



Northwest ENERGY STAR[®] Homes, Version 3 (Rev. 02) HVAC System Quality Installation Contractor Checklist¹

Home Address: _____ City: _____ State: _____					
Heating System Type ² : <input type="checkbox"/> Gas Furnace <input type="checkbox"/> Heat Pump <input type="checkbox"/> Boiler <input type="checkbox"/> Other (please specify): _____					
Heating System Location: _____					
Spaces Served by Heating System: <input type="checkbox"/> Whole House <input type="checkbox"/> Other (please specify): _____					
Cooling System Type ² : _____					
Cooling System Location: _____		Cooling System Designed for Temp. Occupant Load? ³ <input type="checkbox"/> Yes <input type="checkbox"/> No			
Spaces Served by Cooling System: <input type="checkbox"/> Whole House <input type="checkbox"/> Other (please specify): _____					
Inspection Guidelines		Must Correct	Contractor Verified	Verifier/PT Verified ¹	N/A
1. Heating & Cooling System Design^{3,4}					
1.1	SpecPro or other approved software or methodology used to calculate heat loss / gain, equipment capacity, and duct sizing, and documentation from tool is attached.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-
2. Whole-Building Mechanical Ventilation Design⁴					
2.1	Ventilation system designed & installed to meet local code or ASHRAE 62.2-2010, whichever is more stringent, including but not limited to requirements in Items 2.2-2.5. ⁵	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-
2.2	Ventilation system does not utilize an intake duct to the return side of the HVAC system unless the design requirements defined in Footnote 6 are met. Note: In the state of WA, this type of system is only allowable with the approved ventilation TCO. ⁶	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3	Documentation is attached with ventilation system type, location, design rate, control strategy, and frequency and duration of each ventilation cycle.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-
2.4	If present, continuously-operating ventilation and exhaust fans designed and set to operate during all occupiable hours.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.5	If present, intermittently-operating whole-house ventilation system designed to automatically operate at least once per day and at least 10% of every 24 hours.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Selected Heating Equipment⁷					
3.1	Furnace Mfr. and Model: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2	Furnace Listed Output Heating Capacity (Btuh): _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3	Furnace Efficiency (AFUE): _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.4	Furnace Listed Output Heating Capacity is 100-140% of design heat loss or next nominal size. A larger air handler is allowable if necessary to achieve a friction rate of ≥ 0.06 inches water column (IWC). ⁸	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.5	Heat Pump Condenser Mfr. and Model: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.6	Heat Pump Evap. / Fan Coil Mfr. and Model: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.7	Design Total Heat Loss (BTUh) @35 °F: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.8	HP Listed Output Heating Capacity (BTUh) @17 °F: _____ @35 °F: _____ @47 °F: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9	Heat Pump Efficiency (AHRI listed HSPF): _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.10	Heat Pump AHRI Reference #: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.11	HP Listed Output Heating Capacity \geq Design Total Heat Loss @ 35°F	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.12	Heat Pump AHRI Certificate is attached	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.13	For Heat Pump, completed 2011 PTCS [®] Commissioned Heat Pump Certificate & Startup Form is attached.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Selected Cooling Equipment⁷					
4.1	Condenser Mfr. and Model: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2	Evap. / Fan Coil Mfr. and Model: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.3	AHRI Reference #: _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.4	Listed Total Capacity at Design Cond. (BTUh) ⁸ : _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.5	Listed Sensible Cap. at Design Cond. (BTUh) ⁸ : _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.6	Listed Latent Capacity at Design Cond. (BTUh) ⁸ : _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.7	Listed Efficiency (SEER): _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



