



Northwest ENERGY STAR® Single-Family Homes Requirements

Updated: July 1, 2015

Single-Family
Washington, Oregon,
Idaho, Montana

Effective November 1, 2014, the use of Northwest REM/Rate™ will be the required means for Northwest ENERGY STAR® Homes certification for single-family homes. This document outlines the programmatic and technical requirements for building and qualifying homes for certification, including measures used to establish the Reference Home for your state.

Qualifying Homes

In Washington, Oregon, Idaho and Montana, the following homes are eligible for Northwest ENERGY STAR Homes certification:

- Detached dwelling units¹ (e.g., single-family homes) **OR**
- Dwelling units in any townhome building with four units or less

Note that compliance with these guidelines is not intended to imply compliance with all local code requirements that may be applicable to the home.²

Northwest ENERGY STAR Compliance Requirements

Modeling in Northwest REM/Rate™ provides flexibility to select a custom combination of measures for each home that is equivalent in performance to the minimum requirements of the Northwest ENERGY STAR Reference Home for your state, listed in Exhibit 1. Equivalent performance is assessed through energy modeling.

Follow the steps below:

1. Using the Northwest REM/Rate™ software program, configure the preferred set of energy measures for the rated home according to the program requirements³ and limitations set forth in the Modeling Guidelines for Northwest REM/Rate™. Regardless of the measures selected, all homes must meet the mandatory requirements listed in Exhibit 2. Note that the Rater Field Checklist requires that all insulation, windows, doors and skylights meet or exceed 2009 IECC requirements.^{4,5,6,7}
2. Verify that the resulting annual energy consumption is less than or equal to that of the Reference Home. This can be verified with the Northwest ENERGY STAR Homes Compliance Report.
 - The Compliance Report generates annual energy consumption in MMBtu/yr for heating, cooling, water heating and lights/appliances, and flags errors or non-compliance issues.
 - A home may also be constructed prescriptively according to all of the building measures listed for the appropriate Reference Home, as outlined in Exhibit 1, and qualify for certification. The listed building measures are considered minimums; no trade-offs below the building measures are available if choosing this path.
 - i. All other requirements listed in this document must still be met, including producing a Northwest REM/Rate™ .blg file.
 - ii. If your state code requires additional energy credits for homes exceeding a certain conditioned floor area,⁸ building prescriptively to the Reference Home is not an acceptable means of qualifying for certification. Certification of these projects is dependent upon results of the Compliance Report.
 - iii. If the same floor plan is used to construct multiple homes, only one .blg file must be created. The Rater may re-use this .blg file for all subsequent homes rather than creating a new one each time from scratch. This allowance will be made providing RESNET procedures for worst case analysis are used. (http://www.resnet.us/about/worst-case_analysis.pdf)
 - If the resulting total annual energy consumption is less than or equal to that of the Reference Home, proceed to step 3. If not, reconfigure the energy measures for the rated home. The Rater can view a comparison of each detailed input between the Rated home and the Reference Home by running a Building File Report in Northwest REM/Rate™.
3. Construct the home according to the measures selected in Step 1 and the Checklists outlined in Exhibit 2
4. The Rater⁹ shall verify that the home meets all aforementioned requirements, as well as:
 - On-Site Minimum Rated Features for duct leakage,¹⁰ heat pump efficiencies,^{11,12} ventilation strategy,^{13,14,15} water fixtures,¹⁶ slab insulation, infiltration rate¹⁹, built-in appliances, programmable thermostats,²¹ and hot water pipe insulation specified on the state-specific Reference Home (Exhibit 1); **AND**
 - Northwest REM/Rate™ Modeling Guidelines; **AND**
 - Revision 8 Checklists



Northwest ENERGY STAR® Single-Family Homes Requirements

Updated: July 1, 2015

Single-Family
Washington, Oregon,
Idaho, Montana

Exhibit 1: Northwest ENERGY STAR Reference Homes

Exhibit 1 displays the measures used to construct the state-specific Reference Homes (used to model target energy consumption). Only the items listed in step 4 above are considered on-site minimum specifications. The Reference Home measures will be adjusted and updated as new energy codes are adopted. While the table below will be updated periodically, Raters will have real-time access to the current Reference Homes by running a Building File Report in Northwest REM/Rate™.

