of the thermal insulation. Preparation would include confirming that:

- the attic floor is air sealed,
- the proper amount of attic ventilation is provided in the correct locations,
- the electrical wiring is appropriate,
- the appropriate shielding is in place for heat emitting devices so that they do not come in contact with the insulation.

After all the items required for attic preparation have been met, then the installation of the insulation would commence using material that meets the material standard and it would be installed in accordance for the installation standard for that material.

**Standard Practice Standards** provide requirements for conducting a procedure normally done outside of a laboratory. An example of a standard practice is ASTM E 779, which specifies how a blower door test is conducted, but does not specify how tight a building should be. In a standard practice, the outcome would be a report.

**Standard Specification Standards** outline performance requirements and references other standards as to how you would confirm that the specification requirements have been met. As an example, an air tightness specification for a home or building would specify a maximum air leakage rate, and reference ASTM E 779 for how to measure it.



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## **1. Scope**

The scope of this standard is to identify a standard set of data elements for certificates that document the completion of a whole-house energy upgrade (HEU) and individual energy conservation measures (ECMs). A certificate that complies with the requirements of this Standard can be branded and issued by home energy upgrade programs or by entities implementing nationally recognized third-party Quality Assurance (QA) programs. The set of data elements required for inclusion in the certificate will provide a clear, easy-to-understand description of the HEU or ECMs, including information about major energy-related improvements implemented, and, if relevant, predicted energy savings or other performance indicators. The certificate can be designed to be used as a reference document by real estate agents, appraisers, and other professionals during the home sale process, and can be uploaded into Multiple Listing Service (MLS) databases.

## **2. Objective**

Residential energy efficiency programs across the United States issue certificates to homeowners who have implemented an HEU or stand-alone ECMs under the program's auspices. These certificates serve to confirm the achievement (i.e., the HEU was successfully completed, or individual ECMs successfully installed) and may provide details about the nature of the upgrade.

These certificates may also serve as a tool in home re-sale transactions, in several ways. They may be attached to an MLS listing sheet and shown to the buyer and buyer's agent as a demonstration of the home's relative energy efficiency and/or related attributes, which may increase the home's market value. They may also be used by appraisers and underwriters as a source of information about characteristics of a home related to energy consumption and energy savings.

BPI-2101 is designed to establish standards that define which entities can issue a BPI-2101-compliant certificate (a "Certificate") describing an HEU or ECMs, and standardize the data contained in these Certificates. The goals of this standardization are to:

- Provide documentation of a homeowner's investment in an HEU or ECMs, as well as positive reinforcement for the homeowner;
- Enhance the status and value of homes that have received an HEU or ECMs by presenting the market with a nationally-recognized protocol that can be used to document energy efficient features and characteristics of the HEU or ECMs;
- Standardize data about homes' energy efficient features that is presented to real estate agents (via MLS systems), appraisers and underwriters;
- Facilitate the flow of information and data about a home's energy efficient characteristics from an issuing program into the real estate value chain (i.e., into MLS systems and to

appraisers via documents such as the Appraisal Institute's *Residential Green and Energy Efficiency Addendum*);

- Facilitate the collection of high-quality data for other research purposes.

The information in a BPI-2101-compliant Certificate is aligned with the data standard for MLS systems, which is known as the Real Estate Transaction Standard (or "RETS"). This alignment allows information from a BPI-2101-compliant Certificate to be more easily transferred to MLS systems. The information is also designed to align with data fields included on the Appraisal Institute's *Residential Green and Energy Efficiency Addendum* (the "AI Addendum"), an attachment that appraisers can voluntarily elect to include in their residential appraisal to comply with Uniform Standards of Professional Appraisal Practice (USPAP) when completing a high-performance home assignment.

The scope of this standard does *not* include the appearance of a Certificate. Provided that the Certificate contains the data as specified hereafter, the Sponsor may choose a Certificate design that best meets its programmatic needs.

### **3. Third-Party Issuance**

A BPI-2101-compliant Certificate shall be issued only by a qualified Sponsor that the homeowner, real estate agent, appraiser, underwriter and all other actors in any real estate transaction can rely upon for accurate information regarding the HEU or ECMs and the home's energy efficient characteristics. The Sponsor may be: 1) a residential energy efficiency program sponsored by a government agency, weatherization agency, utility, or non-profit organization; 2) an organization designated by any of the previously-listed entities to administer a residential energy efficiency program on their behalf; or 3) an organization implementing a nationally recognized third-party QA program. A qualified Sponsor must meet the following requirements.

A qualified Sponsor must:

1. Assume responsibility for the accuracy of all information and representations in the Certificate.

AND ensure the accuracy of all information either by;

- 2a. Overseeing a QA program that meets all the requirements of the Department of Energy's (DOE) Sponsor Guide for the Home Performance with ENERGY STAR<sup>®</sup> program, to ensure the quality of HEUs or ECMs conducted under its auspices. The Sponsor's QA program is not required to review all HEUs or ECMs conducted under its auspices, and it is not necessary that a QA review be conducted for each individual home or project for which a BPI-2101-compliant Certificate is issued;

Or

- 2b. Providing third-party verification of the HEU or ECMs through the auspices of a nationally- or regionally-recognized program that sets standards for HEUs or ECMs.

Contractors who have implemented an HEU or ECMs may not serve as their own Sponsor because they cannot conduct third-party verification of their own work.

Sponsors may issue rebates or other incentives in support of the HEU or ECMs. However, a Sponsor may issue BPI-2101-compliant Certificates, even if it does not provide any form of incentive.

