LEED for Homes Detailed Prerequisites

ID 1.1 LEED for Homes meeting

Project Team members Green Rater and possible the Provider

Create action plan identifying

Targeted LEED award level

Certified: 40-49 points
Silver: 50-59 points
Gold: 60-79 points
Platinum: 80 points and above

Selected LEED for Homes credits

Identify party responsible for meeting the requirements of each credit

**Aim to earn roughly five points more than necessary

ID 2.1 Durability Planning

Prior to construction, the project team needs to:

a) Complete Durability Risk Evaluation Form

Identifies all moderate and high risk durability issues for building enclosure

b) Develop specific measures to respond to those issues

c) Identify/incorporate all applicable indoor moisture control measures

Location or equipment	Required moisture control measure
Tub, showers, and spa areas	Use nonpaper-faced backer board on walls.
Kitchen, bathroom, laundry rooms, and spa areas	Use water-resistant flooring; do not install carpet.
Entryway (within 3 feet of exterior door)	Use water-resistant flooring; do not install carpet.
Tank water heater in or over living space	Install drain and drain pan.
Clothes washer in or over living space	Install drain and drain pan, or install accessible single-throw supply valve.
Conventional clothes dryer	Exhaust directly to outdoors.
Condensing clothes dryer	Install drain and drain pan.

d) Incorporate measures from 2.1 b and c, above, into project documents (drawings, specifications, and/or scopes of work, as appropriate)

e) List all durability measures and indicate their locations in the

project documents in a durability inspection checklist (include the checklist in project documents for use in verification)

ID 2.2 Durability Management

During construction, the building shall have a quality management process in place to ensure installation of the durability measures

Can be satisfied by having the builder inspect and check off each measure in the durability inspection checklist created for 2.1 (e)

SS 1.1 Erosion Controls During Construction

Prior to construction, design and plan appropriate erosion control measures. During construction, implement these measures.

Erosion control measures must include the following:

a) Stockpile and protect disturbed topsoil from erosion (for reuse)

b) Control the path and velocity of runoff with silt fencing or comparable measures

c) Protect on-site storm sewer inlets, streams, and lakes with straw bales, silt fencing, silt sacks, rock filters, or comparable measures

d) Provide swales to divert surface water from hillsides

e) If soils in a sloped area (i.e., 25% or 4:1 slope) are disturbed during Construction, use tiers, erosion blankets, compost blankets, filter socks and berms, or some comparable approach to keep soil stabilized.

SS 2.1 No Invasive Plants

Introduce no invasive plant species into the landscape

Consult local Cooperative Extension Service or state agencies

www.invasivespeciesinfo.gov/unitedstates/state.html

EA 1.1 Performance of ENERGY STAR for Homes

Meet performance requirements of ENERGY STAR for Homes

Include a third-party inspection

EA 2.1 Basic Insulation

Meet these requirements:

a) Install insulation that meets or exceeds the R-value requirements listed in Chapter 4 of the 2004 International Energy Conservation Code.

Alternative wall and insulation systems, such as structural insulated panels (SIPs) and insulated concrete forms (ICFs), must demonstrate a comparable R-value, but thermal mass or infiltration effects cannot be included in the R-value calculation

b) Install insulation to meet the Grade II specifications set by the National Home Energy Rating Standards (Table 1).

Installation must be verified by an energy rater or Green Rater conducting a pre-drywall thermal bypass inspection, as summarized in figure 1

Note: For any portion of the home constructed with SIPs or ICFs, the rater must conduct a modified visual inspection using the ENERGY STAR Structural Insulated Panel Visual Inspection Form

Table 1. Summary of HERS Installation Grades
Please refer to "Adopted Enhancements to the Mortgage Industry National Home Energy Rating Standards," available from RESNET, for a more detailed description.

Grade	Description
I	Meet the requirements of Grade II (below), but allow only very small gaps, and compression or incomplete fill amounts to 2% or less.
II	Moderate to frequent installation defects, gaps around wiring, electric outlets, etc. and incomplete fill amounts to 10% or less. Gaps running clear through the insulation amount to no more than 2% of the total surface area covered by the insulation. Wall insulation is enclosed on all six sides and in substantial contact with the sheathing material on at least one side (interior or exterior) of the cavity.

http://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/Thermal_Bypass_Inspection_Checklist.pdf

EA 3.1 Reduced Envelope Leakage

Meet the air leakage requirements shown in Table 1
Air leakage rate must be tested and verified by an energy rater

