



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

Home Address: _____ City: _____ State: _____			
Inspection Guidelines	Must Correct	Verifier/PT Verified ²	N/A
1. Review of HVAC System Quality Installation Contractor Checklist²			
1.1 HVAC System Quality Installation Contractor Checklist completed in its entirety and collected for records along with documentation on ventilation system (2.3), HVAC design (1.1), commissioning forms (3.13 or 4.10), and AHRI certificate (3.12 or 4.9)	<input type="checkbox"/>	<input type="checkbox"/>	-
1.2 For the following design parameters, the values reported in the HVAC design match the rated home. ³			
1.2.1 Weather Location	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.2 Number of Occupants	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.3 Conditioned Floor Area ($\pm 10\%$)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.4 Window Area ($\pm 10\%$)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.5 Predominant Window SHGC (± 0.1)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.6 Home Orientation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.3 For furnaces, Listed Output Heating Capacity is 100-140% of design load or next nominal size. A larger air handler is permitted to be used to achieve a friction rate ≥ 0.06 IWC. ⁴	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.4 Heat Pump Output Heating Capacity at 35 F meets or exceeds design heat loss at 35 F.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.5 For cooling-only equipment, Listed Output Cooling Capacity is 95-115% of design load or next nominal size. A larger air handler is permitted to be used to achieve a friction rate ≥ 0.06 IWC. ⁴	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.6 HVAC manufacturer and model numbers on installed equipment, Contractor Checklist (3.1, 3.5, 3.6, 4.1, 4.2), and AHRI certificate or OEM catalog data all match. ⁵	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.7 Verifier-tested Total External Static Pressure is within $\pm 10\%$ of Contractor-reported value (5.1).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.8 HVAC contractor holds credentials necessary to complete HVAC System QI Contractor Checklist ⁶	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Duct Quality Installation - Applies to All Heating, Cooling, Ventilation, Exhaust, and Pressure Balancing Ducts⁷			
2.1 Connections and routing of ductwork completed without kinks or sharp bends. ⁸	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2 No excessive coiled or looped flexible ductwork. ⁹	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3 Flexible ducts in unconditioned space not installed in cavities smaller than outer duct diameter; in conditioned space not installed in cavities smaller than inner duct diameter.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4 Flexible ducts supported at intervals as recommended by mfr. but at a distance ≤ 5 ft.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.5 Building cavities not used as supply or return ducts.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6 HVAC ducts and combustion inlets and outlets may pass perpendicularly through exterior walls but if run within exterior walls must meet local code requirements AND have $\geq 60\%$ R-value of wall assembly on exterior of duct or pipe.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.7 Quantity of supply and return duct terminations match room-level design in Simplified HVAC Design Tool. ⁷	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.8 Bedrooms pressure-balanced using any combination of transfer grills, jump ducts, dedicated return ducts, and door undercuts to either: a) provide 1 sq. in. of free area opening per 1 CFM of supply air, as reported by the contractor in the room by room airflow design; OR b) achieve a verifier-measured room pressure differential ≤ 3 Pa (0.012 IWC) with respect to the main body of the house when bedroom doors are closed and the air handler is operating. ^{7, 10}	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Duct Insulation - Applies to All Heating, Cooling, Ventilation, Exhaust, and Pressure Balancing Ducts¹¹			
3.1 All connections to trunk ducts in unconditioned space are insulated.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2 Ducts in unconditioned spaces insulated to $\geq R-8$, except as follows: $\geq R-4$ on exhaust ducts in unconditioned space in all states and $\geq R-6$ on return ducts in ID & MT.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Duct Leakage - Applies to All Heating, Cooling, and Balanced Ventilation Ducts¹²			
4.1 Total Verifier-measured duct leakage ≤ 0.06 CFM50 per sq. ft. of conditioned floor area or 75 CFM50 total, whichever is greater. ¹²	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2 All rigid duct seams and connections sealed with mastic paste. All flex duct connections made substantially tight with nylon straps.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.3 Duct boots in floor, wall, or ceiling assemblies that separate conditioned from unconditioned space sealed using caulk, foam, or mastic paste.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Whole House Mechanical Ventilation			
5.1 Verifier-measured ventilation rate is 100-120% of design value (2.3). ¹³	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