## **4. Certificate of Efficiency Improvements and Certificate of Performance**

A BPI-2101-compliant Certificate shall be one of two types: a Certificate of Efficiency Improvements or a Certificate of Performance.

- A Certificate of Efficiency Improvements provides information about a set of improvements installed designed to improve the energy efficiency of the home, whether as an HEU or as single measures.
- A Certificate of Performance provides quantitative information about a home's energy performance, as well as details on the set of improvements (as would be detailed in a Certificate of Efficiency Improvements). The quantitative information about a home's performance may indicate that:
  - A home's energy performance was improved by a certain percentage or by a certain amount from a pre-HEU baseline as the result of the HEU; and/or
  - A home has achieved a specific third-party score, rating or label, including, but not limited to, a Residential Energy Services Network (RESNET) Home Energy Rating System (HERS) index, a DOE Home Energy Score, or other indicator of energy consumption; and/or
  - A home is projected to consume a certain quantity of energy on an annual basis, as expressed either in absolute or per-square-foot terms, according to software modeling or other methods; and/or
  - A home consumes a certain quantity of energy on an annual basis, as expressed either in absolute or per-square-foot terms, according to adjusted billing data.

## **5. Use of Data Elements**

A Certificate shall use the data elements from the Data Element List that comprises Annex B of this Standard (the "Data List") to describe the improvements made to the home through the HEU or ECMs and to describe a number of other characteristics of the home, in all cases for which the Data List provides an adequate vocabulary to describe these improvements and characteristics.



The Data List is divided into two parts. The data elements in Annex B.1 provide a high-level description of the work conducted in the home and information about the Sponsor and contractor, and the data elements in Annex B.2 allow a more detailed description of the HEU and individual ECMs.

The data elements in this Standard are drawn from BPI-2200-S-2013, and Sponsors may use the data transfer standard detailed in BPI-2100-S-2013 (“HPXML”) to transfer this data, as appropriate.

Specific uses of the data elements from the Data List in the two types of Certificate (Certificate of Efficiency Improvements and Certificate of Performance) are detailed below.

#### Certificate of Efficiency Improvements

The Sponsor shall include in a Certificate of Efficiency Improvements a description of all improvements made as part of the implementation of HEU or ECMs that can be described using data elements in the Data List.

The data elements in Annex B.1, which provide a high-level description of the HEU and information about the Sponsor and contractor, shall be included in the Certificate. The data elements in Annex B.2, which allow a more detailed description of the HEU, shall be appended to the Certificate as a Data Sheet.

A Certificate shall *not* use terms that are not contained in the Data List to describe an improvement or characteristic if data elements in the Data List are sufficient to adequately describe the improvement or characteristic.

However, a BPI-2101-compliant Certificate may use data elements not contained in the Data List if an improvement or characteristic of the home cannot be adequately described by the data elements in the Data List.

#### Certificate of Performance

A Certificate of Performance includes scores, labels and/or ratings concerning a home’s energy performance. Specific data elements from the Data List that might be incorporated into a Certificate of Performance include, but are not limited to:

- Annual Energy Consumption
- Annual Energy Savings
- DOE Home Energy Score
- RESNET HERS Index
- Other local scoring or upgrade programs

All data included in a Certificate of Efficiency Improvements shall also be included in a Certificate of Performance, as detailed above.

## 6. Multiple Certificates

A Sponsor may issue several Certificates documenting work conducted within the same home if the work occurs over a period of time, or if work is conducted by different contractors under separate contracts. For example, a Sponsor might issue a Certificate of Efficiency Improvements to document the installation of a high-efficiency HVAC system, and issue a second Certificate of Efficiency Improvements six months later when air sealing and insulation improvements are made. In some cases, a Sponsor may issue a Certificate of Performance subsequent to issuing one or more Certificates of Efficiency Improvements if the installed measures result in attainment of a specific goal identified by the Sponsor, such as achievement of a specific score or rating, or a specific reduction in the home's energy consumption.

## 7. Representations

The reliability of the information contained in the Certificate is crucial. Homeowners and occupants of dwellings that have undergone an HEU must be informed about which measures were completed. All parties to a real estate transaction must be assured of the reliability of a Certificate, because the information in the Certificate may influence whether a real estate transaction occurs, and/or the terms of a sales contract for the subject home. For these reasons, the Sponsor shall make the following representations in the Certificate:

1. To the best of the Sponsor's knowledge, all information contained in the Certificate can be relied upon as complete and accurate;

AND either

- 2a. The HEU and/or ECMs described in the Certificate were implemented under the auspices of an energy efficiency program overseen by the Sponsor;

OR

- 2b. The HEU and/or ECMs described in the Certificate were conducted under the auspices of a nationally- or regionally-recognized quality assurance standard for verifying that an HEU has been implemented correctly.

If information about a home's energy consumption included in the Certificate is based on models or projections rather than actual measured consumption data, the Sponsor shall clearly indicate this and provide a clear statement as to whether, and to what extent, the Sponsor stands behind this projection (e.g., in the form of a guarantee). The Sponsor shall also clearly provide a written explanation regarding the reliability of all information based on models or predictions.

Misinformation – whether intentional or in error – has significant legal implications for all parties involved, and could be the basis for a lawsuit. Therefore, Sponsors are strongly encouraged to obtain legal advice regarding their responsibilities for representations made in the Certificate.