Table 1: Air Leakage Requirements

	Performance requirements (in ACH50)			
LEED Criteria	IECC Climate Zones 1–2	IECC Climate Zones 3–4	IECC Climate Zones 5–7	IECC Climate Zone 8
EA 3.1: Reduced Envelope Leakage (mandatory)	7.0	6.0	5.0	4.0
EA 3.2: Greatly Reduced Envelope Leakage (optional)	5.0	4.25	3.5	2.75
EA 3.3: Minimal Envelope Leakage (optional)	3.0	2.5	2.0	1.5

LEED for Homes Detailed Prerequisites

Synergies and Trade-Offs

A project receiving points for EA 1 is not eligible for this credit, and vice versa. A project pursuing this credit must follow the prescriptive pathway and meet all the prerequisites in EA 2–10. Prerequisite EA 1.1 should be skipped. See the pathway schematic at the beginning of the EA section.

Natural air leakage through the envelope contributes to the overall ventilation rate of the home. From a health perspective, it is important to not underventilate a home. From an energy perspective, it is also important not to overventilate. EQ 4 addresses the balance between mechanical and natural ventilation.

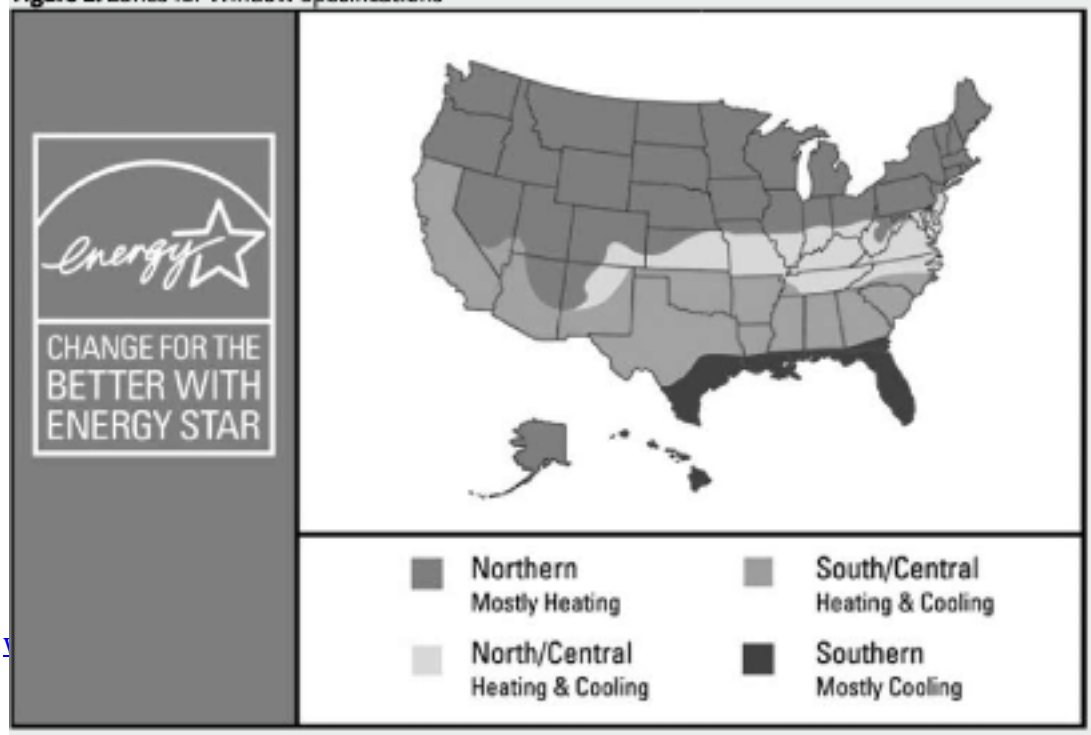
EA 4.1 Good Windows – Meet all requirements

a) Design and install windows and glass doors that have NFRC ratings that meet or exceed the window requirements of the ENERGY STAR for Homes national Builder Option Package (see table)

Table 1. ENERGY STAR Requirements for Windows and Glass Doors

	Metric	ENERGY STAR Zone Northern	North Central	South Central	Southern
EA 4.1: Good Windows (prerequisite)	U-factor SHGC	≤0.35 Any	≤0.40 ≤0.45	≤0.40 ≤0.40	≤0.55 ≤0.35
EA 4.2: Enhanced Windows (optional, 2 points)	U-factor SHGC	≤0.31 Any	≤0.35 ≤0.40	≤0.35 ≤0.35	≤0.55 ≤0.33
EA 4.3: Exceptional Windows (optional, 3 points)	U-factor SHGC	≤0.28 Any	≤0.32 ≤0.40	≤0.32 ≤0.30	≤0.55 ≤0.30