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4.8	Listed Total Capacity (Item 4.4) of cooling-only equipment is 95-115% of design total heat gain or next nominal size. A larger air handler is allowable if necessary to achieve a friction rate of ≥ 0.06 inches water column (IWC). ⁸	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.9	AHRI Certificate is attached	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.10	Completed NWESH Central AC Commissioning & Startup Form is attached. ⁹	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Air Flow Tests					
5.1	Total External Static Pressure: _____ IWC. Test hole locations are well marked and accessible.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5.2	Individual room air flows shall be verified and must be within 20% or ± 25 CFM of design requirements. In spaces where design air flow is less than 40 CFM, up to 40 CFM is allowable. ¹⁰	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Electrical Measurements					
6.1	Evaporator / Air handler fan: _____ amperage _____ line voltage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.2	Compressor unit: _____ amperage _____ line voltage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.3	Electrical measurements within OEM specified tolerance of nameplate value.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. System Controls					
7.1	Operating and safety controls meet OEM requirements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Drain Pan					
8.1	Corrosion-resistant drain pan, properly sloped to drainage system, included with each HVAC component that produces condensate ¹¹	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Technician Name: _____		Equipment Installation Date: _____			
Technician Signature ¹² : _____		Company: _____			
HVAC Designer Name: _____		Company: _____			
HVAC Designer Signature ¹² : _____					

1. The HVAC System Quality Installation Contractor Checklist is designed to align with the requirements of ASHRAE 62.2-2010 and published addenda and PTCS[®] standards, thereby improving the performance of HVAC equipment in new homes when compared to homes built to minimum code. However, these features alone cannot prevent all ventilation, indoor air quality, or HVAC problems (e.g., those caused by a lack of maintenance by occupants). Therefore, this checklist is not a guarantee of proper ventilation, indoor air quality, or HVAC performance.

This checklist shall be provided by the Verifier to the HVAC contractor who shall complete one checklist for each system. Upon completion, the HVAC contractor shall return the checklist(s) to the Verifier. Alternatively, at the discretion of the Builder, Contractor, and Verifier, the Verifier or Performance Tester may verify select checklist items in place of the Contractor. When this occurs, the Verifier or Performance Tester (PT) shall check the box of the verified items in the "Verifier/PT Verified" column. The Verifier is only responsible for ensuring that the Contractor has completed the Contractor checklist in its entirety and for the items that are checked in the "Verifier/PT Verified" column (if any). The Verifier is not responsible for assessing the accuracy of the items in this checklist that are not checked in the "Verifier/PT Verified" column. Instead, it is the contractor's exclusive responsibility to ensure the design and installation comply with the Contractor checklist.

The "Contractor Verified" column shall be used to indicate items verified by the HVAC Contractor or Technician. The "Verifier Verified" column shall only be used to indicate items verified by the Verifier for homes in which the Verifier has agreed to verify and accept responsibility for one or more requirements.

2. This checklist applies to ventilation systems; split air conditioners, unitary air conditioners, air-source heat pumps, and water-source (i.e., geothermal) heat pumps up to 65,000 Btu / h with forced air-distribution systems (i.e., ducts); and furnaces up to 225,000 Btu / h with forced air-distribution systems (i.e., ducts). All other permutations of equipment (e.g., boilers, mini-splits / multi-split systems) and distribution systems are exempt. If the ventilation system is the only applicable system installed in the home, then only Section 2 shall be completed.

3. Whole house and room-by-room heating and cooling loads shall be calculated, equipment capacity shall be selected, and duct systems shall be sized according to SpecPro or other methodology approved by Northwest ENERGY STAR Homes. Alternatively, other software or methodology may be used if compliant with latest editions of ACCA Manual J, S, & D, respectively, or 2009 ASHRAE Handbook of Fundamentals. The values for the geographically closest location shall be selected or a justification provided for the selected location. Cooling systems designed for temporary occupant load may be required in order to accommodate



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a significant number of guests on a regular or sporadic basis. This additional load shall be satisfied by a supplemental cooling system (e.g., a small single-package or split-coil unit) or by a system that can shift capacity from zone to zone (e.g., a variable volume system).

The HVAC system design shall be completed for the specific configuration (e.g., plan, elevation, option, and orientation) of the home to be built except as follows: for each house plan with multiple configurations (e.g., orientations, elevations, options) the loads shall be calculated for each potential configuration. If the loads across all configurations vary by $\leq 25\%$, then the largest load shall be permitted to be used for equipment selection for all configurations, subject to the specified over-sizing limits defined in Items 3.4 and 4.8. Otherwise, the contractor shall group the load for each configuration into a set with $\leq 25\%$ variation and equipment selection shall be completed for each set of loads.