## Annex A: Implementation (Informative)

This standard was designed to complement the current versions of three tools essential to the real estate transaction. Alignment with these tools creates an opportunity to make an efficiency Certificate accessible throughout the resale transaction:

- The Real Estate Standards Organization Data Dictionary version 1.1 defines the mandatory data transfer standard for MLS systems. Like BPI-2101, the MLS will *not* use fields that are not contained in data transfer standard if adequate fields are available in the standard. There will be a field for green verification programs, which will have “BPI-2101 Standard Certificate” as a field value.
- The Appraisal Institute Green and Energy Efficiency Addendum (“AI Addendum”) supplements the Uniform Residential Appraisal Report Form 1004. The BPI-2101 Data List is consistent with the fields on the AI Addendum.
- Mortgage Industry Standards Maintenance Organization (MISMO) manages the data collection standard, which is the basis for the Uniform Loan Delivery Dataset used by underwriters. This data standard provides a field called “Certification.” Typical field values allow identification of homes built to the standards of programs like LEED and ENERGY STAR, but it could also be used for a BPI-2101-compliant Certificate.

The alignment between the AI Addendum and BPI-2101 is important. The Data List in Annex B of this standard provides data elements recommended for appraisers: an assessment of quality and summary of features. Other data elements needed by appraisers include energy savings, scores or rating information and projected or actual utility usage. These four elements taken together allow the appraiser to assess the home using one or more different valuation approaches and are critically needed to improve how the values of existing efficient homes are assessed.

Some sponsors may use the Data List in Annex B to generate a Certificate and then use the same Data List element to populate the AI Addendum. This is a recommended approach because it packages the same set of data in two ways: a form that consumers and MLS can use when evaluating properties (a Certificate) and a form that appraisers can use when assessing value (the AI Addendum). In addition to providing more information about the home, a completed AI Addendum may also contribute to changes in the way appraisers are assigned to jobs by encouraging assignment of appraisers who are knowledgeable about building science for appraising homes that have completed HEUs.

Future versions of BPI-2101 may seek to develop strategies for alignment with other appraisal tools that are created in the future.

For more information, see CNT Energy’s Value for High-Performance Homes website. The site explains how tools like the Real Estate Transaction Standard and the AI Addendum can work in tandem with BPI-2101 to advance the high-performance home real estate transaction. Links are available directly to the main pages for the sponsors of these tools as well.

<http://www.cntenergy.org/innovation/valuehph/>

## **Annex B: BPI-2101-S-2013 Data Element List (Normative)**

### **Annex B.1 Certificate Data Elements**

Data elements B.1.1-B.1.39 are listed on the following pages.

### **Annex B.2 Data Sheet Data Elements**

Data Elements B.2.1-B.2.161 are listed on the following pages.

Ref #	Certificate Label	Unit of Measure	Data Type	Enumeration	Comments & Definitions
B.1.1	Date issued		Date		
B.1.2	Certificate version		Text		
B.1.3	<b>Program Information</b>				
B.1.4	Program name		Text		
B.1.5	Project completion date		Date		May be reported by the organization issuing the certificate or may correspond to the date the certificate was issued. The project completion date does not necessarily correspond to the date on the Certificate of Occupancy, if required.
B.1.6	<b>Customer Information</b>				
B.1.7	First name		Text		May be used for customer and business contacts.
B.1.8	Last name		Text		May be used for customer and business contacts.
B.1.9	Address 1		Text		May be used for customer and business contacts.
B.1.10	Address 2		Text		May be used for customer and business contacts.
B.1.11	City or municipality		Text		May be used for customer and business contacts.
B.1.12	State		State code		2-letter state abbreviation.
B.1.13	Zip code		Text		User may enter 5-digit or 9-digit zip code.
B.1.14	<b>Contractor Information</b>				
B.1.15	Business name		Text		
B.1.16	<b>Energy Consumption and Savings</b>				

Ref #	Certificate Label	Unit of Measure	Data Type	Enumeration	Comments & Definitions
B.1.17	Energy units		Enumeration	cmh (cubic meters per hour), ccf (hundred cubic feet), kcf (thousand cubic feet), MCF (million cubic feet), cfh (cubic feet per hour), kWh (thousand Watt-hours), MWh (million Watt-hours), kBtu (thousand Btu), MBtu (million Btu), therms, Lbs. (pounds), KLbs. (thousand pounds), Mlbs. (million pounds), Tonnes, Cords, (full cord), Gallons, kGal (thousand gallons), ton hour	
B.1.18	Fuel type		Enumeration	Electricity, Renewable electricity, Natural gas, Renewable natural gas, Fuel oil (1, 2, 4, 5/6), District steam, District hot water, District chilled water, Solar hot water, Propane, Kerosene, Diesel, Anthracite coal, Bituminous coal, Coke, Wood, Wood pellets, Combination, Other	
B.1.19	Consumption		Number		Can be repeated for multiple fuels as necessary and may be provided for pre- and post-upgrades. Use smart meter data if possible. Renewable generation can be indicated by a negative value.

Ref #	Certificate Label	Unit of Measure	Data Type	Enumeration	Comments & Definitions
B.1.20	Consumption cost	Dollars	Number		Consumption cost may be provided pre- and post-upgrade. Indicate whether consumption cost is actual or estimated. If actual cost is reported, indicate the source of the value (e.g., customer bills, utility smart meters, etc.)
B.1.21	Total energy savings		Number		Total savings are annual and should be reported over a 12-month period or annualized if less than one year of data is available. Programs may indicate whether savings are reported by calendar or program year.
B.1.22	Energy savings type		Enumeration	Measured, Estimated	
B.1.23	Total dollar savings	Dollars	Number		Total savings are annual and should be reported over a 12-month period or annualized if less than one year of data is available. Programs may indicate whether savings are reported by calendar or program year.
B.1.24	<b>Emissions Reductions</b>				
B.1.25	Emissions type		Enumeration	Carbon dioxide (CO <sub>2</sub> ), CO <sub>2</sub> equivalent, Methane (CH <sub>4</sub> ), Nitrous Oxide (N <sub>2</sub> O)	
B.1.26	Emissions units		Enumeration	Metric ton, Ton, Pounds, Kilograms	