Figure 1. Zones for Window Specifications



b) The ratio of skylight glazing to conditioned floor area may not exceed 3%3

All skylights must meet the ENERGY STAR performance requirements for skylights, but are exempt from the requirements in table 1

c) Homes in the Northern of North/Central climate zones that have a total window-to-floor area ratio (WFA) of 18% or more must meet a more stringent U-

factor requirement (also applicable to EA 4. And 4.3):
U-Factor = (.18 / WFA) * (U-factor from table 1)

d) Homes in the Southern or South/Central climate zones that have a total window-to-floor (WFA) of 18% or more must meet a more stringent heat gain coefficient (SHGC) requirement (also applicable to EA 4.2 and 4.3):
SHGC = (.18 / WFA) * (SHGC from Table 1)

Note: Up to .75% of the window-to-floor area may be used for decorative glass or skylight area that does not meet the U-factor and SHGC requirements above.

EA 5.1 Reduced Distribution Losses

a) Limit duct air leakage rate to outside the conditioned envelope. The tested duct leakage rate must be equal to or less then 4.0 cfm at 25 Pascals per 100 square feet of conditioned floor area (for each installed system), verified by the energy rater. Testing is waived if the home meets EA 5.3 (b) or (c)

EA 5.3 b) Locate the air-handler unit and all ductwork within the conditioned envelope and minimize envelope leakage (i.e., meet the requirements of EA 3.3)

EA 3.3 Minimal Envelope Leakage
Meet the air leakage requirements shown in Table 1. The air leakage rate must be tested and verified by an energy rater

Table 1: Air Leakage Requirements

	Performance requirements (in ACH50)			
LEED Criteria	**IECC Climate Zones 1–2**	**IECC Climate Zones 3–4**	**IECC Climate Zones 5–7**	**IECC Climate Zone 8**
EA 3.1: Reduced Envelope Leakage (mandatory)	7.0	6.0	5.0	4.0
EA 3.2: Greatly Reduced Envelope Leakage (optional)	5.0	4.25	3.5	2.75
EA 3.3: Minimal Envelope Leakage (optional)	3.0	2.5	2.0	1.5

EA 5.3 c) Locate the air-handler unit and all ductwork visibly within conditioned spaces (i.e., no ductwork hidden in walls, chases, floors, or ceilings)

b) Do not install ducts in exterior walls unless extra insulation is added to maintain the overall UA for an exterior wall without ducts. Ducts may be run inside interior wall cavities but must be fully ducted (i.e., do not use the wall cavity as the duct).

c) Use at least R-6 insulation around ducts in unconditioned spaces

EA 6.1 Good HVAC Design and Installation – meet all requirements

a) Design and size HVAC equipment properly using ACCA Manual J, the ASHRAE 2001 Handbook of Fundamentals, or an equivalent computation procedure

b) Install HVAC equipment that meets the requirements of the ENERGY STAR for Homes national Builder Option Package (Table 1)

Table 1(a). HVAC Requirements for IECC Climate Zones 4–8.

		HVAC equipment					
		Central AC and air source heat pumps	Furnaces (gas, oil, or propane)	Boilers (gas, oil, or propane)	Ground-source heat pumps		
	End use				Open loop	Closed loop	Direct expansion
EA 6.1: Good HVAC Design and Installation (prerequisite)	Cooling Heating	≥ 13 SEER ≥ 8.2 HSPF	≥ 90 AFUE	≥ 85 AFUE	≥ 16.2 EER ≥ 3.6 COP	≥ 14.1 EER ≥ 3.3 COP	≥ 15 EER ≥ 3.5 COP
EA 6.2: High-Efficiency HVAC (2 points)	Cooling Heating	≥ 14 SEER ≥ 8.6 HSPF	≥ 92 AFUE	≥ 87 AFUE	≥ 17.8 EER ≥ 4.0 COP	≥ 15.5 EER ≥ 3.6 COP	≥ 16.5 EER ≥ 3.9 COP
EA 6.3: Very High Efficiency HVAC (heat pump, 4 points; other systems, 3 points)	Cooling Heating	≥ 15 SEER ≥ 9.0 HSPF	≥ 94 AFUE*	≥ 90 AFUE	≥ 19.4 EER ≥ 4.3 COP	≥ 17 EER ≥ 4.0 COP	≥ 18 EER ≥ 4.2 COP

** Furnace with low electric energy use.*

Table 1(b). HVAC Requirements for IECC Climate Zones 1–3.