Building Measures	Reference Home Oregon Requirements (NG Furnaces and Electric HPs)	Reference Home Washington Requirements (NG Furnaces and Electric HPs)	Reference Home Montana and Idaho Requirements (NG Furnaces and Electric HPs)
Furnace	≥ 92 AFUE	≥ 95 AFUE	≥ 90 AFUE
Heat pump ¹¹	8.5 HSPF (9 climate zone 5) / 14.5 SEER / 12 EER	9.0 HSPF / 14.5 SEER / 12 EER	9.0 HSPF / 14.5 SEER / 12 EER
AC	≥ 13 SEER	≥ 13 SEER	≥ 13 SEER
NG water heater	0.61 EF gas tank	0.62 EF gas tank	0.61 EF gas tank
Electric water heater ¹⁸	.93 EF electric storage tank	.93 EF electric storage tank	.93 EF electric storage tank
Lighting - CFL	≥ 80%	≥ 90%	≥ 80%
Spot and whole-house exhaust fans ^{13, 15}	Reference Home assumes exhaust fan for whole-house ventilation, high efficacy (2.857 CFM/Watt)	Reference Home assumes exhaust fan for whole-house ventilation, high efficacy (2.857 CFM/Watt)	Reference Home assumes exhaust fan for whole-house ventilation, high efficacy (2.857 CFM/Watt)
Walls ²	U≤ .051	U≤ .051	U≤ .051
Below grade wall	R-19	R-19	R-19
Flat ceilings	R-49 with ≥ R-21 at edge	R-49 with ≥ R-21 at edge	R-38 (R-49 in climate zone 6) with ≥ R-21 at edge
Scissor truss vault	R-38	R-38	R-38
Rafter vault	R-30	R-30	R-30
Floors	R-30	R-38	R-30
Slab	R-10 full+R-15 per.+R-15 break	R-10 full+R-5 break	MT: R-10, 4 ft/R-15 heated slab ID: R-10, 2 ft per
Infiltration rate ^{19, 20}	4 ACH@50	3 ACH@50	4 ACH@50
Duct leakage ¹⁰	Leakage to outside = (.015 x conditioned floor area)	Leakage to outside = (.015 x conditioned floor area)	Leakage to outside = (.045 x conditioned floor area)
Duct location ²⁰	Conditioned space	Conditioned space	Matches design home
Windows	≤ 0.30 U value	≤ 0.28 U value	≤ 0.30 U value
Skylights	≤ 0.50 U value	≤ 0.50 U value	≤ 0.50 U value
Glazing percentage ²⁰	≤ 21%	≤ 21%	≤ 15%
Doors	≥ R-5	≥ R-5	≥ R-5
Water Fixtures ¹⁶	1.75 gpm showerheads 1.5 gpm kitchen faucet 1.0 gpm bathroom faucets	EPA WaterSense models	1.75 gpm showerheads 1.5 gpm kitchen faucet 1.0 gpm bathroom faucets
Appliances	Built-in appliances ENERGY STAR qualified	Built-in appliances ENERGY STAR qualified	Built-in appliances ENERGY STAR qualified
Programmable thermostats ²¹	Required	Required	Required
Hot water pipe insulation	R-4, pipes in unconditioned spaces only	R-4, all pipes	R-4, pipes in unconditioned spaces only



Northwest ENERGY STAR® Single-Family Homes Requirements

Updated: July 1, 2015

Single-Family
Washington, Oregon,
Idaho, Montana

Exhibit 2: Mandatory Requirements for All Qualified Homes

Design Phase	Build Phase
HVAC Designer <ul style="list-style-type: none"> Completes one HVAC Design Report per system design. 	HVAC Contractor <ul style="list-style-type: none"> Completes HVAC Commissioning Checklist once per system installed (HVAC contractor must keep on file in case Rater requests it).
Rater <ul style="list-style-type: none"> Collects HVAC Design report once per system design. Completes Rater Design Review Checklist once per system design. 	Builder <ul style="list-style-type: none"> Ensures that Water Management System Builder Requirements are met for each home. No per-home documentation required.
	Rater <ul style="list-style-type: none"> Completes Rater Field Checklist once per home.

Partnership, Training and Credentialing Requirements

Prior to home qualification, builders, Raters, HVAC contractors and performance testers must become Northwest ENERGY STAR Partners by satisfying all training requirements detailed at <http://www.northwestenergystar.com/partners/join-program>.