Ref #	Certificate Label	Unit of Measure	Data Type	Enumeration	Comments & Definitions
B.1.27	Emissions		Number		Refer to the EPA's Greenhouse Gas Equivalencies Calculator to calculate emissions from fuel consumption: <a href="http://www.epa.gov/cleanenergy/energy-resources/calculator.html">http://www.epa.gov/cleanenergy/energy-resources/calculator.html</a>
B.1.28	<b>Scores and Certifications</b>				
B.1.29	Certifying organization		Enumeration	US Green Building Council (LEED Rating System), Home Innovation Research Labs, Local program, ENERGY STAR Certified New Home, Passive House Institute US (PHUIS)	
B.1.30	Program certificate		Enumeration	Home Performance with ENERGY STAR, Certified, Silver, Bronze, Gold, Platinum, Emerald, 1-Star, 2-Star, 3-Star, 4-Star, 5-Star, Net-zero, PHIUS+	
B.1.31	ENERGY STAR Certified New Home version		Number		
B.1.32	Year certified	Year	Number		



Ref #	Certificate Label	Unit of Measure	Data Type	Enumeration	Comments & Definitions
B.1.33	Score type		Enumeration	RESNET, U.S. DOE, Other	The Home Energy Rating System (HERS) index is a measure of a home's energy efficiency. It can also be used to inspect and calculate a home's energy performance. The lower a home's HERS Index Score, the greater its efficiency (RESNET). The Home Energy Score is an asset rating for homes, developed and administered by the U.S. Department of Energy. After conducting a brief walk thru of a home, a qualified assessor calculates a home's score on a 10 point scale using a standard scoring tool, with 10 reflecting homes that use the least amount of energy assuming standard operating conditions (US DOE).
B.1.34	Score		Number		
B.1.35	Certifying organization URL		Text		Website address
B.1.36	<b>Program Certification</b>				
B.1.37	HPwES logo/program logo		Logo		
B.1.38	Program representative signature block		Signature		
B.1.39	Other signatures		Signature		
B.1.40	Score disclaimer		Text		

Ref #	Certificate Label	Unit of Measure	Data Type	Enumerations	Comments & Definitions
B.2.1	Project number		System ID		
B.2.2	<b>Project Information</b>				
B.2.3	Program name		Text		
B.2.4	<b>Customer Information</b>				
B.2.5	First name		Text		May be used for customer and business contacts.
B.2.6	Last name		Text		May be used for customer and business contacts.
B.2.7	Address type		Enumeration	Street, Mailing	May be used for customer and business contacts.
B.2.8	Address 1		Text		May be used for customer and business contacts.
B.2.9	Address 2		Text		May be used for customer and business contacts.
B.2.10	City or municipality		Text		May be used for customer and business contacts.
B.2.11	State		State code		Two letter state abbreviation
B.2.12	Zip code		Text		User may enter 5-digit or 9-digit zip code.
B.2.13	<b>Contractor Information</b>				
B.2.14	Business name		Text		
B.2.15	<b>Air Sealing and Insulation</b>				
B.2.16	Building air leakage unit		Enumeration	CFM, CFMnatural, ACH, ACHnatural	Air sealing and insulation data may be provided for multiple areas.
B.2.17	House pressure		Number		House Pressure may be used in conjunction with Building Air Leakage Unit to quantify air leakage. For example, CFM50 where CFM is an enumeration of Building Air Leakage Unit and 50 is the number of Pascals of house pressure.
B.2.18	Building air leakage		Number		

Ref #	Certificate Label	Unit of Measure	Data Type	Enumerations	Comments & Definitions
B.2.19	Attic areas air sealed		Enumeration	Attic floor, Top plates, Attic kneewall transitions, Plumbing wet walls, Chimney/flue chases, Recessed lights, Attic access, Dropped soffit, Attic level transitions, Mechanical chases, Other	
B.2.20	Basement/crawlspace areas air sealed		Enumeration	Plumbing penetrations, Access, Wiring penetrations, Chimney/flue chase, Mechanical chases, Rim joists, Windows and doors, Foundation service penetrations, Cantilevers, Other	
B.2.21	Living spaces air sealed		Enumeration	Home-garage connection, Rim joists, Baseboards, Windows and doors, Plumbing penetrations, HVAC registers, Interior sheathing voids, Cantilevers, Other	
B.2.22	Areas insulated		Enumeration	Attic floor, Attic roof, Foundation wall, Frame floor, Slab perimeter, Under slab, Rim joist, Wall	
B.2.23	Insulation material		Enumeration	Batts, Fiberglass (Insulsafe), Rockwool, Recycled cotton, Loose fill, Cellulose, Fiberglass, Rockwool, Vermiculite, Rigid Polyisocyanurate (ISOCY), XPS, Expanded Polystyrene (EPS) Sheathing, Spray foam, Open Cell (Icynene), Closed Cell, Other, None, Unknown	
B.2.24	Insulation nominal R-value		Number		R-value can be provided for each area insulated.
B.2.25	<b>Radiant Barrier</b>				

