

Affiliate Steps toward Building ENERGY STAR Homes

To certify a home as an Energy Star, a builder works with a RESNET certified home energy rater to evaluate the home with respect to criteria required by the Energy Star program. In Oregon, Washington, Idaho, Montana, and California, the Energy Star program is slightly different from the rest of the country. The following steps will help Habitat affiliates navigate the path toward building Energy Star homes.

o **Step 1 Review Energy Star information online**

All affiliate leaders and decision makers review general Energy Star information:

- Review general Energy Star information to understand homeowner benefits at [www.Energystar.Gov](http://www.energystar.gov) (select “New Homes”) and for affiliates in Oregon, Washington, Idaho, and Montana, review the Northwest Energy Star program’s general information at: <http://www.northwestenergystar.com/index.php?cID=125>

Construction leaders and staff review above link AND technical information:

- Technical requirements vary – influenced by climate zone and the ENERGY STAR program you are in.
- **In all states except those listed below...**
 - o Most affiliates building single family detached houses will be using the national “ENERGY STAR Performance Path” which has a few prescriptive requirements. 2 page description:
 - https://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/PerfPathTRK_060206.pdf
 - o Some affiliates building single family detached houses, may have the option of using a prescriptive path to ENERGY STAR certification called the “National Builder Option Package” (BOP) which also has a few performance requirements.
 - http://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/Nat_BOP_Final_062807.pdf
 - BOP Listing by County:
http://www.energystar.gov/index.cfm?c=bop_pt_bop_index
 - o *Tip: Habitat houses can usually meet the HERS Index required in the Performance Path with lower efficiency equipment that what is required by the BOP. The BOP path also requires tighter ducts and lower infiltration than is needed for the Performance Path*
 - o Affiliates building attached housing review the material on the performance and prescriptive paths here:
http://www.energystar.gov/index.cfm?c=bldrs_lenders_raters.nh_attached_housing_using
 - o All of the above paths require that a home pass the Thermal Bypass Inspection.
 - Thermal Bypass Inspection Checklist:
http://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/Thermal_Bypass_Inspection_Checklist.pdf
 - Thermal Bypass Inspection Guide Book:
http://www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/TBC_Guide_062507.pdf

- **Oregon and Washington** use the Northwest uses Energy Star program, a Builder Option Packages (BOPs): <http://www.northwestenergystar.com/index.php?cID=119>
- **Idaho and Montana** can choose either the national program or the Northwest Energy Star program
- **California** uses a performance path with some prescriptive requirements including the combined Quality Insulation Installation and Thermal Bypass Checklist.
Description: <http://www.thebii.org/energystar.asp>
- **Hawaii** uses a Builder Option Package approach described here:
http://www.energystar.gov/ia/partners/downloads/BOP_Hawaii.pdf
- **Step 2 Find a Rater**
 - A rater is like a personal energy analyst.
 - *Tip: If you are interested in the BOP path, discuss this when you are contacting raters as not all raters work with BOPs.*
 - **For states except those below**, look for a rater at these two sites:
 1. **Energy Star Partner Locator:**
http://www.energystar.gov/index.cfm?fuseaction=new_homes_partners.showHomesSearch
 2. **Residential Energy Services Network (RESNET):** <http://www.resnet.us/>
 - Select “Builder Information” then “Find a Rater”
 - Look for the diamond shaped “Volunteer Rater” emblem that signifies that rater would like to work with Habitat
 - Read more about RESNET’s Habitat partnership here:
<http://natresnet.org/rater/partnership/default.htm>
 - **Oregon and Washington** (also Idaho and Montana affiliates that choose the Northwest Energy Star program):
<http://www.northwestenergystar.com/index.php?cID=181>
 - **California** has three HERS Providers that each list raters certified to work in CA:
 - 1 CHEERS: http://hersmobile.org/ratersearch/search.asp?RaterType=NC_HVAC
 - 2 CalCERTS: https://www.calcerts.com/Rater_Directory.cfm
 - 3 CBPCA: <http://www.cbpcac.org/HERS/findarater.html>
- **Step 3 Become an ENERGY STAR Partner**
 - **California and all other states except those below**, start here:
https://www.energystar.gov/index.cfm?fuseaction=opa.showPartnerRoles&p_code=HBUILDER (In Step 3, select your state from the pull down menu then select your rater. You do not have to stick with this rater.)
 - **Oregon and Washington** (also Idaho and Montana affiliates who choose the Northwest Energy Star program):
http://www.northwestenergystar.com/files/73632008builder_agreement_web.pdf