Footnotes

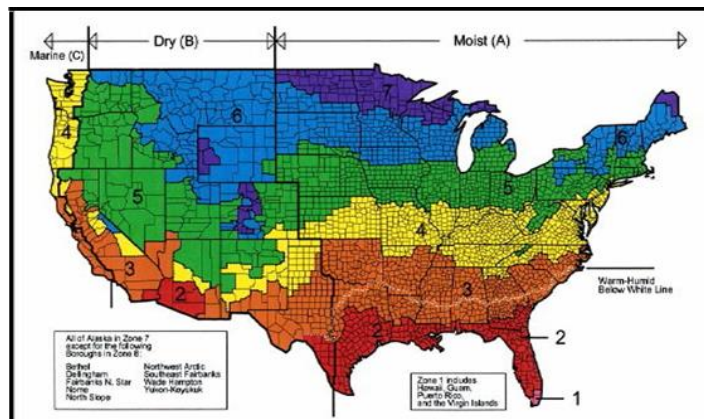
- A dwelling unit, as defined by the 2009 IECC, is a single unit that provides complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation.
- Where requirements of the local codes, manufacturers' installation instructions, engineering documents or regional ENERGY STAR programs overlap with the requirements of these guidelines, the EPA offers the following guidance:
 - In cases where the overlapping requirements exceed the ENERGY STAR guidelines, these overlapping requirements shall be met;
 - In cases where overlapping requirements conflict with a requirement of these ENERGY STAR guidelines (e.g., slab insulation is prohibited to allow visual access for termite inspections), then the conflicting requirement within these guidelines shall not be met. Qualification shall only be allowed if the Rater has determined that no equivalent option is available that could meet the intent of the conflicting requirement of these ENERGY STAR guidelines (e.g., switching from exterior to interior slab edge insulation). Note that under the Performance Path, a home must still meet its Annual Energy Use Target. Therefore, other efficiency measures may be needed to compensate for the omission of the conflicting requirement.
- Program requirements are defined as items listed in the Northwest ENERGY STAR Single-Family Homes Requirements document, Modeling Guidelines for Northwest REM/Rate™ document, Revision 8 Checklists, PTCS requirements, and RESNET requirements.
- Insulation levels in a home shall meet or exceed those specified in the state energy code. Note that the U-factor for steel-frame envelope assemblies shall be calculated using the ASHRAE zone method, reduction of ceiling insulation in space-constrained roof/ceiling assemblies shall be limited to 500 ft² or 20% of the ceiling area, whichever is less. Slab insulation is required for slab floors with a floor surface less than 24 inches below grade. Slab insulation shall extend to the top of the slab to provide a complete thermal break. If the top edge of the insulation is installed between the exterior wall and the edge of the interior slab, it shall be permitted to be cut at a 45-degree angle away from the exterior wall. Slab insulation must meet the requirements of the Northwest ENERGY STAR Homes Reference Home and the Rater Field Checklist.
- Insulation shall be verified by a Rater/Rating Field Inspector to achieve a Grade I installation as defined in the RESNET Standards for ceilings and walls. Floor insulation must be installed to manufacturer's specifications. For ceiling, wall and floor assemblies with continuous rigid insulated sheathing, a Grade II installation is acceptable for the cavity insulation only if the rigid insulation sheathing meets or exceeds the following levels: R-3 in Climate Zones 1 to 4; R-5 in Zones 5 to 8. Note that insulation can be verified by a Field Inspector as long as they are working under the supervision of a Rater.

Northwest ENERGY STAR® Single-Family Homes Requirements

Updated: July 1, 2015

Single-Family
Washington, Oregon,
Idaho, Montana

6. All windows, doors and skylights shall meet or exceed the component U-factor and SHGC requirements specified in the 2009 IECC – Table 402.1.1. If no NFRC rating is noted on the window or in product literature (e.g., for site-built fenestration), select the U-factor and SHGC value from Tables 4 and 14, respectively, in 2005 ASHRAE Fundamentals, Chapter 31. Select the highest U-factor and SHGC value among the values listed for the known window characteristics (e.g., frame type, number of panes, glass color and presence of low-e coating). Note that the U-factor requirement applies to all fenestration, while the SHGC only applies to the glazed portion. The following exceptions apply:
- An area-weighted average of fenestration products shall be permitted to satisfy the U-factor requirements;
 - An area-weighted average of fenestration products more than 50% glazed shall be permitted to satisfy the SHGC requirements;
 - 15 square feet of glazed fenestration per dwelling unit shall be exempt from the U-factor and SHGC requirements, and shall be excluded from area-weighted averages calculated using a) and b), above;
 - One side-hinged opaque door assembly, up to 24 square feet in area, shall be exempt from the U-factor requirements and shall be excluded from area-weighted averages calculated using a) and b), above;
 - Fenestration utilized as part of a passive solar design shall be exempt from the U-factor and SHGC requirements, and shall be excluded from area-weighted averages calculated using a) and b), above. Exempt windows shall be facing within 45 degrees of true South and directly coupled to thermal storage mass that has a heat capacity > 20 btu / ft³×OF and provided in a ratio of at least 3 sq. ft. per sq. ft. of south-facing fenestration. Generally, thermal mass materials will be at least 2 in. thick.
7. The following map depicts Climate Zone boundaries based on 2009 IECC Figure 301.1. It is for illustrative purposes only.