Ref #	Certificate Label	Unit of Measure	Data Type	Enumerations	Comments & Definitions
B.2.26	Radiant barrier		Boolean		Radiant barriers are installed in homes, usually in attics, to reduce summer heat gain and reduce cooling costs. The barriers consist of a highly reflective material that reflects radiant heat rather than absorbing it.
B.2.27	Radiant barrier location		Enumeration	Top side of truss under sheathing, Below bottom cord of truss, Attic floor, Other	<a href="https://www.fsec.ucf.edu/en/publications/pdf/FSEC-DN-7-84.pdf">https://www.fsec.ucf.edu/en/publications/pdf/FSEC-DN-7-84.pdf</a> .
B.2.28	<b>Roof</b>				
B.2.29	ENERGY STAR qualified cool roof		Boolean		Roof products must meet the following specifications to qualify as ENERGY STAR qualified: Low slope roofs (2:12 or less) must have an initial solar reflectance of $\geq 0.65$ . After 3 years, the solar reflectance must be $\geq 0.50$ . Steep slope roofs (2:12 or greater) must have an initial solar reflectance of $\geq 0.25$ . After 3 years, the solar reflectance must be $\geq 0.15$ . There is no minimum requirement for thermal emittance ( <a href="http://www.energystar.gov/index.cfm?c=roof_prods.pr_crit_roof_products">http://www.energystar.gov/index.cfm?c=roof_prods.pr_crit_roof_products</a> ).
B.2.30	Roof color		Enumeration	Light, Medium, Dark, Reflective	
B.2.31	<b>Duct Sealing and Insulation</b>				
B.2.32	Duct leakage test unit of measurement		Enumeration	CFM, CFM per Std 152	
B.2.33	House pressure		Number		House Pressure may be used in conjunction with Duct Leakage Test Unit of Measurement to quantify duct leakage. For example, CFM50 where CFM is an enumeration of Duct Leakage Test Unit of Measurement and 50 is the number of Pascals of house pressure
B.2.34	Measured duct leakage		Number		
B.2.35	Duct insulation R value		Number		
B.2.36	<b>Windows</b>				
B.2.37	Number of windows		Number		Information should be presented for all windows of the same type. Multiple groups may be described (e.g., two groups of windows with different characteristics).

Ref #	Certificate Label	Unit of Measure	Data Type	Enumerations	Comments & Definitions
B.2.38	Window area	Square feet	Number		Provide area of the entire window group if applicable (e.g. for a group of identical windows, the area of a single window multiplied by the number of windows in the group).
B.2.39	Percent of home's windows		Percent (fraction)		Percent of all windows that constitute a group.
B.2.40	U-factor		Number		Rate of heat loss indicated in terms of the U-factor (U-value) of a window assembly. The lower the U-factor, the greater a window's resistance to heat flow and the better its insulating properties.
B.2.41	Solar heat gain coefficient		Percent (fraction)		Fraction of incident solar radiation admitted through a window, both directly transmitted and absorbed and subsequently released inward.
B.2.42	Glass type		Enumeration	Low-e, Tinted, Reflective, Tinted/reflective, Other	
B.2.43	Glass layers		Enumeration	Single-pane, Double-pane, Triple-pane, Multi-layered, Single-paned with storms, Single-paned with low-e storms, Other	Sometimes referred to as number of panes.
B.2.44	Frame type		Enumeration	Aluminum (thermal break), Composite, Fiberglass, Metal, Vinyl, Other	
B.2.45	Exterior shading type		Enumeration	External overhangs, Awnings, Solar screens, Solar film, Deciduous tree, Evergreen tree, Building, Functional shutters, Other	
B.2.46	Window third party certification		Enumeration	ENERGY STAR, Other	Independent organization has verified that product or appliance meets or exceeds the standard in question (ENERGY STAR, CEE, or other).
B.2.47	<b>Doors</b>				
B.2.48	Door type		Enumeration	Interior, Exterior, Storm	
B.2.49	Door R-value		Number		

Ref #	Certificate Label	Unit of Measure	Data Type	Enumerations	Comments & Definitions
B.2.50	Door third party certification		Enumeration	ENERGY STAR, Other	Independent organization has verified that product or appliance meets or exceeds the standard in question (ENERGY STAR, CEE, or other).
B.2.51	<b>Skylights</b>				
B.2.52	Number of skylights		Number		
B.2.53	Skylight area	Square feet	Number		Provide area of the entire skylight group if applicable (e.g., for a group of identical skylights, the area of a single skylight multiplied by the number of skylights in the group).
B.2.54	Glass type		Enumeration	Low-e, Tinted, Reflective, Tinted/reflective, Other	
B.2.55	Glass layers		Enumeration	Single-pane, Double-pane, Triple-pane, Multi-layered, Single-paned with storms, Single-paned with low-e storms, Other	Sometimes referred to as number of panes.
B.2.56	Skylight third party certification		Enumeration	ENERGY STAR, Other	Independent organization has verified that product or appliance meets or exceeds the standard in question (ENERGY STAR, CEE, or other).
B.2.57	Exterior shading type		Enumeration	External overhangs, Awnings, Solar screens, Solar film, Deciduous tree, Evergreen tree, Building, Other, None	
B.2.58	<b>Appliances</b>				
B.2.59	Clothes washer third party certification		Enumeration	ENERGY STAR, ENERGY STAR Most Efficient, CEE Tier I, CEE Tier II, CEE Tier III, Other	Independent organization has verified that product or appliance meets or exceeds the standard in question (ENERGY STAR, CEE, or other).
B.2.60	Refrigerator third party certification		Enumeration	ENERGY STAR, ENERGY STAR Most Efficient, CEE Tier I, CEE Tier II, CEE Tier III, Other	Independent organization has verified that product or appliance meets or exceeds the standard in question (ENERGY STAR, CEE, or other).
B.2.61	Freezer third party certification		Enumeration	ENERGY STAR, ENERGY STAR Most Efficient, CEE Tier I, CEE Tier II, CEE Tier III, Other	Independent organization has verified that product or appliance meets or exceeds the standard in question (ENERGY STAR, CEE, or other).

