



Northwest ENERGY STAR[®] Homes, Version 3 (Rev. 02) Thermal Enclosure System Verifier Checklist

Home Address: _____ City: _____ State: _____				
Inspection Guidelines	Must Correct	Builder Verified ¹	Verifier Verified	N/A
1. High-Performance Fenestration				
1.1 Fenestration shall meet or exceed Northwest ENERGY STAR Homes BOP or TCO ²	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Quality-Installed Insulation				
2.1 Ceiling, wall, floor, and slab insulation levels shall meet or exceed Northwest ENERGY STAR Homes BOP Prescriptive Path or TCO requirements ^{3,4,5}	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2 All ceiling, wall, floor, and slab insulation shall achieve RESNET-defined Grade I installation or, alternatively, Grade II for surfaces that contain a layer of continuous, air impermeable insulation \geq R-3 in Climate Zone 4, \geq R-5 in Climate Zones 5 & 6.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Fully-Aligned Air Barriers⁶				
At each location noted below, a complete air barrier shall be provided that is fully aligned with the insulation as follows: <ul style="list-style-type: none"> • At interior surface of ceilings. Also, include barrier at interior edge of attic eave using a wind baffle that extends to the full height of the insulation. Include a baffle in every bay or a tabbed baffle in each bay with a soffit vent that will also prevent wind washing of insulation in adjacent bays. • At exterior surface and interior surface of walls⁷ • At interior surface of floors, including supports to ensure permanent contact and blocking at exposed edges^{8,9} 				
3.1 Walls¹⁰				
3.1.1 Walls behind showers and tubs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.2 Walls behind fireplaces	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.3 Attic knee walls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.4 Skylight shaft walls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.5 Wall adjoining porch roof	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.6 Staircase walls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.7 Double walls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.8 Garage rim / band joist adjoining conditioned space	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.9 All other exterior walls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2 Floors				
3.2.1 Floor above garage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2.2 Cantilevered floor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2.3 Floor above unconditioned basement or vented crawlspace	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3 Ceilings¹⁰				
3.3.1 Dropped ceiling / soffit below unconditioned attic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3.2 All other ceilings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Reduced Thermal Bridging				
4.1 For insulated ceilings with attic space above (i.e., non-cathedralized ceilings), Grade I insulation extends to the inside face of the exterior wall below meets or exceeds Northwest ENERGY STAR Homes BOP or TCO or, when using alternative in Footnote 11, \geq R-21. ^{3,11}	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2 For slabs on grade, insulation under slab and at 100% of slab edge meets or exceeds Northwest ENERGY STAR Homes BOP or TCO or, when using alternative in Footnote 11, \geq R-5 at slab edge. Slab insulation shall be aligned with thermal boundary of the walls. ^{3,4,5,11}	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.3 Insulation beneath attic platforms (e.g., HVAC platforms, walkways) \geq R-49, or when using alternative in Footnote 11, \geq R-38. ^{3,11}	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.4 Reduced thermal bridging at above-grade walls separating conditioned from unconditioned space (rim / band joists exempted) using one of the following options: ^{12,13}				
4.4.1 Continuous rigid insulation sheathing, insulated siding, or combination of the two; \geq R-3 in Climate Zone 4, \geq R-5 in Climate Zones 5 & 6 ^{14,15} , OR ;	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.4.2 Structural Insulated Panels (SIPs), OR ;	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.4.3 Insulated Concrete Forms (ICFs), OR ;	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.4.4 Double-wall / staggered stud framing ¹⁶ , OR (see next page);	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