8. Washington State Energy Code requires additional energy credits for homes depending on size. Homes in Washington with CFA in excess of 5000 square feet are not eligible for certification by building prescriptively to the Reference Home.
9. The term 'Rater' refers to the person completing the third-party inspections, modeling the home using NW REM/Rate™ and the procedures detailed above, and submitting the .blg file to a Northwest Rating Provider for certification. The Rater must be a Northwest ENERGY STAR Partner as per the training requirements detailed at www.northwestenergystar.com/partners/join-program and be certified by RESNET.
10. Certification of a duct system under the Northwest ENERGY STAR Homes program is consistent with the EPA's ENERGY STAR Homes specification. The specification may also be found on the Rater Field Checklist.
- Each system requires testing. The measured duct leakage to outdoors CFM25 shall not exceed 0.04 x floor area served by the system (in square feet) or 40 CFM25, whichever is greater, and the factory-supplied air handler shall be in place at the time of the test. The following exceptions exist:
- If both the ducts and equipment are located within the conditioned space, the system is exempted from the duct-testing requirement. Up to five percent (5%) of the linear feet of the duct system may be located outside the thermal and/or air barriers of the house, or in exterior cavities of the house.
 - If the air handler is located completely within conditioned space, it is not required to be in place during the test.
 - If the air handler is located in unconditioned space, it is not required to be in place during the test. However, the leakage limit shall be decreased to 0.03 x floor area served by the system (in square feet) or 35 CFM25, whichever is greater.
 - If the ducts are located outside of the conditioned space, all boots and registers must be sealed to the air barrier or finished surface.
 - If a total leakage test performed at rough inspection passes the leakage to outside requirements, a duct test at final is not required.
 - For instances where State Energy (or Residential/Building) Code require more stringent targets be met or allow for fewer exceptions, the State Code shall be followed.



Northwest ENERGY STAR® Single-Family Homes Requirements

Updated: July 1, 2015

Single-Family
Washington, Oregon,
Idaho, Montana

In cases where Northwest utility incentives (whole-house or HVAC-specific incentives) are provided, systems must align with Performance Tested Comfort Systems® (PTCS®) specifications. A PTCS-certified technician shall complete the testing and certification process and shall provide documentation of the test results showing compliance to the Rater. Each system requires testing and the measured CFM50 shall not exceed 0.06 x floor area served by the system (in square feet) or 75 CFM50, whichever is greater, and the factory-supplied air handler shall be in place at the time of the test. The following exceptions exist:

- If both the ducts and equipment are located within the conditioned space, the system is exempted from the duct-testing requirement. Up to five percent (5%) of the linear feet of the duct system may be located outside the thermal and/or air barriers of the house, or in exterior cavities of the house.
 - If the air handler is located completely within conditioned space, it is not required to be in place during the test.
 - If the air handler is located in unconditioned space, it is not required to be in place during the test. However, the leakage limit shall be decreased to 0.04 x floor area served by the system (in square feet) or 50 CFM50, whichever is greater.
11. The efficiency for air source heat pumps in Climate Zones 4, 5 and 6 shall exceed the ENERGY STAR minimum of 8.0 HSPF.
12. A mini-split heat pump system's rated heating capacity shall meet or exceed the minimum heating size (output) as specified below (depending on the climate of the installation).
- Coastal zones west of the Cascades (Zone 4), 6 Btu/h/ft² of heated floor area;
 - Intermountain zones of eastern Washington, Oregon, and southwestern Idaho with less than 7000 heating degree days (Zone 5), 8 Btu/h/ft² of heated floor area;
 - Mountain zones of eastern Idaho and western Montana with more than 7000 heating degree days (Zone 6), 10 BTU/h/ft² of heated floor area

In addition to the mini-split heat pump system, the home may include supplemental electric unit heaters or zone heaters. Electric unit or zonal heat sources complying with this specification shall have a total capacity NOT to exceed the amounts specified below (depending on the climate of the installation):

- Coastal zones west of the Cascades (Zone 4), ≤ 3 W/ ft² of heated floor area;
- Intermountain zones of eastern Washington, Oregon and southwestern Idaho with less than 7000 heating degree days (Zone 5), ≤ 4 W/ ft² of heated floor area;
- Mountain zones of eastern Idaho and western Montana with more than 7000 heating degree days (Zone 6), ≤ 5 W/ ft² of heated floor area.