- **Step 4 Request a preliminary evaluation and recommendations from your rater.**
 - To do a preliminary evaluation, the rater will use information about your construction process from the following:
 - Design/construction documents for dimensional take-offs
 - Specifications including some that may not be on the plans such as window U-Value and Solar Heat Gain Coefficient, number of fixtures with fluorescent lighting, heating/AC efficiency, etc.
 - Information from mechanical contractor on system sizing procedure
 - Test results and audit information from a completed house (duct and infiltration testing, presence of ENERGY STAR products, etc.)
 - Inspection of energy related details in a house under construction (e.g. insulation installation, air barrier continuity, attic ventilation baffles and dams, air sealing details)
 - After making calculations and conducting audits, inspections, and tests, the rater will be able to tell you how close to ENERGY STAR your standard construction practices are - including any prescriptive requirements you are missing and the rater will be able to make recommendations on how to meet any performance requirements you failed. Let your rater know if you are considering any specific improvements as well as any specific things you do not want to do.
 - Likely stumbling blocks: excessive duct leakage, insulation and air barrier details that do not meet thermal bypass inspection requirements, mechanical system sizing not done with ACCA Manual J.

- **Step 5 Review your rater's findings & recommendations, decide on a course of action**
 - As a rule of thumb, I suggest that all changes you decide to make meet the following criteria:
 - Volunteer friendly
 - Proven to be cost-effective (by a third party such as the Dept. of Energy)
 - Readily available on the current, local market
 - Not place an unreasonable maintenance burden on the home owner
 - *It would be wise to discuss these criteria with the rater in advance*
 - Solicit the input of any subcontractors and construction staff whose work will be affected by the changes needed to meet Energy Star. Try to identify and resolve conflicts before construction starts.
 - *Tip: It may be necessary to do training with subcontractors, construction leaders and volunteers before you are ready to build an ENERGY STAR certified house.*
 - *Tip: It can be beneficial to make individual changes in a practice house, especially if success will depend on multiple people working together.*
 - *Tip: Write a checklist of all the things that need to happen to build your first Energy Star house – circulate the checklist to all construction leaders to improve coordination.*

- **Step 6 Build an ENERGY STAR house with your rater providing inspections, testing, verification, and certification. Process will likely include...**
 - **Pre-construction:** Preliminary analysis (e.g. HERS Index or Title 24) for that specific design on that specific lot, mechanical system sizing calculated w/Manual J, all other prescriptive specifications verified to be in construction documents
 - **Construction:** Thermal Bypass Inspection – may take more than 1 site visit to verify all criteria including prescriptive requirements. *Depending on the rater, might include duct test after mechanical rough in.*
 - **Post-construction:** Duct testing, and whole house infiltration testing when required. Final calculations and paper work prep for registering the house as an Energy Star

- **Step 7 Rater registers house with HERS Provider and gives ENERGY STAR Certificate to affiliate and applies a blue Energy Star label to the house.**
- *Tip: Write a press release to tell the community you've built an Energy Star house & why!*
- *Tip: To maximize benefit, provide homeowners with guidance on how to operate their new Energy Star home.*