Ref #	Certificate Label	Unit of Measure	Data Type	Enumerations	Comments & Definitions
B.2.62	Dishwasher third party certification		Enumeration	ENERGY STAR, ENERGY STAR Most Efficient, CEE Tier I, CEE Tier II, CEE Tier III, Other	Independent organization has verified that product or appliance meets or exceeds the standard in question (ENERGY STAR, CEE, or other).
B.2.63	Dehumidifiers third party certification		Enumeration	ENERGY STAR, ENERGY STAR Most Efficient, CEE Tier I, CEE Tier II, CEE Tier III, Other	Independent organization has verified that product or appliance meets or exceeds the standard in question (ENERGY STAR, CEE, or other).
B.2.64	<b>Lighting</b>				
B.2.65	Lighting type		Enumeration	Incandescent (halogen), Fluorescent tube (tube type - T5, T8, Super T8, T12 and ballast type - electronic, magnetic, instant start, rapid start, programmed start), Compact fluorescent, Light emitting diode (LED), High intensity discharge (HID)	Lighting data may be provided for multiple lighting types.
B.2.66	Average wattage		Number		
B.2.67	Number of bulbs		Number		
B.2.68	ENERGY STAR light fixtures		Boolean		
B.2.69	ENERGY STAR ceiling fan		Boolean		
B.2.70	<b>HVAC Systems</b>				
B.2.71	Heating system type		Enumeration	Furnace (sealed combustion, condensing system, atmospheric burner, power burner); Wall furnace (sealed combustion, condensing system, atmospheric burner, power burner); Boiler (hot water, steam, sealed combustion, condensing system, atmospheric burner, power burner, rotary cup); Electric distribution (baseboard, radiant floor, radiant ceiling); Solar thermal heating; District steam heating; Other	Heating system data may be provided for multiple heating systems.

Ref #	Certificate Label	Unit of Measure	Data Type	Enumerations	Comments & Definitions
B.2.72	Rank		Enumeration	Primary, Secondary, Tertiary, Fourth, Fifth, Sixth	The first HVAC system listed on the certificate should be the primary system.
B.2.73	Heating system fuel type		Enumeration	Electricity, Electricity (Renewable), Natural Gas, Natural Gas (Renewable), Fuel Oil, Fuel Oil No.1, Fuel Oil No.2, Fuel Oil No.4, Fuel Oil No. 5 and No.6, District Steam, District hot water, District chilled water, Solar, Propane, Kerosene, Diesel, Anthracite coal, Bituminous coal, Coke, Wood, Wood pellets, Combination, Other	
B.2.74	Annual heating efficiency unit		Enumeration	AFUE, COP, Percent	
B.2.75	Annual heating efficiency		Number		
B.2.76	Heating capacity	Btuh	Number		
B.2.77	Heating system third party certification		Enumeration	ENERGY STAR, CEE Tier I, CEE Tier II, CEE Tier III, Other	Independent organization has verified that product or appliance meets or exceeds the standard in question (ENERGY STAR, CEE, or other).
B.2.78	Fraction of heating load served		Percent (fraction)		
B.2.79	Cooling system type		Enumeration	Central air conditioning, Air source heat pump, Ground source heat pump, Room air conditioner, Evaporative cooler, Other	Cooling system data may be provided for multiple cooling systems.
B.2.80	Rank		Enumeration	Primary, Secondary, Tertiary, Fourth, Fifth, Sixth	The first HVAC system listed on the certificate should be the primary system.



Ref #	Certificate Label	Unit of Measure	Data Type	Enumerations	Comments & Definitions
B.2.81	Cooling system fuel type		Enumeration	Electricity, Electricity (Renewable), Natural Gas, Natural Gas (Renewable), Fuel Oil, Fuel Oil No.1, Fuel Oil No.2, Fuel Oil No.4, Fuel Oil No. 5 and No.6, District Steam, District hot water, District chilled water, Solar, Propane, Kerosene, Diesel, Anthracite coal, Bituminous coal, Coke, Wood, Wood pellets, Combination, Other	
B.2.82	Annual cooling efficiency unit		Enumeration	SEER, EER, COP, kW/ton	
B.2.83	Annual cooling efficiency		Number		
B.2.84	Cooling capacity	Btuh	Number		
B.2.85	Cooling system third party certification		Enumeration	ENERGY STAR, CEE Tier I, CEE Tier II, CEE Tier III, Other	Independent organization has verified that product or appliance meets or exceeds the standard in question (ENERGY STAR, CEE, or other).
B.2.86	Fraction of cooling load served		Percent (fraction)		
B.2.87	Heat pump system type		Enumeration	Water-to-air, Water-to-water, Air-to-air	Heat pump system data may be provided for multiple heat pump systems.
B.2.88	Heat pump third party certification		Enumeration	ENERGY STAR, CEE Tier I, CEE Tier II, CEE Tier III, Other	Independent organization has verified that product or appliance meets or exceeds the standard in question (ENERGY STAR, CEE,
B.2.89	Heat pump annual cooling efficiency unit		Enumeration	COP, SEER, EER, kW/ton	
B.2.90	Heat pump annual cooling efficiency		Number		
B.2.91	Heat pump annual heating efficiency unit		Enumeration	HSPF, COP, AFUE, Percent	
B.2.92	Heat pump annual heating efficiency		Number		