Each room in which the heaters are located shall have a thermostat capable of controlling the room heaters separately from other zones in the house.

13. Commissioning is required when a whole-house exhaust fan is used:
- Using a flow hood or similar method that accurately measures airflow, verify that the minimum airflow is met by the exhaust fan.
 - An exhaust fan rated for continuous operation with a sone rating of 1.0 or less located in a central location providing an airflow rate meeting ASHRAE 62.2 2010 requirements must be provided and must run continuously. Alternatively, programmable timer controls may be installed to operate an exhaust fan with a sone rating of 2.0 or less intermittently on a schedule that provides the specified ventilation rates required by ASHRAE 62.2 2010.
14. Air-to-air HRV/ERV installations shall:
- Include documentation that units are installed according to manufacturer's instructions.
 - Include a fully ducted (both supply and exhaust) ventilation system with both exhaust and supply airflow. A minimum rating of 60% sensible heat recovery efficiency is required with the unit operating in its installed fan speed mode at 32 deg. F. Units shall be third-party tested in accordance with C439-06.
 - Be sized and set to operate in accordance to ASHRAE Std 62.2 2010.
 - Have a minimum fan efficacy of 1.33 cfm/W measured at the most typical operational flow rate.
 - Supply air to at least one central location in the home or the return side of the home's central duct system. For maximum effectiveness, the system should supply air to individual bedrooms as well as other general living spaces.
 - Have an easily accessible filter. When such filter is not integral to the HRV/ERV, filters should be installed on the upstream side of the heat exchanger in the intake airstream.
 - Provide protection against ice buildup that does not disable the unit during freezing weather.

Connections to the HRV/ERV shall be made with flexible connectors to reduce vibration. Ductwork shall be located within the conditioned envelope to the maximum extent possible. All ductwork located outside the conditioned building envelope, or between the outside wall and the HRV/ERV, shall also be fully insulated to R-8 minimum. All ducting should be adequately supported and sealed. Duct testing is not required unless ventilation ducts are conjoined with space conditioning ducts.

15. All exhaust fans, both spot and whole-house ventilation, shall be high efficacy (2.857 cfm/watt) fans, except in kitchens and half bathrooms and must be rated at ≤ 1.0 sones when set to run continuously, ≤ 2.0 sones when set to run intermittently. A half bathroom is any bathroom that does not contain a bathtub, shower, spa or similar source of moisture. Additional exhaust fans that are not ENERGY STAR qualified must meet the efficacy requirement of 1.4 cfm/w.
16. Faucets and showerheads should be installed as follows: 1.75 gpm showerheads, 1.5 gpm kitchen faucet, 1.0 gpm bathroom faucet. Faucet aerators are permitted. An exception to 1.0 gpm faucets in bathrooms: 1.5 gpm faucets may be used if showerheads are 1.5 gpm or below. In Washington, any EPA WaterSense labeled products are acceptable.



Northwest ENERGY STAR® Single-Family Homes Requirements

Updated: July 1, 2015

Single-Family
Washington, Oregon,
Idaho, Montana

17. The Rater may define the 'permit date' as either the date that the permit was issued or the date of the contract on the home. In cases where permit or contract dates are not available, Providers have discretion to estimate permit dates based on other construction schedule factors. These assumptions should be both defensible and documented.
18. Domestic hot water systems that are integrated with the space-heating system are permitted to be used in the following two scenarios:
 - Either the space-heating system (e.g., furnace or boiler) shall heat and circulate a fluid through an indirect storage tank, OR a single integrated/combined product intended for both space heating and domestic hot water shall be used. A "tankless coil water heater," where domestic water flows through a coil installed in the space-heating system, is not permitted.
 - Heat pump water heaters shall not be installed inside the thermal and pressure boundary of the home unless both intake and exhaust air is ducted directly to the outside according to manufacturer's specifications. Heat pump water heaters used to meet this requirement must be selected from NEEA's Qualified Products List (<http://neea.org/docs/northern-climate-heat-pump-water-heater-specification/qualified-products-list.pdf?sfvrsn=6>) and installed using the recommendations set forth in the Smart Water Heat Best Practices Installation Guide (http://smartwaterheat.org/sites/default/files/Smart_Water_Heat_Best_Practices_Installation_Guide.pdf).
19. Envelope leakage shall be determined by a Rater/RFI using a RESNET-approved testing protocol. Homes built to the ENERGY STAR specification must meet or beat the target infiltration rate for the state identified in Exhibit 1, with the exception of scenarios where codes mandate the installation of fire suppression systems. In these cases, the Rater and Provider may determine the reasonable infiltration rate that the home shall meet, or add a 0.5 ACH to the state target.
20. Conditioned Floor Area for calculation of window to floor area (WFA), building leakage rates and duct leakage rates shall include conditioned basements. Conditioned basements are defined by Northwest ENERGY STAR Homes as occupiable space located below grade, or partially below grade and is included within the home's thermal and pressure boundary. Conditioned, attached garages shall not be included in the CFA. Up to 15 square feet of "decorative" glazed fenestration per dwelling unit may be exempted from the U-value and SHGC requirements, and shall be excluded from area-weighted average calculations, but shall be included in calculating the total WFA ratio.
21. Programmable thermostat shall be installed unless the thermostat controls a zone with electric radiant heat, for which a manual adjustable thermostat is allowed. Ductless heat pumps are not required to have programmable thermostats.