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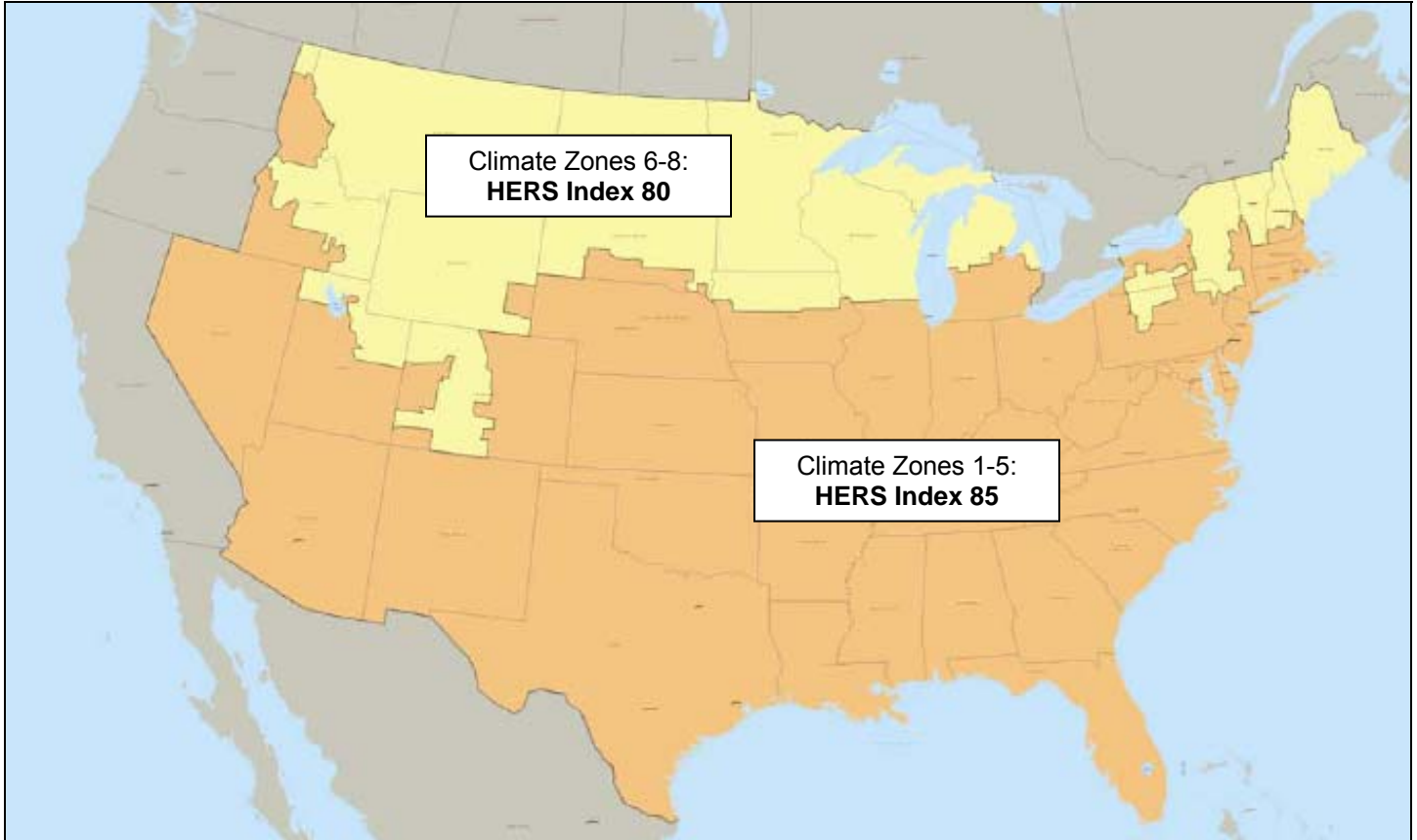


ENERGY STAR Qualified Homes National Performance Path Requirements

ENERGY STAR Performance Requirements:

To qualify as ENERGY STAR, a home must meet the minimum requirements specified below, be verified and field-tested in accordance with the RESNET Standards by a RESNET-accredited Provider, and meet all applicable codes.

Maximum HERS Index Required to Earn the ENERGY STAR¹



Note: Due to the unique nature of some state codes and/or climates, EPA has agreed to allow regionally-developed definitions of ENERGY STAR in California, Hawaii, and the Pacific Northwest to continue to define program requirements. The States of Montana and Idaho may use either the requirements of the national program or the regionally-developed program in the Pacific Northwest.

ENERGY STAR Mandatory Requirements:

Envelope ^{2,3,4}	Completed Thermal Bypass Inspection Checklist
Ductwork ^{5,6}	Leakage ≤ 6 cfm to outdoors / 100 sq. ft.
ENERGY STAR Products ^{13,14}	<p>Include at least one ENERGY STAR qualified product category:</p> <ul style="list-style-type: none"> ▪ Heating or cooling equipment ⁷; <u>OR</u> <ul style="list-style-type: none"> ▪ Windows ⁸; <u>OR</u> ▪ Five or more ENERGY STAR qualified light fixtures ^{9,10}, appliances ¹¹, ceiling fans equipped with lighting fixtures, and/or ventilation fans ¹²
ENERGY STAR Scoring Exceptions	<ul style="list-style-type: none"> ▪ On-site power generation may not be used to decrease the HERS Index to qualify for ENERGY STAR. ▪ A maximum of 20% of all screw-in light bulb sockets in the home may use compact fluorescent lamps (CFLs) to decrease the HERS Index for ENERGY STAR compliance. CFLs used for this purpose must be ENERGY STAR qualified.