Ref #	Certificate Label	Unit of Measure	Data Type	Enumerations	Comments & Definitions
B.2.93	Fraction of heating load served		Percent (fraction)		
B.2.94	Fraction of cooling load served		Percent (fraction)		
B.2.95	Geothermal loop		Enumeration	Opened, Closed	
B.2.96	Control type		Enumeration	Programmable thermostat, Manual thermostat, Digital thermostat, Timer, EMCS, Other	
B.2.97	Calculation used to size new/replacement heating system		Enumeration	ACCA Manual J; ACCA Manual J and ACCA Manual D; Other	
B.2.98	Home Energy Management System		Boolean		Home Energy or smart-home monitoring systems allow occupants to manage their water and energy usage by providing real time energy usage data.
B.2.99	<b>HVAC Improvements</b>				
B.2.100	HVAC system clean and tune		Boolean		
B.2.101	<b>Domestic Water Heaters</b>				
B.2.102	Water heater type		Enumeration	Storage water heater, Dedicated boiler w storage tank, Instantaneous water heater, Heat pump water heater, Space-heating boiler w storage tank, Space-heating boiler w tankless coil	Water heater date may be provided for multiple water heating systems.

Ref #	Certificate Label	Unit of Measure	Data Type	Enumerations	Comments & Definitions
B.2.103	Fuel type		Enumeration	Electricity, Electricity (Renewable), Natural Gas, Natural Gas (Renewable), Fuel Oil, Fuel Oil No.1, Fuel Oil No.2, Fuel Oil No.4, Fuel Oil No. 5 and No.6, District Steam, District hot water, District chilled water, Solar, Propane, Kerosene, Diesel, Anthracite coal, Bituminous coal, Coke, Wood, Wood pellets, Combination, Other	Solar hot water heater may be indicated by selecting the enumeration "solar" from this data element.
B.2.104	Back-up system		Enumeration	Electricity, Electricity (Renewable), Natural Gas, Natural Gas (Renewable), Fuel Oil, Fuel Oil No.1, Fuel Oil No.2, Fuel Oil No.4, Fuel Oil No. 5 and No.6, District Steam, District hot water, District chilled water, Solar, Propane, Kerosene, Diesel, Anthracite coal, Bituminous coal, Coke, Wood, Wood pellets, Combination, Other	If the primary water heater is solar powered, then a back-up system must be reported.
B.2.105	Water heater third party certification		Enumeration	ENERGY STAR, CEE Tier I, CEE Tier II, CEE Tier III, Other	Independent organization has verified that product or appliance meets or exceeds the standard in question (ENERGY STAR, CEE,
B.2.106	Recovery efficiency		Percent (fraction)		The ratio of energy delivered to heat cold water compared to the energy consumed by the water heater as determined following standardized DOE testing procedure (see <a href="http://www.ahrinet.org/terms+and+technical+definitions.aspx">http://www.ahrinet.org/terms+and+technical+definitions.aspx</a> ).
B.2.107	Thermal efficiency rating	Btu/(ft2)day	Percent (fraction)		Ratio of square feet required for collector to heat water.
B.2.108	Tank volume	Gallons	Number		
B.2.109	Fraction of water heating load served		Percent (fraction)		
B.2.110	Water heater jacket insulation nominal R value		Number		

Ref #	Certificate Label	Unit of Measure	Data Type	Enumerations	Comments & Definitions
B.2.111	Length of insulated pipe	Linear feet	Number		
B.2.112	Type of active system		Enumeration	Direct, Indirect	Applies to solar thermal water heating systems.
B.2.113	Type of passive system		Enumeration	Integral collector, Thermosyphon	Applies to solar thermal water heating systems.
B.2.114	<b>Other</b>				
B.2.115	Passive solar		Boolean		Passive solar design—also known as climatic design—involves using a building's windows, walls, and floors to collect, store, and distribute solar energy in the form of heat in the winter and reject solar heat in the summer. ( <a href="http://www.eere.energy.gov/basics/buildings/passive_solar_design.html">http://www.eere.energy.gov/basics/buildings/passive_solar_design.html</a> ).
B.2.116	Ventilation fan type		Enumeration	Exhaust only, Supply only, Heat recovery ventilator, Energy recovery ventilator	Heat recovery ventilator – A mechanically powered ventilating device with separate intake and exhaust air streams, and a heat exchanger to transfer a portion of the sensible energy (heat) from one air stream to the other. Energy recovery ventilator – A mechanically powered ventilating device with separate intake and exhaust air streams, and a heat exchanger to transfer a portion of the total energy (heat and moisture) from one air stream to the other. Definitions from HVI Product Performance Certification Procedure, 2009: <a href="http://www.hvi.org/ratings/HVI920_1March2009.pdf">http://www.hvi.org/ratings/HVI920_1March2009.pdf</a>
B.2.117	Exterior features		Enumeration	Siding (Wood siding, Stucco, Synthetic stucco, Vinyl siding, Aluminum siding, Brick veneer, Asbestos siding, Fiber cement siding, Composite shingle siding, Masonite siding, Other), Multiple layers	Multiple exterior features may be selected.
B.2.118	<b>Water Efficiency</b>				
B.2.119	Kitchen faucet flow rate	gpm	Number		The current federal minimum standard for kitchen faucets is 2.2 gpm.