Addendum: See Water Management System Requirements below.



Water Management System Builder Requirements¹

ENERGY STAR Certified Homes, Version 3 / 3.1 (Rev. 08)

Builder Responsibilities:

- It is the exclusive responsibility of builders to ensure that each certified home is constructed to meet these requirements.
- While builders are not required to maintain documentation demonstrating compliance for each individual certified home, builders are required to develop a process to ensure compliance for each certified home (e.g., incorporate these requirements into the Scope of Work for relevant sub-contractors, require the site supervisor to inspect each home for these requirements, and / or sub-contract the verification of these requirements to a Rater).
- In the event that the EPA determines that a certified home was constructed without meeting these requirements, the home may be decertified.

1. Water-Managed Site and Foundation

- 1.1 Patio slabs, porch slabs, walks, and driveways sloped ≥ 0.25 in. per ft. away from home to edge of surface or 10 ft., whichever is less.²
- 1.2 Back-fill has been tamped and final grade sloped ≥ 0.5 in. per ft. away from home for ≥ 10 ft. See Footnote for alternatives.²
- 1.3 Capillary break beneath all slabs (e.g., slab on grade, basement slab) except crawlspace slabs using either: ≥ 6 mil polyethylene sheeting, lapped 6-12 in., or ≥ 1 in. extruded polystyrene insulation with taped joints.^{3, 4, 5}
- 1.4 Capillary break at all crawlspace floors using ≥ 6 mil polyethylene sheeting, lapped 6-12 in., & installed using one of the following:^{3, 4, 5}
- 1.4.1 Placed beneath a concrete slab; OR,
- 1.4.2 Lapped up each wall or pier and fastened with furring strips or equivalent; OR,
- 1.4.3 Secured in the ground at the perimeter using stakes.
- 1.5 Exterior surface of below-grade walls of basements & unvented crawlspaces finished as follows:
- a) For poured concrete, masonry, & insulated concrete forms, finish with damp-proofing coating.⁶
- b) For wood framed walls, finish with polyethylene and adhesive or other equivalent waterproofing.
- 1.6 Class 1 vapor retarder not installed on interior side of air permeable insulation in exterior below-grade walls.⁷
- 1.7 Sump pump covers mechanically attached with full gasket seal or equivalent.
- 1.8 Drain tile installed at basement and crawlspace walls, with the top of the drain tile pipe below the bottom of the concrete slab or crawlspace floor. Drain tile surrounded with ≥ 6 in. of $\frac{1}{2}$ to $\frac{3}{4}$ in. washed or clean gravel and with gravel layer fully wrapped with fabric cloth. Drain tile level or sloped to discharge to outside grade (daylight) or to a sump pump. If drain tile is on interior side of footing, then channel provided through footing to exterior side.⁸

2. Water-Managed Wall Assembly

- 2.1 Flashing at bottom of exterior walls with weep holes included for masonry veneer and weep screed for stucco cladding systems, or equivalent drainage system.⁹
- 2.2 Fully sealed continuous drainage plane behind exterior cladding that laps over flashing in Item 2.1 and fully sealed at all penetrations. Additional bond-break drainage plane layer provided behind all stucco and non-structural masonry cladding wall assemblies.^{9, 10}
- 2.3 Window and door openings fully flashed.¹¹