ENERGY STAR Qualified Homes National Performance Path Notes

1. The appropriate climate zone for each building site shall be determined by the 2004 International Residential Code (IRC), Table N1101.2. The HERS Index must be calculated in accordance with the RESNET Mortgage Industry National Home Energy Rating Standards.
2. The Thermal Bypass Inspection Checklist must be completed for homes to earn the ENERGY STAR label. The Checklist requires visual inspection of framing areas where air barriers are commonly missed and inspection of insulation to ensure proper alignment with air barriers, thus serving as an extra check that the air and thermal barriers are continuous and complete.
3. Envelope leakage must be determined by a RESNET-certified rater using a RESNET-approved testing protocol.
4. To ensure consistent exchange of indoor air, whole-house mechanical ventilation is recommended, but not required.
5. Ducts must be sealed and tested to be ≤ 6 cfm to outdoors / 100 sq. ft. of conditioned floor area, as determined and documented by a RESNET-certified rater using a RESNET-approved testing protocol. If total duct leakage is ≤ 6 cfm to outdoors / 100 sq.ft. of conditioned floor area, then leakage to outdoors does not need to be tested. Duct leakage testing can be waived if all ducts and air handling equipment are located in conditioned space (i.e., within the home's air and thermal barriers) AND the envelope leakage has been tested to be ≤ 3 ACH50 OR ≤ 0.25 CFM 50 per sq. ft. of the building envelope. Note that mechanical ventilation will be required in this situation.
6. EPA recommends, but does not require, locating ducts within conditioned space (i.e., inside the air and thermal barriers), and using a minimum of R-4 insulation for ducts inside conditioned space to prevent condensation.
7. All cooling equipment, regardless of whether it is used to satisfy the ENERGY STAR products requirement, must be sized according to the latest editions of ACCA Manuals J and S, ASHRAE 2001 Handbook of Fundamentals, or an equivalent computation procedure. Maximum oversizing limit for air conditioners and heat pumps is 15% (with the exception of heat pumps in Climate Zones 5 - 8, where the maximum oversizing limit is 25%). This can be accomplished either by the rater performing the calculations or reviewing documentation provided by the professional contractor or engineer who calculated the sizing (e.g., HVAC contractor). The following operating conditions shall be used in the sizing calculations and verified where reviewed by the rater:

Outdoor temperatures shall be the 99.0% design temperatures as published in the ASHRAE Handbook of Fundamentals for the home's location or most representative city for which design temperature data are available. Note that a higher outdoor air design temperature may be used if it represents prevailing local practice by the HVAC industry and reflects extreme climate conditions that can be documented with recorded weather data; Indoor temperatures shall be 75^o F for cooling; Infiltration rate shall be selected as "tight", or the equivalent term.

In specifying equipment, the next available size may be used. In addition, indoor and outdoor coils shall be matched in accordance with ARI standards.
8. Where windows are used to meet the ENERGY STAR qualified product requirement, they shall be ENERGY STAR qualified or meet all specifications for ENERGY STAR qualified windows. Additional information can be found at www.energystar.gov/windows.
9. For the purposes of meeting the ENERGY STAR requirement, qualified lighting fixtures in the following locations cannot be counted: storage rooms (e.g., closets, pantries, sheds), or garages.
10. Efficient lighting fixtures represent a significant opportunity for persistent energy savings and a meaningful way to differentiate ENERGY STAR qualified homes from those meeting minimum code requirements. In 2008, EPA intends to propose and solicit industry comments on adding the ENERGY STAR Advanced Lighting Package (ALP) as an additional requirement for ENERGY STAR qualified homes in 2009. To learn more about the ALP, refer to www.energystar.gov/homes.
11. Eligible appliances include ENERGY STAR qualified refrigerators, dish washers, and washing machines.
12. ENERGY STAR qualified ventilation fans include range hood, bathroom, and inline fans.
13. Further efficiency and savings can be achieved by installing ENERGY STAR qualified products, in addition to those required (e.g., additional lighting, appliances, etc.). For more information, visit www.energystar.gov.
14. In homes with heat pumps that have programmable thermostats, the thermostat must have "Adaptive Recovery" technology to prevent the excessive use of electric back-up heating.