Ref #	Certificate Label	Unit of Measure	Data Type	Enumerations	Comments & Definitions
B.2.120	Bathroom faucet flow rate	gpm	Number		To meet the WaterSense standards for water efficiency, bathroom faucets must meet the following specifications: 1.5 gpm at 60 (no less than 0.8 gpm at 20 psi) (2013).
B.2.121	Shower flow rate	gpm	Number		The current federal minimum standard for residential showerheads is 2.5 gpm at 80 psi.
B.2.122	Toilet flush volume	gpf	Number		To meet the WaterSense standards for water efficiency, toilets must meet the following specifications: 1.28 gpf with at least 350 grams of waste removal (2013).
B.2.123	Toilets dual flush		Boolean		
B.2.124	<b>Reclaimed Water</b>				
B.2.125	Reclaimed water system installed		Boolean		
B.2.126	Rain barrels provide irrigation		Boolean		
B.2.127	Greywater reuse system		Boolean		
B.2.128	System size	Gallons	Number		
B.2.129	Location of system		Text		
B.2.130	Watersense fixtures		Boolean		
B.2.131	<b>Photovoltaic System</b>				
B.2.132	Rated power output (capacity)	kW	Number		
B.2.133	Annual energy produced	kWh/year	Number		
B.2.134	Production type		Enumeration	Measured, Estimated	
B.2.135	Ownership		Enumeration	Leased, Owned	
B.2.136	Year manufactured	Year	Number		
B.2.137	Location		Enumeration	Roof, Ground, Other	

Ref #	Certificate Label	Unit of Measure	Data Type	Enumerations	Comments & Definitions
B.2.138	Array orientation		Enumeration	North, Northwest, West, Southwest, South, Southeast, East, Northeast	
B.2.139	Tracker installed		Boolean		
B.2.140	Array azimuth	Degrees	Number		
B.2.141	Array tilt	Degrees	Number		
B.2.142	Grid connection		Enumeration	Grid-tied, off-grid	
B.2.143	Collector area	Square feet	Number		
B.2.144	Inverter efficiency		Percent (fraction)		
B.2.145	Warranty in place		Boolean		
B.2.146	Remaining years on warranty		Number		
B.2.147	Other warranty issues		Text		
B.2.148	<b>Siting Issues</b>				
B.2.149	Walking score		Number		
B.2.150	Walking score source		Text		
B.2.151	Distance from bus	Linear feet	Number		
B.2.152	Distance from train	Linear feet	Number		
B.2.153	Distance from subway	Linear feet	Number		
B.2.154	Orientation of front of home		Enumeration	North, Northwest, West, Southwest, South, Southeast, East, Northeast	
B.2.155	Landscaping		Enumeration	Water efficient, Natural	
B.2.156	Comments		Text		
B.2.157	Shading on west exposure		Boolean		

Ref #	Certificate Label	Unit of Measure	Data Type	Enumerations	Comments & Definitions
B.2.158	<b>Energy Consumption and Savings</b>				
B.2.159	Fuel provider name		Text		
B.2.160	Energy units		Enumeration	cmh (cubic meters per hour), ccf (hundred cubic feet), kcf (thousand cubic feet), MCF (million cubic feet), cfh (cubic feet per hour), kWh (thousand Watt-hours), MWh (million Watt-hours), kBtu (thousand Btu), MBtu (million Btu), therms, Lbs. (pounds), KLbs. (thousand pounds), Mlbs. (million pounds), Tonnes, Cords, (full cord), Gallons, kGal (thousand gallons), ton hour	
B.2.161	Consumption		Number		Can be repeated for multiple fuels as necessary and may be provided for pre- and post-upgrades. Use smart meter data if possible. Renewable generation can be indicated by a negative value.
B.2.162	Consumption cost	Dollars	Number		Consumption cost may be provided pre- and post-upgrade. Indicate whether consumption cost is actual or estimated. If actual cost is reported, indicate the source of the value (e.g., customer bills, utility smart meters, etc.)
B.2.163	Type of meter reading		Enumeration	Point, Median, Average, Total, Estimate, Other	
B.2.164	Meter reading start time and date	YYYY-MM-DDThh:mmTZD	TimeDate		Meter readings can be provided for pre- and post-upgrade consumption.
B.2.165	Meter reading end time and date	YYYY-MM-DDThh:mmTZD	TimeDate		Meter readings can be provided for pre- and post-upgrade consumption.
B.2.166	Total energy savings		Number		Total savings are annual and should be reported over a 12-month period or annualized if less than one year of data is available. Programs may indicate whether savings are reported by calendar or program year.

Ref #	Certificate Label	Unit of Measure	Data Type	Enumerations	Comments & Definitions
B.2.167	Energy savings type		Enumeration	Measured, Estimated	
B.2.168	Total dollars saved from energy efficiency upgrades	Dollars	Number		Total savings are annual and should be reported over a 12-month period or annualized if less than one year of data is available. Programs may indicate whether savings are reported by calendar or program year.
B.2.169	Demand savings	kW	Number		Reduction in peak demand
B.2.170	Water units		Enumeration	Gallon, KGal (thousand Gallons), MGal (million Gallons), cf (cubic feet), ccf (hundred cubic feet), kcf (thousand cubic feet), MCF (million	
B.2.171	Total water savings		Number		Total savings are annual and should be reported over a 12-month period or annualized if less than one year of data is available. Programs may indicate whether savings are reported by calendar or program year.
B.2.172	Water savings type		Enumeration	Measured, Estimated	
B.2.173	Total dollars saved from water efficiency upgrades	Dollars	Number		Total savings are annual and should be reported over a 12-month period or annualized if less than one year of data is available. Programs may indicate whether savings are reported by calendar or program year.
B.2.174	<b>Health and Safety</b>				
B.2.175	Radon tested		Boolean		
B.2.176	Radon test result	pCi/L	Number		
B.2.177	Carbon monoxide (CO) reading		Number		
B.2.178	Health and safety tests completed		Boolean		
B.2.179	Health and safety tests passed		Boolean		