



Northwest ENERGY STAR® Homes Program Requirements¹ for Multifamily Dwellings

(Five or fewer conditioned stories above grade)

NWBOP1 MF
Gas and Heat Pump
Heated Dwellings

This BOP was developed to provide construction guidelines for energy-efficient Multifamily dwellings. Multifamily builders shall use these specifications and complete the Mandatory Requirements for all Qualified Homes, listed in Exhibit 2. Note that compliance with these guidelines is not intended to imply compliance with all local code¹ requirements that may be applicable to the building to be built.

Exhibit 1: Northwest ENERGY STAR Homes BOP1 - Consistent Elements for All Dwellings

Heating & Cooling Equipment									
<ul style="list-style-type: none"> ▪ Heating equipment shall meet the following efficiency levels: <ul style="list-style-type: none"> ○ ≥ 85 AFUE gas furnace, boiler or unit heater ○ ≥ 8.5 HSPF / 14 SEER / 12 EER / 2.5 COP air-source, package terminal or mini-split heat pump ▪ Cooling-only equipment shall meet the following efficiency level: <ul style="list-style-type: none"> ○ ≥ 13 SEER 									
Envelope, Windows & Doors²									
Walls:									
Climate Zone 4	Above Grade: ≥ R-21 Intermediate framed AND achieve Grade I installation per RESNET standards								
	Below Grade: ≥ R-21 Intermediate framed AND achieve Grade I installation per RESNET standards								
Climate Zones 5 & 6	Above Grade: ≥ R-21 + R-5 exterior Intermediate framed AND achieve Grade II installation per RESNET standards								
	Below Grade: ≥ R-21 + R-5 exterior Intermediate framed AND achieve Grade II installation per RESNET standards								
Ceiling:	≥ R-60 with ≥ R-21 at ceiling edge								
Framed Floor:	≥ R-38								
Slab:	≥ R-15 2' perimeter insulation with minimum R-5 thermal break. Insulation must extend from the top of slab for a total distance ≥ 2ft. vertical, horizontal, or combined								
Infiltration:	≤ 4 ACH@50 ³								
Windows:	≤ 0.30 U-Value ^{4, 5, 6}								
Skylights:	≤ 0.40 U-Value								
Doors:	R-5, One door up to 28 sq. ft. exempt								
Buildings with total window-to-floor area (WFA) greater than 21% shall have adjusted U-Values as outlined in Footnote 5									
Water Heating									
DHW equipment shall meet the following efficiency requirements:									
Plumbing: All hot water pipes must be insulated to ≥ R-4, regardless of location									
Natural Gas	0.61	Gas commercial tank water heaters may be used if they have standby losses that do not exceed the following (Btu/hr):							
		Gallons	70-74	75-79	80-84	85-89	90-94	95-99	100+
Electric ⁷	0.93	Max Standby Losses	930	960	980	1010	1030	1060	1080
Ventilation, Thermostat & Ductwork									
<ul style="list-style-type: none"> ▪ All ducts in unconditioned space shall have insulation ≥ R-8 ▪ For heating and cooling systems with ductwork outside the conditioned envelope, total duct leakage shall be ≤ 0.06 CFM50 per sq. ft. of conditioned floor area or ≤ 75 CFM50, whichever is greater⁸ ▪ Exhaust fans in Full Bathrooms must be ENERGY STAR qualified⁹ ▪ Mechanical ventilation systems installed to meet Whole-house ventilation requirements must be designed and installed in accordance with local code OR ASHRAE Standard 62.2-2010, whichever is more stringent; AND must also be ENERGY STAR qualified Exhaust⁹ OR HRV¹⁰. The measured ventilation rate for dwelling units and common areas shall not exceed 150% of the ASHRAE or code minimum. 									



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Lighting, Appliances & Fixtures
<ul style="list-style-type: none"> ▪ All builder-installed appliances shall be ENERGY STAR qualified ▪ ENERGY STAR qualified CFLs or pin-based lighting in 90% of fixtures¹¹, OR use any efficient light source and lighting design to reach 0.59 Watts per square foot, while meeting the requirements outlined in Footnote 12 ▪ Low-flow fixtures: 1.75 gpm showerheads

Qualifying Dwellings

The following types of Multifamily dwellings in WA, OR, ID and MT are eligible for certification under Northwest ENERGY STAR Homes:

- Dwelling units in any townhome¹³ building with 5 units or more; **OR**
- Dwelling units in Multifamily buildings with 3 stories or fewer above-grade; **OR**
- Dwelling units in Multifamily buildings with 4 or 5 stories above-grade, where dwelling units occupy 80% or more of the occupiable square footage of the building. When evaluating mixed-use buildings for eligibility, exclude commercial /retail space when assessing whether 80% threshold has been met; **AND**
 - Dwelling units in Multifamily buildings with 4 or 5 stories above-grade, where building is wood framed on residential stories or utilizes continuous insulation strategies such as SIPs, ICFs or similar; **AND**
 - Dwelling units in Multifamily buildings with 4 or 5 stories above-grade, where units use individual or “bundled” space and water heating strategies as defined by the following characteristics:
 - Rater/Rating Field Inspector¹⁴ must be able to physically access the equipment
 - Equipment must not be centrally sourced
 - Equipment must be designed for residential, not commercial application
- Dwelling units in Multifamily buildings that are not eligible for certification under Northwest ENERGY STAR Homes may be eligible through the EPA’s ENERGY STAR Multifamily High Rise Program.

Mandatory Requirements for All ENERGY STAR Qualified Homes

All ENERGY STAR Qualified Multifamily buildings must meet the requirements of the checklists in Exhibit 2.

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 building. ▪ No per-home documentation required.
	Rater <ul style="list-style-type: none"> ▪ Completes Rater Field Checklist once per floor.

Effective Date

Any Multifamily home initiated in the database after 1/1/2014 shall use this version of the guidelines to qualify for Northwest ENERGY STAR Home certification.



Northwest ENERGY STAR® Homes Notes

Footnotes

1. Where requirements of the local codes, manufacturers' installation instructions, engineering documents, overlap with the requirements of these guidelines, the Northwest and national ENERGY STAR programs offer the following guidance:
 - In cases where the overlapping requirements exceed the ENERGY STAR guidelines, the more stringent 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. Certification 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).
2. Insulation levels in a unit or building shall meet or exceed those specified in the relevant state energy code. Note that the U-factor for steel-frame envelope assemblies shall be calculated using the ASHRAE zone method or Washington State Energy Code Table 10-5A. Additionally, reduction of ceiling insulation in space-constrained roof/ceiling assemblies shall be limited to 500 ft² or 20% of ceiling area, whichever is less. Finally, slab insulation shall extend to the top of the slab to provide a complete thermal break.

Insulation shall be verified by a Rater, Rating Field Inspector, or Building Performance Specialist to achieve Grade I installation as defined in the RESNET Standards, except for wall framing systems with rigid insulation sheathing. For such homes, Grade II installation is acceptable for the cavity insulation.
3. Compliance with this requirement shall be determined according to the following means:
 - By meeting minimum ventilation requirements and providing a completed Rater Field Checklist per floor on stacked units and per unit on townhomes, Multifamily projects meet the adopted specifications to qualify for Northwest ENERGY STAR Homes certification.
 - In areas where the authority having jurisdiction requires testing to a published standard or methodology, this requirement shall be met in accordance with code accepted standards and methodologies.
 - RESNET, EPA and Northwest ENERGY STAR Homes recommend unit by unit testing, as opposed to whole building testing, with a target of 0.22 CFM@50 per sq. ft. of surface area (Minneapolis Leakage Ratio) **OR**
 - Where no such methodology or targets are provided, the following will be considered acceptable by Northwest ENERGY STAR Homes:
 - ENERGY STAR Multifamily High Rise testing standards
 - ASHRAE 62.2 2013 testing on a 15% sample of each dwelling unit type and floor plan
 - LEED NC Environmental Tobacco Smoke Control testing on a 15% sample of each dwelling unit type and floor plan
 - In the event that local codes require whole building testing, follow whole building leakage testing in accordance with protocols published by Retrotec or The Energy Conservatory Where infiltration testing is not required by code, this standard may be assumed to be met through verified compliance with the Rater Field Checklist and ventilation system requirements.
4. All windows, doors, and skylights shall meet ENERGY STAR Program Requirements for Residential Windows, Doors, and Skylights – Version 5.0 as outlined at www.energystar.gov/windows except fenestration utilized as part of a passive solar design. These windows shall be facing within 45 degrees of true south and directly coupled to thermal storage mass that has a heat capacity > 20 btu per ft³ per 1°F 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" thick. Also, note that the U-Value and SHGC for doors apply to the whole door, not just to the glazing portion. The following exceptions apply:
 - a. An area-weighted average of fenestration products shall be permitted to satisfy the U-factor requirements;
 - b. An area-weighted average of fenestration products more than 50% glazed shall be permitted to satisfy the SHGC requirements;
 - c. 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;
 - d. 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;
5. All decorative glass and skylight window areas count toward the total window area to above-grade conditioned floor area (WFA) ratio. For homes using the Prescriptive Path that have a WFA ratio >15%, an improved window U-Value is required and is determined by:



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$$\text{Improved U-Value} = [0.15 / \text{WFA}] \times [\text{ENERGY STAR U-Value}]$$

Where the ENERGY STAR U-Value is the maximum allowable U-Value in the Northwest ENERGY STAR BOP 1, Exhibit 1. For example, for a building built to the BOP, with a WFA of 18%:

$$\text{Improved U-Value} = [0.15 / 0.18] \times 0.30$$

$$\text{Improved U-Value} = 0.25$$

Conditioned Floor Area for calculation of Window to Floor Area (WFA) shall include conditioned basements. Conditioned basements are defined by Northwest ENERGY STAR Homes as basements with rigid foam insulation or insulation that is installed in a furred out wall assembly and that meet vapor permeability and bulk water protection as defined in the Water Management System Builder Checklist. Attached garages shall not be included in the CFA.

6. Up to 15 square feet of glazed fenestration per dwelling unit shall be exempt from the U-factor and SHGC requirements.
7. When a heat pump water heater is installed to meet this requirement, please refer to the Northern Climate Specification guidelines at: <http://neea.org/northernclimatespec/>, and NEEA's Heat Pump Water Heater (HPWH) Best Practices Installation Guide at: [http://smartwaterheat.org/sites/default/files/Smart Water Heat Best Practices Installation Guide.pdf](http://smartwaterheat.org/sites/default/files/Smart_Water_Heat_Best_Practices_Installation_Guide.pdf).
8. Certification of a duct system under the Northwest ENERGY STAR Homes program is consistent with the EPA 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. 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 in passes the leakage to outside requirements, a duct test at final is not required.
- Note, 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.

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.

9. All exhaust fans shall be ENERGY STAR qualified, except in kitchens and half bathrooms. A half bathroom is any bathroom that does not contain a bathtub, shower, spa, or similar source of moisture. Alternatively, exhaust fans that are not ENERGY STAR qualified must meet the efficacy requirement of 1.4 cfm/w and have a sone rating of 3 or less.

10. Air-to-air H/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 65% sensible recovery efficiency (SRE) 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
- 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 dwelling. For maximum effectiveness, system should supply air to individual bedrooms as well as other general living spaces



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- Have an easily accessible filter. When such filter is not integral to the H/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 H/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 H/ERV, shall also be fully insulated to R-8 minimum. All ducting should be adequately sealed and supported.

11. This requirement applies to RESNET-defined Qualifying Light Fixture Locations. Also note that the ENERGY STAR Advanced Lighting Package (ALP), which requires a minimum of 80% ENERGY STAR qualified hard-wired fixtures and 100% ENERGY STAR qualified ceiling fans, where installed, may also be used to comply with the lighting requirements.
12. When the Watts per square foot strategy is used, please use the Watts per Square Foot Tool (found here: <http://www.northwestenergystar.com/partners/home-verifiers?tid=36&=Apply>) to determine the dwelling's lighting power density. The following guidelines must also be met:
 - Every room in the dwelling must have at least one hardwired light fixture
 - A wattage assumption of 64 must be used for all incandescent lamps
 - There are no wattage assumptions for LED or Xenon lights. Actual wattages must be used
 - Total dwelling square footage includes the garage square footage
 - The Watts per Square Foot Tool must be submitted at time of verification
13. For townhomes, builders may choose to follow the [Northwest ENERGY STAR Single-Family Homes Requirements](#), so long as the following requirements are met:
 - a. By modeling the townhome in Northwest REM/Rate™, the Rater must show that both an end unit and center unit would consume equal to or less energy than units built to the Multifamily BOP; **AND**
 - b. The Provider approves the Rater's model in Northwest REM/Rate
14. The term "Rater/Rating Field Inspector" refers to the person completing the third-party inspections required for certification. This person shall:
 - Be a certified Home Energy Rater, Rating Field Inspector, BOP Inspector, or an equivalent designation as determined by a Verification Oversight organization such as RESNET; **AND**
 - Have attended and successfully completed an EPA-recognized training class. See www.energystar.gov/newhomestraining. Raters who operate under a Sampling Provider are permitted to verify the Minimum Rated Features of the home using the RESNET-approved sampling protocol.