ENERGY STAR Qualified Homes Thermal Bypass Inspection Checklist

The Thermal Bypass Inspection Checklist must be completed for homes to earn the ENERGY STAR label. The Checklist requires visual inspection of framing areas where air barriers are commonly missed and inspection of insulation to ensure proper alignment with air barriers, thus serving as an extra check that the air and thermal barriers are continuous and complete. State, local, and regional codes, as well as regional ENERGY STAR program requirements, supersede the items specified in this Checklist.

Guidance on Completing the Thermal Bypass Inspection Checklist:

1. Accredited HERS Providers and certified home energy raters shall use their experience and discretion in verifying that each Inspection Checklist item is installed per the inspection guidelines (e.g., identifying minor defects that the Provider or rater deems acceptable versus identifying major defects that undermine the intent of the Checklist item).
2. Alternative methods of meeting the Checklist requirements may be used in completing the Checklist, if the Provider deems them to be equivalent, or more stringent, than the Inspection Checklist guidelines.
3. In the event an item on the Checklist cannot be verified by the rater, the home cannot be qualified as ENERGY STAR, unless the builder assumes responsibility for verifying that the item has met the requirements of the Checklist. This option is available at the discretion of the Provider or rater but may not be used to verify more than six (6) items on the Inspection Checklist. This responsibility will be formally acknowledged by the builder signing-off on the Checklist for the item(s) that they verified. The column titled "N/A" should be used when the checklist item is not present in the home or when local code requirements take precedent.
4. The Checklist may be completed for a batch of homes using a RESNET-approved sampling protocol when qualifying homes as ENERGY STAR. For example, if the approved sampling protocol requires rating one in seven homes, then the Checklist will be completed for the one home which was rated.
5. In the event that a Provider or rater finds an item that is inconsistent with the Checklist Inspection guidelines, the home cannot be qualified as ENERGY STAR until the item is corrected in a manner that meets the ENERGY STAR requirements. If correction of the item is not possible, the home cannot earn the ENERGY STAR label.
6. The Provider or rater is required to keep a hard copy record of the completed and signed Checklist. The signature of a builder employee is also required if the builder verified compliance with any item on the Checklist.
7. For purposes of this Checklist, an air barrier is defined as any solid material that blocks air flow between a conditioned space and an unconditioned space, including necessary sealing to block excessive air flow at edges and seams. Additional information on proper air sealing of thermal bypasses can be found on the Building America Web site (www.eere.energy.gov/buildings/building_america) and in the EEBA Builder's Guides (www.eeba.org). These references include guidance on identifying and sealing air barriers, as well as details on many of the items included in the Checklist.