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4.4.5 Advanced framing, including all of the items below:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.4.5.a All corners insulated to $\geq R-6$ at edge ¹⁷ , AND ;	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.4.5.b All headers above windows & doors insulated ¹⁸ , AND ;	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.4.5.c Framing limited at all windows & doors ¹⁹ , AND ;	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.4.5.d All interior / exterior wall intersections insulated to the same R-value as the rest of the exterior wall ²⁰ , AND ;	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.4.5.e Minimum stud spacing of 19 in. o.c. Alternatively, minimum spacing of 16 in. o.c. is permitted if $\geq R-22$ wall cavity insulation is installed. ²¹	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Air Sealing				
5.1 Penetrations to unconditioned space fully sealed with solid blocking or flashing as needed and gaps sealed with caulk or foam				
5.1.1 Duct / flue shaft	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.1.2 Plumbing / piping	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.1.3 Electrical wiring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.1.4 Bathroom and kitchen exhaust fans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.1.5 Recessed lighting fixtures adjacent to unconditioned space ICAT labeled and fully gasketed. Also, if in insulated ceiling without attic above, exterior surface of fixture insulated to $\geq R-10$ to minimize condensation potential.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.1.6 Light tubes adjacent to unconditioned space include lens separating unconditioned and conditioned space and are fully gasketed. ²²	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.2 Cracks in the building envelope fully sealed				
5.2.1 All sill plates adjacent to conditioned space sealed to foundation or sub-floor with caulk, foam, or equivalent material. Foam gasket also placed beneath sill plate if resting atop concrete or masonry and adjacent to conditioned space.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.2.2 At top of walls adjoining unconditioned spaces, continuous top plates or sealed blocking using caulk, foam, or equivalent material	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.2.3 Drywall sealed to top plate at all unconditioned attic / wall interfaces using caulk, foam, drywall adhesive (but not other construction adhesives), or equivalent material. Either apply sealant directly between drywall and top plate or to the seam between the two from the attic above or place foam gasket between drywall and top plate.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.2.4 Rough openings around windows & exterior doors sealed with caulk or foam	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.2.5 Marriage joints between modular home modules at all exterior boundary conditions fully sealed with gasket and foam	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.2.6 All seams at Structural Insulated Panels (SIPs) foamed and/or taped per manufacturer's instructions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.2.7 In multi-family buildings, the gap between the drywall shaft wall (i.e. common wall) and the structural framing between units fully sealed at all exterior boundaries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.2.8 Rim / band joists between conditioned and unconditioned space fully sealed using caulk or foam ⁷	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.3 Other Openings				
5.3.1 Doors adjacent to unconditioned space (e.g., attics, garages, basements) or ambient conditions gasketed or made substantially air-tight	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.3.2 Attic access panels and drop-down stairs equipped with a durable $\geq R-10$ insulated cover that is gasketed (i.e., not caulked) to produce continuous air seal when occupant is not accessing the attic ²³	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.3.3 Whole-house fans equipped with a durable $\geq R-10$ insulated cover that is either installed on the house side or mechanically operated ²³	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Verifier Name: _____ Verifier Pre-Drywall Inspection Date: _____ Verifier Initials: _____ Verifier Name: _____ Verifier Final Inspection Date: _____ Verifier Initials: _____ Builder Employee: _____ Builder Inspection Date: _____ Builder Initials: _____				



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Notes:

1. At the discretion of the Verifier, the builder may verify up to eight items specified in this Checklist. When exercised, the builder's responsibility will be formally acknowledged by the builder signing off on the Checklist for the item(s) that they verified.
2. All windows, doors and skylights shall meet or exceed the component U-factor and SHGC requirements specified in the relevant Northwest ENERGY STAR Homes BOP or TCO, located at: www.northwestenergystar.com/partners. 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). For homes that have a WFA ratio greater than stipulated in the BOP or TCO, an improved window U-Value is required. Guidance and calculations for determining the adjusted U-value are provided in the BOP Reference Design Notes. Note that the U-factor requirement applies to all fenestration while the SHGC only applies to the glazed 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 $\geq 50\%$ glazed shall be permitted to satisfy the SHGC requirements;
 - c. 15 square feet of "decorative" 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, but shall be included in calculating the total window area to above-grade conditioned floor area (WFA) ratio.
 - 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;
 - e. 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 / ft³xoF and provided in 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.
3. Insulation levels in a home or multi-family dwelling shall meet or exceed the component insulation requirements specified in the relevant Northwest ENERGY STAR Homes BOP or TCO, located at: www.northwestenergystar.com/partners. Compliance can be determined by meeting component insulation requirements or using a total UA alternative. Where compliance will be determined with a total UA approach, the method must meet local code requirements and be approved by the Provider or State Certifying Organization (SCO). Note that the U-factor for steel-frame envelope assemblies shall be calculated using the ASHRAE zone method or a method providing equivalent results, and not a series-parallel path calculation method. Additionally, 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. Also, note that while ceiling and slab insulation can be included in trade-off calculations, Items 4.1 through 4.3 of the Checklist shall be met regardless of the UA tradeoffs calculated.
4. Slab edge insulation is only required for slab-on-grade 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.
5. Where an insulated wall separates a garage, patio, porch, or other unconditioned space from the conditioned space of the house, slab insulation shall also be installed at this interface to provide a thermal break between the conditioned and unconditioned slab. Where specific details cannot meet this requirement, partners shall provide the detail to EPA to request an exemption prior to the home's qualification. EPA will compile exempted details and work with industry to develop feasible details for use in future revisions to the program. A list of currently exempted details is available at: www.energystar.gov/slabeledge.
6. For purposes of this checklist an air barrier is defined as any durable, rigid, solid material that blocks air flow between conditioned space and unconditioned space, including necessary sealing to block excessive air flow at edges and seams and adequate support to resist positive and negative pressures without displacement or damage. Open-cell foam shall have a finished thickness ≥ 5.5 in. to qualify as an air barrier unless the manufacturer indicates otherwise.
7. EPA highly recommends, but does not require, inclusion of an interior air barrier at band joists. An exterior air barrier at band joists is required and can be achieved by sealing from the interior with caulk or foam or from the exterior with caulk or gasket before sheathing is attached.
8. Examples of supports necessary for permanent contact include staves for batt insulation or netting for blown-in insulation. Alternatively, batts that completely fill floor cavities enclosed on all six sides may be used to meet Items 2.2 and 3.2 even when compression occurs due to excess insulation, as long as the R-value of the batts has been appropriately assessed based on manufacturer guidance and the only defect preventing the insulation from achieving the required insulation grade is the compression caused by the excess insulation.