4. For each house plan with multiple configurations, the room-level design airflows shall be calculated for each potential configuration. If the design airflows for each room vary across all configurations by $\leq 25\%$ or 25 CFM, then the average room-level design airflow shall be permitted to be used when designing the duct system. Otherwise, the contractor shall group the room-level design airflow for each configuration into a set with $\leq 25\%$ or 25 CFM variation and the duct design shall be completed for the average airflow of that set. The person responsible for the heating, cooling, and ventilation design, whether it be the HVAC technician or other qualified HVAC design professional, shall be responsible for completing sections 1 and 2 of this checklist.
5. For proper procedures, exceptions, and selection methods see ASHRAE 62.2-2010 and published addenda. All components shall be designed and installed per local codes, manufacturers' installation instructions, engineering documents, and Northwest ENERGY STAR Homes program requirements, as specified in the applicable BOP or TCO.

The system shall have at least one supply or exhaust fan with associated ducts and controls. Local exhaust fans are allowed to be part of an exhaust ventilation system.

6. If the whole-house ventilation system utilizes the HVAC air handler, then the fan type shall be ECM / ICM, variable speed, or include a controller (e.g., smartcycler) that reduces the ventilation run time by accounting for hours when the HVAC system is heating or cooling the home.

Outdoor ducts connected to the return side of an air handler are permitted to be part of the supply ventilation system in single family homes if manufacturer requirements for return air temperature are met.

Ventilation requirements for multi-family buildings must be met by means of exhaust-only (central or individual in-unit exhaust fans) or balanced (HRV / ERV) strategies and shall not require the use of the HVAC air handler. For additional guidance on ventilation in multi-family buildings, please refer to the Northwest ENERGY STAR Homes Program Requirements for Multi-family Homes.

7. All evaporators and condensing units shall be properly matched as demonstrated by an attached AHRI certificate. If an AHRI certificate is not available, a copy of OEM-provided catalog data indicating acceptable combination selection and performance data shall be attached.
8. Listed system capacity at design conditions is to be obtained from the OEM expanded performance data. For warm air heating systems, the output capacity must be between 100% and 140% of calculated system load unless a larger size is dictated by the cooling equipment selection or in order to accomplish the design friction rate. For alternate heat sources, system capacity adheres to design requirements outlined in the applicable TCO.

For cooling systems, the next largest nominal piece of equipment may be used that is available to satisfy the latent and sensible requirements. Single-speed systems generally have OEM nominal size increments of $\frac{1}{2}$ ton. Multi-speed or multi-stage equipment may have OEM nominal size increments of one ton. Therefore, the use of these advanced system types can provide extra flexibility to meet the equipment sizing requirements.

9. The Northwest ENERGY STAR Homes AC Commissioning & Startup Form is only required for homes in locations with ≥ 600 CDD. In locations with < 600 CDD, commissioning is recommended, but not required. HVAC System Quality Installation Contractor Checklist items shall be completed for all cooling systems, regardless of location.
10. Ducts shall not include coiled or looped ductwork except to the extent needed for acoustical control. Balancing dampers or proper duct sizing shall be used instead of loops to limit flow to diffusers. When balancing dampers are used, they shall be located at the trunk to limit noise unless the trunk will not be accessible when the balancing process is conducted. In such cases, opposable blade dampers or dampers located in the duct boot are permitted.
11. Condensate pan shall be made of corrosion-resistant materials, to include galvanized steel and plastic. Drain pan shall drain condensate to a conspicuous point of disposal to alert occupants in the event of a stoppage of the primary drainage system; and shall be equipped with a backflow prevention valve when drained to a shared drainage system, such as a storm water management system.
12. HVAC technician signature required prior to submittal to Verifier. If the HVAC system design (Sec. 1 & 2) was not completed by the HVAC technician, then the designer shall sign for those sections.