3. Water-Managed Roof Assembly

- 3.1 Step and kick-out flashing at all roof-wall intersections, extending ≥ 4 " on wall surface above roof deck and integrated shingle-style with drainage plane above; boot / collar flashing at all roof penetrations.¹²
- 3.2 For homes that don't have a slab-on-grade foundation and do have expansive or collapsible soils, gutters & downspouts provided that empty to lateral piping that discharges water on sloping final grade ≥ 5 ft. from foundation, or to underground catchment system not connected to the foundation drain system that discharges water ≥ 10 ft. from foundation. See Footnote for alternatives & exemptions.^{3, 13, 14}
- 3.3 Self-adhering polymer-modified bituminous membrane at all valleys & roof deck penetrations.^{3, 15}
- 3.4 In 2009 IECC Climate Zones 5 & higher, self-adhering polymer-modified bituminous membrane over sheathing at eaves from the edge of the roof line to > 2 ft. up roof deck from the interior plane of the exterior wall.^{3, 15}

4. Water-Managed Building Materials

- 4.1 Wall-to-wall carpet *not* installed within 2.5 ft. of toilets, tubs, and showers.
- 4.2 Cement board or equivalent moisture-resistant backing material installed on all walls behind tub and shower enclosures composed of tile or panel assemblies with caulked joints. Paper-faced backerboard shall not be used.¹⁶
- 4.3 In Warm-Humid climates, Class 1 vapor retarders not installed on the interior side of air permeable insulation in above-grade walls, except at shower and tub walls.⁷
- 4.4 Building materials with visible signs of water damage or mold *not* installed or allowed to remain.¹⁷
- 4.5 Framing members & insulation products having high moisture content *not* enclosed (e.g., with drywall).¹⁸
- 4.6 For each condensate-producing HVAC component, corrosion-resistant drain pan (e.g., galvanized steel, plastic) included that drains to a conspicuous point of disposal in case of blockage. Backflow prevention valve included if connected to a shared drainage system.

Footnotes:

1. These requirements are designed to improve moisture control in homes. However, these features alone cannot prevent all moisture problems. For example, leaky pipes or overflowing baths can lead to moisture issues and negatively impact the performance of the home.
2. Swales or drains designed to carry water from foundation are permitted to be provided as an alternative to the slope requirements for any home, and shall be provided for a home where setbacks limit space to less than 10 ft. Also, tamping of back-fill is not required if either: proper drainage can be achieved using non-settling compact soils, as determined by a certified hydrologist, soil scientist, or engineer; OR, the builder has scheduled a site visit to provide in-fill and final grading after settling has occurred (e.g., after the first rainy season).



Water Management System Builder Requirements¹

ENERGY STAR Certified Homes, Version 3 / 3.1 (Rev. 08)

3. Not required in Dry (B) climates as shown in 2009 IECC Figure 301.1 and Table 301.1.
4. Not required for raised pier foundations with no walls. To earn the ENERGY STAR, EPA recommends, but does not require, that radon-resistant features be included in homes built in EPA Radon Zones 1, 2 & 3. For more information, see www.epa.gov/indoorairplus.
5. For an existing slab (e.g., in a home undergoing a gut rehabilitation), in lieu of a capillary break beneath the slab, a continuous and sealed Class I or Class II Vapor Retarder (per Footnote 7) is permitted to be installed on top of the entire slab. In such cases, up to 10% of the slab surface is permitted to be exempted from this requirement (e.g., for sill plates). In addition, for existing slabs in occupiable space, the Vapor Retarder shall be, or shall be protected by, a durable floor surface. If Class I Vapor Retarders are installed, they shall not be installed on the interior side of air permeable insulation or materials prone to moisture damage.
6. Interior surface of an existing below-grade wall (e.g., in a home undergoing a gut rehab.) listed in Item 1.5a is permitted to be finished by:
 - Installing a continuous and sealed drainage plane, capillary break, Class I Vapor Retarder (per Footnote 7) and air barrier that terminates into a foundation drainage system as specified in Item 1.8; OR
 - If a drain tile is not required as specified in Footnote 8, adhering a capillary break and Class I Vapor Retarder (per Footnote 7) directly to the wall with the edges taped/sealed to make it continuous.

Note that no alternative compliance option is provided for existing below-grade wood-framed walls in Item 1.5b.

7. The 2009 IRC defines Class I vapor retarders as a material or assembly with a rating of ≤ 0.1 perm, using the desiccant method with Proc. A of ASTM E 96. The following materials are typically ≤ 0.1 perm and shall not be used on the interior side of air permeable insulation in above-grade exterior walls in warm-humid climates or below-grade exterior walls in any climate: rubber membranes, polyethylene film, glass, aluminum foil, sheet metal, and foil-faced insulating / non-insulating sheathings. These materials can be used on the interior side of walls if air permeable insulation is not present (e.g., foil-faced rigid foam board adjacent to a below-grade concrete foundation wall is permitted).