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9. Fully-aligned air barriers may be installed at the exterior surface of the floor cavity in all Climate Zones if the insulation is installed in contact with this exterior air barrier and the perimeter rim and band joists of the floor cavity are also sealed and insulated to comply with the fully-aligned air barrier requirements for walls.
10. All insulated vertical surfaces are considered walls (e.g., above and below grade exterior walls, knee walls) and must meet the air barrier requirements for walls, with the exception of adiabatic (“common”) walls in multi-family dwellings. All insulated ceiling surfaces, regardless of slope (e.g., cathedral ceilings, tray ceilings, conditioned attic roof decks, flat ceilings, sloped ceilings), must meet the requirements for ceilings.
11. The minimum designated R-values are permitted to be achieved when using an equivalent U-factor or UA alternative calculation. Note that if the minimum designated values are used, they must be compensated with higher values elsewhere that result in an equivalent U-factor or UA value. Also, note that these requirements can be met by using any available strategy, such as a raised-heel truss, alternate framing that provides adequate space, and / or high-density insulation.
12. Up to 10% of the total exterior wall surface area is exempted from the reduced thermal bridging requirements to accommodate intentional designed details (e.g., architectural details such as thermal fins, wing walls, or masonry fireplaces; structural details, such as steel columns). It shall be apparent to the Verifier that the exempted areas are intentional designed details or the exempted area shall be documented in a plan provided by the builder, architect, designer, or engineer. The Verifier need not evaluate the necessity of the designed detail to qualify the home.
13. Mass walls utilized as the thermal mass component of a passive solar design (e.g., a Trombe wall) are exempt from this item. To be eligible for this exemption, the passive solar design shall be comprised of the following five components: an aperture or collector, an absorber, thermal mass, a distribution system, and a control system. For more information, see: http://energy.gov/sites/prod/files/guide_to_passive_solar_home_design.pdf.
14. If used, insulated siding shall be attached directly over a water-resistive barrier and sheathing. In addition, it shall provide the required R-value as demonstrated through either testing in accordance with ASTM C 1363 or by attaining the required R-value at its minimum thickness. Insulated sheathing rated for water protection can be used as a water resistant barrier if all seams are taped and sealed. If non-insulated structural sheathing is used at corners, advanced framing details listed under Item 4.4.5 shall be met for those wall sections.
15. Steel framing shall meet the reduced thermal bridging requirements by complying with item 4.4.1 of the checklist.
16. Double-wall framing is defined as any framing method that ensures a continuous layer of insulation covering the studs to at least the R-value required in Item 4.4.1 of the Checklist, such as offset double-stud walls, aligned double-stud walls with continuous insulation between the adjacent stud faces, single sill (2x8) with staggered studs, or single-stud walls with 2x2 or 2x3 cross-framing. In all cases, insulation shall fill the entire wall cavity from the interior to exterior sheathing except at windows, doors and other penetrations.
17. All exterior corners shall be constructed to allow access for the installation of \geq R-6 insulation that extends to the exterior wall sheathing. Examples of compliance options include standard-density insulation with alternative framing techniques, such as using three studs per corner, or high-density insulation (e.g., spray foam) with standard framing techniques.
18. Header insulation shall be \geq R-3 for wall assemblies with 2x4 framing, or equivalent cavity width, and \geq R-5 for all other assemblies (e.g., with 2x6 framing). Compliance options include continuous rigid insulation sheathing, SIP headers, other prefabricated insulated headers, single-member or two-member headers with insulation either in between or on one side, or an equivalent assembly, except where a framing plan provided by the builder, architect, designer, or engineer indicates that full-depth solid headers are the only acceptable option. The Verifier need not evaluate the structural necessity of the details in the framing plan to qualify the home. Also, the framing plan need only encompass the details in question and not necessarily the entire home. R-value requirement refers to manufacturer’s nominal insulation value.
19. Framing at windows shall be limited to a maximum of one pair of king studs and one pair jack studs per window opening to support the header and window sill. Additional jack studs shall be used only as needed for structural support and cripple studs only as needed to maintain on-center spacing of studs.
20. Insulation shall run behind interior / exterior wall intersections using ladder blocking, full length 2”x6” or 1”x6” furring behind the first partition stud, drywall clips, or other equivalent alternative.
21. All vertical framing members shall either be on-center or have an alternative structural purpose (e.g., framing members at the edge of pre-fabricated panels) that is apparent to the Verifier or documented in a framing plan that encompasses that member and is provided by the builder, architect, designer, or engineer. The Verifier need not evaluate the structural necessity of the framing plan to qualify the home. However, all framing with stud spacing of 16” o.c. shall have \geq R-22 wall cavity insulation installed regardless of any framing plan. For multifamily dwellings, minimum stud spacing of 16 in. o.c. is permitted if \geq R-21 wall cavity insulation is installed.
22. Light tubes that do not include a gasketed lens are required to be sealed and insulated \geq R-6 for the length of the tube.
23. Examples of durable covers include, but are not limited to pre-fabricated covers with integral insulation, rigid foam adhered to cover with adhesive, or batt insulation mechanically fastened to the cover (e.g., using bolts, metal wire, or metal strapping).