ENERGY STAR Qualified Homes Thermal Bypass Inspection Checklist

Home Address: _____		City: _____		State: _____	
Thermal Bypass	Inspection Guidelines	Corrections Needed	Builder Verified	Rater Verified	N/A
1. Overall Air Barrier and Thermal Barrier Alignment	Requirements: Insulation shall be installed in full contact with sealed interior and exterior air barrier except for alternate to interior air barrier under item no. 2 (<i>Walls Adjoining Exterior Walls or Unconditioned Spaces</i>)				
	All Climate Zones:				
	1.1 Overall Alignment Throughout Home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2 Garage Band Joist Air Barrier (at bays adjoining conditioned space)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.3 Attic Eave Baffles Where Vents/Leakage Exist	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Only at Climate Zones 4 and Higher:				
	1.4 Slab-edge Insulation (A maximum of 25% of the slab edge may be uninsulated in Climate Zones 4 and 5.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Best Practices Encouraged, Not Req'd.:				
1.5 Air Barrier At All Band Joists (Climate Zones 4 and higher)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.6 Minimize Thermal Bridging (e.g., OVE framing, SIPs, ICFs)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. Walls Adjoining Exterior Walls or Unconditioned Spaces	Requirements: <ul style="list-style-type: none"> • Fully insulated wall aligned with air barrier at both interior and exterior, OR • Alternate for Climate Zones 1 thru 3, sealed exterior air barrier aligned with RESNET Grade 1 insulation fully supported • Continuous top and bottom plates or sealed blocking 				
	2.1 Wall Behind Shower/Tub	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.2 Wall Behind Fireplace	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.3 Insulated Attic Slopes/Walls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.4 Attic Knee Walls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.5 Skylight Shaft Walls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.6 Wall Adjoining Porch Roof	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.7 Staircase Walls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.8 Double Walls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Floors between Conditioned and Exterior Spaces	Requirements: <ul style="list-style-type: none"> • Air barrier is installed at any exposed fibrous insulation edges • Insulation is installed to maintain permanent contact with sub-floor above including necessary supports (e.g., staves for blankets, netting for blown-in) • Blanket insulation is verified to have no gaps, voids or compression. • Blown-in insulation is verified to have proper density with firm packing 				
	3.1 Insulated Floor Above Garage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.2 Cantilevered Floor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Shafts	Requirements: Openings to unconditioned space are fully sealed with solid blocking or flashing and any remaining gaps are sealed with caulk or foam (provide fire-rated collars and caulking where required)				
	4.1 Duct Shaft	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.2 Piping Shaft/Penetrations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.3 Flue Shaft	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Attic/ Ceiling Interface	Requirements: <ul style="list-style-type: none"> • All attic penetrations and dropped ceilings include a full interior air barrier aligned with insulation with any gaps fully sealed with caulk, foam or tape • Movable insulation fits snugly in opening and air barrier is fully gasketed 				
	5.1 Attic Access Panel (fully gasketed and insulated)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.2 Attic Drop-down Stair (fully gasketed and insulated)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.3 Dropped Ceiling/Soffit (full air barrier aligned with insulation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.4 Recessed Lighting Fixtures (ICAT labeled and sealed to drywall)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.5 Whole-house Fan (insulated cover gasketed to the opening)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Common Walls Between Dwelling Units	Requirements: Gap between drywall shaft wall (i.e., common wall) and the structural framing between units is fully sealed at all exterior boundary conditions				
	6.1 Common Wall Between Dwelling Units	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Home Energy Rating Provider: _____		Rater Inspection Date: _____		Builder Inspection Date: _____	
Home Energy Rater Company Name: _____		Builder Company Name: _____			
Home Energy Rater Signature: _____		Builder Employee Signature: _____			



ENERGY STAR Qualified Homes National Builder Option Package

The requirements for the ENERGY STAR Builder Option Package (BOP) are specified in the table below.

To qualify as ENERGY STAR using this BOP, a home must meet the requirements specified, be verified and field-tested in accordance with the HERS Standards by a RESNET-accredited Provider, and meet all applicable codes.

	Hot Climates ¹ (2004 IRC Climate Zones 1,2,3)	Mixed and Cold Climates ¹ (2004 IRC Climate Zones 4,5,6,7,8)
Cooling Equipment (Where Provided)	Right-Sized ² : <ul style="list-style-type: none"> ENERGY STAR qualified A/C (14 SEER / 11.5 EER); <u>OR</u> ENERGY STAR qualified heat pump³ (14 SEER / 11.5 EER / 8.2 HSPF) 	Right-Sized ² : <ul style="list-style-type: none"> 13 SEER A/C; <u>OR</u> ENERGY STAR qualified heat pump³ (14 SEER / 11.5 EER / 8.5 HSPF)
Heating Equipment	<ul style="list-style-type: none"> 80 AFUE gas furnace; <u>OR</u> ENERGY STAR qualified heat pump^{2,3} (14 SEER / 11.5 EER / 8.2 HSPF); <u>OR</u> 80 AFUE boiler; <u>OR</u> 80 AFUE oil furnace 	<ul style="list-style-type: none"> ENERGY STAR qualified gas furnace (90 AFUE); <u>OR</u> ENERGY STAR qualified heat pump^{2,3} (See Note 3 for specifications); <u>OR</u> ENERGY STAR qualified boiler (85 AFUE); <u>OR</u> ENERGY STAR qualified oil furnace (85 AFUE)
Thermostat ³	ENERGY STAR qualified thermostat (except for zones with radiant heat)	
Ductwork	Leakage ⁴ : ≤ 4 cfm to outdoors / 100 sq. ft.; <u>AND</u> R-6 min. insulation on ducts in unconditioned spaces ⁵	
Envelope	<ul style="list-style-type: none"> Infiltration^{6,7} (ACH50): 7 in CZ's 1-2 6 in CZ's 3-4 5 in CZ's 5-7 4 in CZ 8; <u>AND</u> Insulation levels that meet or exceed the 2004 IRC⁸; <u>AND</u> Completed Thermal Bypass Inspection Checklist⁹ 	
Windows	ENERGY STAR qualified windows or better (additional requirements for CZ2 and CZ4) ^{10, 11, 12}	
Water Heater ¹³	Gas (EF): 40 Gal = 0.61 60 Gal = 0.57 80 Gal = 0.53 Electric (EF): 40 Gal = 0.93 50 Gal = 0.92 80 Gal = 0.89 Oil or Gas ¹⁴ : Integrated with space heating boiler	
Lighting and Appliances ^{15,16}	Five or more ENERGY STAR qualified appliances, light fixtures, ceiling fans equipped with lighting fixtures, and/or ventilation fans	