Note that this list is not comprehensive and other materials with a perm rating ≤ 0.1 also shall not be used. Also, if mfr. spec.'s for a product indicate a perm rating ≥ 0.1 , then it may be used, even if it is in this list. Also note that open-cell and closed-cell foam generally have ratings above this limit and may be used unless mfr. spec.'s indicate a perm rating ≤ 0.1 . Several exemptions to these requirements apply:

- Class I vapor retarders, such as ceramic tile, may be used at shower and tub walls;
 - Class I vapor retarders, such as mirrors, may be used if mounted with clips or other spacers that allow air to circulate behind them.
8. Alternatively, either a drain tile that is pre-wrapped with a fabric filter or a Composite Foundation Drainage System (CFDS) that has been evaluated by ICC-ES per AC 243 are permitted to be used. Note that the CFDS must include a soil strip drain or another ICC-ES evaluated perimeter drainage system to be eligible for use. In an existing home (e.g. in a home undergoing a gut rehab.) a drain tile installed only on the interior side of the footing without a channel is permitted. Additionally, a drain tile is not required when a certified hydrologist, soil scientist, or engineer has determined that a crawlspace foundation, or an existing basement foundation (e.g., in a home undergoing a gut rehab.), is installed in Group I Soils (i.e. well-drained ground or sand-gravel mixtures), as defined by 2009 IRC Table R405.1.
 9. These Items not required for existing structural masonry walls (e.g., in a home undergoing a gut rehabilitation). Note this exemption does not extend to existing wall assemblies with masonry veneers.
 10. Any of the following systems may be used: a monolithic weather-resistant barrier (i.e., house wrap) shingled at horizontal joints and sealed or taped at all joints; weather resistant sheathings (e.g., faced rigid insulation) fully taped at all "butt" joints; lapped shingle-style building paper or felts; or other water-resistive barrier recognized by ICC-ES or other accredited agency.
 11. Apply pan flashing over the rough sill framing, inclusive of the corners of the sill framing; side flashing that extends over pan flashing; and top flashing that extends over side flashing or equivalent details for structural masonry walls.
 12. Intersecting wall siding shall terminate 1 in. above the roof or higher, per manufacturer's recommendations. Continuous flashing shall be installed in place of step flashing for metal and rubber membrane roofs.
 13. The assessment of whether the soil is expansive or collapsible shall be completed by a certified hydrologist, soil scientist, or engineer.
 14. Any of the following are permitted to be used as alternatives to Item 3.2: a) a roof design that deposits rainwater to a grade-level rock bed with a waterproof liner and a lateral drain pipe that meets discharge requirements per Item 3.2; b) a rainwater harvesting system that drains overflow to meet discharge requirements per Item 3.2; or c) a continuous rubber membrane (e.g. EPDM) that is aligned with the foundation wall from final grade to ≥ 8 in. below grade and then slopes ≥ 0.5 in. per ft. away from the home for at least 5 ft., with Group I Soils (as defined in Footnote 8) covering the membrane to within 3 in. of final grade.
 15. As an alternative, any applicable option in 2009 IRC Section R905.2.8.2 is permitted to be used to meet Item 3.3 and any option in 2009 IRC Section R905.2.7.1 is permitted to be used to meet Item 3.4. EPA recommends, but does not require, that products meet ASTM D1970.
 16. In addition to cement board, materials that have been evaluated by ICC-ES per AC 115 may also be used to meet this requirement. Monolithic tub and shower enclosures (e.g., fiberglass with no seams) are exempt from this backing material requirement unless required by the manufacturer. Paper-faced backerboard may only be used behind monolithic enclosures or waterproof membranes that have been evaluated by ICC-ES per AC 115, and then only if it meets ASTM mold-resistant standards ASTM D3273 or ASTM D6329.
 17. If mold is present, effort should be made to remove all visible signs of mold (e.g., by damp wipe with water and detergent). If removal methods are not effective, then the material shall be replaced. However, stains that remain after damp wipe are acceptable. Lumber with "sap stain fungi" is exempt from this Item as long as the lumber is structurally intact.
 18. For wet-applied insulation, follow manufacturer's drying recommendations. EPA recommends that lumber moisture content be $\leq 18\%$.
 19. This Revision is required to certify all homes permitted after 07/01/2016, but can be used to certify any home permitted or completed prior to this date. The Rater may define the 'permit date' as either the date that the permit was issued or the date of the contract on the home. In cases where permit or contract dates are not available, Providers have discretion to estimate permit dates based on other construction schedule factors. These assumptions should be both defensible and documented.