		HVAC equipment					
		Central AC and air source heat pumps	Furnaces (gas, oil, or propane)	Boilers (gas, oil, or propane)	Ground-source heat pumps		
	End use				Open loop	Closed loop	Direct expansion
EA 6.1: Good HVAC Design and Installation (prerequisite)	Cooling Heating	≥ 14 SEER ≥ 8.2 HSPF	≥ 80 AFUE	≥ 80 AFUE	≥ 16.2 EER ≥ 3.6 COP	≥ 14.1 EER ≥ 3.3 COP	≥ 15 EER ≥ 3.5 COP
EA 6.2: High-Efficiency HVAC (2 points)	Cooling Heating	≥ 15 SEER ≥ 8.6 HSPF	≥ 90 AFUE	≥ 85 AFUE	≥ 17.8 EER ≥ 4.0 COP	≥ 15.5 EER ≥ 3.6 COP	≥ 16.5 EER ≥ 3.9 COP
EA 6.3: Very High Efficiency HVAC (heat pump, 4 points; other systems, 3 points)	Cooling Heating	≥ 16 SEER ≥ 9.0 HSPF	≥ 92 AFUE*	≥ 87 AFUE	≥ 19.4 EER ≥ 4.3 COP	≥ 17 EER ≥ 4.0 COP	≥ 18 EER ≥ 4.2 COP

** Furnace with low electric energy use.*

c) Install ENERGY STAR labeled programmable thermostat (except heat pumps and hydronic systems)

EA 8.1 ENERGY STAR Lights

Install at least four ENERGY STAR labeled light fixtures or ENERGY STAR labeled compact fluorescent light bulbs (CFLs) in high-use rooms (Kitchen, dining room, living room, family room, hallways).

EA 11.1 Refrigerant Charge Test

Provide proof of proper refrigerant charge of the air-conditioning system (Unless home has no mechanical cooling system)

MR 1.1 Framing Order Waste Factor Limit

Limit the overall estimated waste factor to 10% or less. If the waste factor on any portion of the framing order exceeds 10%, calculate the overall waste factor as shown in Table 1.

Table 1. Sample Framing Order Waste Factor Calculation

Framing component	Total cost	Waste factor	Waste cost
Random lengths	$1,000	15%	$150
Studs	$2,000	5%	$100
Beams and headers	$500	20%	$100
Roof deck	$2,000	0%	$0
Wall sheathing	$0	0%	$0
Rafters	$2,000	0%	$0
Ceiling joists	$1,500	10%	$150
Cornice work	$3,000	10%	$300
TOTAL	**$12,000**		**$1,000**
Overall waste factor (waste $ / cost $)			**8.3%**

Waste factor is defined as the percentage of framing material ordered in excess of the estimated material needed for construction

MR 2.1 FSC-Certified Tropical Wood – meet the two requirements as applicable

a) Provide all wood product suppliers with a notice (figure 1)

Notice to Vendors: [The company] prefers to purchase products that contain tropical wood only if they are certified according to the guidelines of the Forest Stewardship Council (FSC). Please provide the country of manufacture of each product you expect to supply to us. Also please provide a list of FSC-certified products you can supply.

i. a statement that the builder's preference is to purchase products containing tropical wood only if it is FSC-Certified

ii. a request for the country of manufacture of each product supplied;

iii. a request for a list of FSC-certified tropical wood products the vendor can supply

b) If tropical wood is intentionally used (i.e., specified in purchasing documents), use only FSC-certified tropical wood products. Reused or re-claimed materials are exempt

Note: A species of wood is considered tropical for the purposes of this prerequisite if it is grown in a country that lies between the Tropics of Cancer and Capricorn

MR 3.1 Construction Waste Management Planning – complete the following tasks related to management of construction waste:

a) Investigate and document local options for diversion (e.g., recycling, reuse) of all anticipated major constituents of the project waste stream, including cardboard packaging and household recyclables (e.g., beverage containers).

b) Document the diversion rate for construction waste. Record the diversion rate for land clearing and/or demolition, if applicable (e.g., on gut rehab project), separately from the rate for the new construction phase of the project.