Note: Due to the unique nature of some state codes and/or climates, EPA has agreed to allow regionally-developed definitions of ENERGY STAR in California, Hawaii, and the Pacific Northwest to continue to define program requirements. The States of Montana and Idaho may use either the requirements of the national program or the regionally-developed program in the Pacific Northwest.



Map is for illustrative purposes only and is based on figure N1101.2 from the 2004 International Residential Code (IRC).



ENERGY STAR Qualified Homes National Builder Option Package Notes

1. The appropriate climate zone shall be determined by the 2004 International Residential Code (IRC), Figure N1101.2.
 2. Cooling equipment shall be sized according to the latest editions of ACCA Manuals J and S, ASHRAE 2001 Handbook of Fundamentals, or an equivalent procedure. Maximum oversizing limit for air conditioners and heat pumps is 15% (with the exception of heat pumps in Climate Zones 5 - 8, where the maximum oversizing limit is 25%). The following operating conditions shall be used in the sizing calculations and verified where reviewed by the rater:
Outdoor temperatures shall be the 99.0% and 1.0% design temperatures as published in the ASHRAE Handbook of Fundamentals for the home's location or most representative city for which design temperature data are available; Indoor temperatures shall be 75 F for cooling and 70 F for heating; Infiltration rate shall be selected as "tight", or the equivalent term.
In specifying equipment, the next available size may be used. In addition, indoor and outdoor coils shall be matched in accordance with ARI standards.
 3. Homes with heat pumps in Climate Zones 4 and 5 must have an HSPF ≥ 8.5 , which exceeds the ENERGY STAR minimum of 8.2 HSPF. Homes with heat pumps in Climate Zones 6, 7, and 8 cannot be qualified using this BOP, but can earn the label using the ENERGY STAR Performance Path requirements. In homes with heat pumps that have programmable thermostats, the thermostat must have "Adaptive Recovery" technology to prevent the excessive use of electric back-up heating.
 4. Ducts must be sealed and tested to be ≤ 4 cfm to outdoors / 100 sq. ft. of conditioned floor area, as determined and documented by a RESNET-certified rater using a RESNET-approved or equivalent ASTM-approved testing protocol. Duct leakage testing can be waived if all ducts and air handling equipment are located in conditioned space (i.e., within the home's air and thermal barriers) AND the envelope leakage has been tested to be ≤ 3 ACH50 OR ≤ 0.25 CFM 50 per sq. ft. of the building envelope.
 5. EPA recommends, but does not require, locating ducts within the home's conditioned space (i.e., inside the air and thermal barriers), and using a minimum of R-4 insulation for ducts inside the conditioned space to prevent condensation.
 6. Envelope leakage must be determined by a RESNET-certified rater using a RESNET-approved testing protocol.
 7. To ensure consistent exchange of indoor air, whole-house mechanical ventilation is recommended, but not required.
 8. Insulation levels of a home must meet or exceed Sections N1102.1 and N1102.2 of the 2004 IRC. These sections allow for compliance to be determined by meeting prescriptive insulation requirements, by using U-factor alternatives, or by using a total UA alternative. These sections also provide guidance and exceptions that may be used. However, note that the U-factor for steel-frame envelope assemblies addressed in Section N1102.2.4 shall be calculated using the ASHRAE zone method, or a method providing equivalent results, and not a series-parallel path calculation method as is stated in the code. Additionally, Section N1102.2.2, which allows for the reduction of ceiling insulation in space constrained roof/ceiling assemblies, shall be limited to 500 sq. ft. or 20% of ceiling area, whichever is less. In all cases, insulation shall be inspected to Grade I installation as defined in the RESNET Standards by a RESNET-certified rater, with the following exceptions:
 - i. Rim/Band Joists - the interior sheathing/enclosure material is optional in all climate zones, provided insulation is adequately supported and meets all other requirements.
 - ii. Wall Insulation - the interior sheathing/enclosure material is optional in climate zones 1-3, provided insulation is adequately supported and meets all other requirements.
 - iii. Sealed, Unvented Attic/Roof Assemblies - the interior sheathing/enclosure material is optional in climate zones 1-3, provided insulation is adequately supported and meets all other requirements, including full contact with the exterior (roof) sheathing.
 - iv. Floor insulation over unconditioned basements or enclosed crawlspaces, either vented or unvented, need not be enclosed (though floor insulation over ambient conditions does).
- .Note that the fenestration requirements of the 2004 IRC do not apply to the fenestration requirements of the National Builder Option Package. Therefore, if UA calculations are performed, they must use the IRC requirements (with the exception of fenestration) plus the fenestration requirements contained in the national BOP. For more information, refer to the "Codes and Standards Information" document.
9. The Thermal Bypass Inspection Checklist must be completed for homes to earn the ENERGY STAR label. The Checklist requires visual inspection of framing areas where air barriers are commonly missed and inspection of insulation to ensure proper alignment with air barriers, thus serving as an extra check that the air and thermal barriers are continuous and complete.
 10. All windows and skylights must be ENERGY STAR qualified or meet all specifications for ENERGY STAR qualified windows. Windows in Climate Zones 2 and 4 must exceed ENERGY STAR specifications (CZ 2: U-value ≤ 0.55 and SHGC ≤ 0.35 ; CZ 4: U-value ≤ 0.40 and SHGC ≤ 0.45). Visit www.energystar.gov/windows for more information on ENERGY STAR qualified windows.
 11. All decorative glass and skylight window area counts toward the total window area to above-grade conditioned floor area (WFA) ratio. For homes with a WFA ratio $>18\%$, the following additional requirements apply:
 - a. In IRC Climate Zones 1, 2, and 3, an improved window SHGC is required, and is determined by:



ENERGY STAR Qualified Homes National Builder Option Package Notes

Required SHGC = $[0.18 / \text{WFA}] \times [\text{ENERGY STAR SHGC}]$

Where the ENERGY STAR SHGC is the minimum required SHGC of the climate-appropriate window specified in this BOP.

- b. In IRC Climate Zones 4, 5, 6, 7, and 8, an improved window U-Value is required, and is determined by:

Required U-Value = $[0.18 / \text{WFA}] \times [\text{ENERGY STAR U-Value}]$

Where the ENERGY STAR U-Value is the minimum required U-Value of the climate-appropriate window specified in this BOP.

12. Up to 0.75% WFA may be used for decorative glass that does not meet ENERGY STAR requirements. For example, a home with total above-grade conditioned floor area of 2,000 sq. ft. may have up to 15 sq. ft. (0.75% of 2,000) of decorative glass.
13. To determine domestic hot water (DHW) EF requirements for additional tank sizes, use the following equations:
Gas DHW EF $\geq 0.69 - (0.002 \times \text{Tank Gallon Capacity})$; Electric DHW EF $\geq 0.97 - (0.001 \times \text{Tank Gallon Capacity})$.
14. In homes with gas or oil hydronic space heating, water heating systems must have an efficiency ≥ 0.78 EF. This may be met through the use of an instantaneous water heating system or an indirect storage system with a boiler that has a system efficiency ≥ 85 AFUE. Homes with tankless coil hot water heating systems cannot be qualified using this BOP, but can earn the label using the ENERGY STAR Performance Path requirements.
15. Any combination of ENERGY STAR qualified products listed may be installed to meet this requirement. ENERGY STAR qualified ventilation fans include range hood, bathroom, and inline fans. ENERGY STAR qualified lighting fixtures installed in the following locations shall not be counted: storage rooms (e.g., closets, pantries, sheds), or garages. Eligible appliances include ENERGY STAR qualified refrigerators, dish washers, and washing machines. Further efficiency and savings can be achieved by installing ENERGY STAR qualified products, in addition to those required (e.g., additional lighting, appliances, etc.).
16. Efficient lighting fixtures represent a significant opportunity for persistent energy savings and a meaningful way to differentiate ENERGY STAR qualified homes from those meeting minimum code requirements. In 2008, EPA intends to propose and solicit industry comments on adding the ENERGY STAR Advanced Lighting Package (ALP) as an additional requirement for ENERGY STAR qualified homes in 2009. To learn more about the ALP, refer to www.energystar.gov/homes.