EQ 2.1 Basic Combustion Venting Measures – meet the requirements

a) No unvented combustion appliances (e.g., decorative logs) are allowed

b) A carbon monoxide (CO) monitor must be installed on each floor

c) All fireplaces and woodstoves must have doors

d) Space and water heating equipment that involves combustion must meet one of the following. Space heating systems in homes located in IECC-2007 climate zone 1 or 2 are exempt

i. it must be designed and installed with closed combustion (i.e., sealed supply air and exhaust ducting;

ii. it must be designed and installed with power-vented exhaust; or

iii. it must be located in a detached utility building or open-air facility

EQ 4.2 Enhanced Outdoor Air Ventilation

Design and install a whole building ventilation system that complies with ASHRAE Standard 62. 2-2007. A summary of alternatives is provided below, but the HVAC contractor should review and follow the requirements of ASHRAE Standard 62.2-2007, Sections 4 and 7

a) Mild climate exemption. A home built in a climate with fewer than 4,500 infiltration degree-days is exempt from this prerequisite

b) Continuous ventilation. Meet the ventilation requirements in Table 1

Table 1. Minimum Air Flow Requirements for Continuous Ventilation Systems, in cfm

Conditioned floor area (ft²)	Bedrooms 0, 1	2, 3	4, 5	6, 7	> 7
≤ 1,500	30	45	60	75	90
1,501–3,000	45	60	75	90	105
3,001–4,500	60	75	90	105	120
4,501–6,000	75	90	105	120	135
6,001–7,500	90	105	120	135	150
> 7,500	105	120	135	150	165

Credit: ASHRAE Standard 62.2, 2007. ©American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., www.ashrae.org <http://www.ashrae.org/>

c) Intermittent ventilation. Use Equation 4.2 of ASHRAE Standard 62.2-2007 to demonstrate adequate ventilation airflow

d) Passive ventilation. Have a passive ventilation system approved and verified by a licensed HVAC engineer as providing ventilation equivalent to that achieved by continuous ventilation systems as described in Table 1

EQ 5.1 Basic Local Exhaust

a) Design and install local exhaust systems in all bathrooms (including half-baths) and the kitchen to meet the requirements of Section 5 of ASHRAE Standard 62.2-2007. Sample requirements that relate to minimum intermittent local exhaust flow rates are shown in Table 1

Table 1: Minimum Air Flow Requirements for Intermittent Local Exhaust

Location	Minimum air flow
Kitchen	100 cfm; vented range hood required if exhaust fan flow rate is less than 5 kitchen air changes per hour.
Bathroom	50 cfm

b) Design and install the fans and ducts to meet the requirements of Section 7 of ASHRAE Standard 62.2-2007

c) Exhaust air to the outdoors (i.e., exhaust to attics or interstitial spaces is not permitted)

d) Use ENERGY STAR labeled bathroom exhaust fans (except for exhaust fans serving multiple bathrooms)

EQ 6.1 Room-by-Room Load calculations

Perform design calculations (using ACCA Manuals J and D, the ASHRAE Handbook of Fundamentals, or an equivalent computation procedure) and install ducts accordingly.

EQ 7.1 Forced-Air Systems:

Good Filters

Install air filters with a minimum efficiency reporting value (MERV) greater or equal to 8 and ensure that air handlers can maintain adequate pressure and airflow. Air filter housing must be airtight to prevent bypass or leakage

EQ 7.1 Nonducted HVAC Systems (e.g., Hydronic Systems):

Good Filters

Install air filters greater or equal to MERV 8 and maintain adequate pressure and air flow in any mechanical ventilation systems. A home in a climate with fewer than 4,500 infiltration degree-days or a home that uses only passive or exhaust-only ventilation is exempt from this requirement.

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EQ 9.1 Radon-Resistant Construction in High-Risk Areas

If the home is in EPA Radon Zone 1, design and build the home with radon-resistant construction techniques as prescribed by EPA, the International Residential Code, Washington State Ventilation and Indoor Air Quality Code, or some equivalent code or standard.

EQ 10.1 No HVAC in Garage

Place all air-handling equipment and ductwork outside the fire-rated envelope of the garage

AE 1.1 Basic Operations training

Provide the home's occupant(s) with the following:

a) An operations and maintenance manual or binder that includes all the following items:

i. The completed checklist of LEED for Homes features
ii. A copy of each signed Accountability Form
iii. A copy of the durability inspection checklist
iv. The product manufactueres' manuals for all installed equipment, fixtures, and appliances
v. General information on efficient use of energy, water, and natural resources
vi. Operations and maintenance guidance for LEED for Homes-related equipment installed in the home, including

- space heating and cooling equipment
- mechanical ventilation equipment
- humidity control equipment
- radon protection system
- renewable energy system
- irrigation, rainwater harvesting, and or graywater system

vii. Guidance on occupant activities and choices, including the following:

- cleaning materials, methods, and supplies
- water-efficient landscaping
- impacts of chemical fertilizers and pesticides
- irrigation
- lighting selection
- appliance selection

viii. Educational information on "green power"

b) A minimum one-hour walk-through of the home with the occupant(s), featuring the following:

i. identification of all installed equipment
ii. instruction in how to use the measures and operate the equipment
iii. information on how to maintain the measures and equipment