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6. Controls				
6.1	Continuously operating ventilation & exhaust fans include readily accessible override controls.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.2	Function of ventilation controls is obvious (e.g., bathroom exhaust fan) or, if not, controls have been labeled.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Ventilation Inlets & Source				
7.1	All ventilation air inlets located ≥ 10 ft. of stretched-string distance from known contamination sources such as stack, vent, exhaust hood, or vehicle exhaust. Exception: ventilation air inlets in the wall ≥ 3 ft. from dryer exhausts and contamination sources exiting through the roof. ¹⁴	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.2	Ventilation air inlets ≥ 4 ft. above grade or roof deck and not obstructed by snow, plantings, condensing units or other material at time of inspection.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.3	Ventilation air inlets provided with rodent / insect screen with ≤ 0.5 inch mesh. ¹⁵	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.4	Ventilation air comes directly from outdoors and not from adjacent dwelling units, garages, crawlspaces, or attics.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Point-Source Ventilation				
8.1	In each kitchen & bathroom, exhaust fan is installed that exhausts directly to the outdoors and not into an attic, crawlspace, or garage. Fan airflow rate and operation meet local code or ASHRAE 62.2-2010 requirements, whichever is more stringent. Kitchen fans with rated flow ≥ 300 CFM must be capable of operating at multiple speeds. ^{13, 16, 17}	<input type="checkbox"/>	<input type="checkbox"/>	-
8.2	If fans share common exhaust duct, back-draft dampers installed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.3	Common exhaust duct not shared by fans in separate dwellings. ¹⁸	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8.4	Clothes dryers vented directly to outdoors, except for vent-less dryers equipped with a condensate drain.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Ventilation & Exhaust Fan Ratings				
9.1	Exhaust fans used for whole-house and bathroom ventilation are ENERGY STAR qualified. ¹⁷	<input type="checkbox"/>	<input type="checkbox"/>	-
9.2	Intermittent bathroom exhaust fans are rated ≤ 2.0 sones at required flow rate. Continuous bathroom exhaust fans are rated ≤ 1.0 sone at required flow rate. ¹⁹	<input type="checkbox"/>	<input type="checkbox"/>	-
9.3	Intermittent kitchen exhaust fans are rated at ≤ 3.0 sones at required flow rate or meet local code requirements for sound levels, whichever is more stringent. Continuous kitchen exhaust fans are rated ≤ 1.0 sone at required flow rate. ¹⁹	<input type="checkbox"/>	<input type="checkbox"/>	-
10. Combustion Appliances				
10.1	Furnaces, boilers, and water heaters located within the home's pressure boundary shall be mechanically drafted or direct-vented (NFPA 54 class III or IV). Unvented combustion space or water heating appliances shall not be permitted within the home's pressure boundary. ^{20, 21}	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.2	In homes with fireplaces that are not mechanically drafted or direct-vented, total rated flow of the home's two largest exhaust fans is ≤ 15 CFM per 100 sq. ft. of conditioned floor area OR the verifier-measured pressure differential is ≤ -5 Pa using BPI's or RESNET's worst-case depressurization test procedure. ^{16, 22}	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Filtration				
11.1	MERV 6 – MERV 10 rated filter installed in each ducted mechanical system. ²³	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.2	All return air and mechanically supplied outdoor air pass through filter prior to conditioning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.3	Filter located and installed so as to facilitate access and regular service by the owner. ²⁴	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11.4	Filter access panel includes gasket or comparable sealing mechanism and fits snugly against the exposed edge of filter when closed to prevent bypass. ²⁵	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Verifier Name: _____		Date Checklist Inspected: _____		
Verifier Signature: _____		Verifier Company Name: _____		



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1. The HVAC System Quality Installation Verifier 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 code. However, these features alone cannot prevent all ventilation, indoor air quality, and HVAC problems, for instance those caused by a lack of occupant maintenance. Therefore, this Checklist is not a guarantee of proper ventilation, indoor air quality, or HVAC performance.
2. The Verifier / Performance Tester (PT) shall complete one checklist per system and is only responsible for ensuring that the Contractor has completed the Contractor Checklist in its entirety and verifying the discrete objective parameters referenced in Section 1 of this Checklist, not for assessing the accuracy of the load calculations or field verifications included or for verifying the accuracy of every input on the Contractor Checklist. For Heat Pumps, the contractor shall provide a completed 2011 PTCS Commissioned Heat Pump Certificate & Startup Form. For Central AC systems in locations with ≥ 600 Cooling Degree Days (CDD), the contractor shall provide a completed NWEHSH Central AC Commissioning & Startup Form. In locations with <600 CDD, commissioning is recommended, but not required; however, all Items except 4.12 of the HVAC System Quality Installation Contractor Checklist shall still be completed.
3. The Verifier shall either confirm that the contractor selected the geographically closest available weather location or collect from the contractor a justification for the selected location. The Verifier need not evaluate the legitimacy of the justification to qualify the home.

The number of occupants among all HVAC systems in the home shall be equal to the number of RESNET-defined bedrooms, plus one, unless the system is designed for temporary occupant load as indicated in the header of the Contractor Checklist. 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).

"Predominant" is defined as the SHGC value used in the greatest amount of window area in the home.

4. IWC is an abbreviation for Inches of Water Column (1 IWC is roughly equivalent to 249 Pa).
5. In cases where the condenser unit is installed after the time of inspection by the Verifier, the HVAC manufacturer and model numbers on installed equipment can be documented through the use of photographs provided by the HVAC Contractor after installation is complete.
6. HVAC contractors installing systems or completing any portion of the HVAC System QI Contractor Checklist must be credentialed as a Northwest Approved HVAC Contractor. The Verifier must confirm that the contractor holds the necessary credentials. An explanation of this credentialing process and a list of credentialed contractors can be found at www.northwestenergystar.com/partners/join-program/hvac-contractors.
7. Items 2.7 and 2.8 do not apply to ventilation ducts.
8. Kinks are to be avoided and are caused when ducts are bent across sharp corners such as framing members. Sharp bends are to be avoided and occur when the radius of the turn in the duct is less than one duct diameter.
9. 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 (OBD) or dampers that are located in the duct boot are permitted.
10. For HVAC systems with multi-speed fans, the highest design fan speed shall be used when verifying this requirement.
11. EPA recommends, but does not require, that all metal ductwork not encompassed by Section 3 (e.g., duct boots, ducts in conditioned space) also be insulated and that insulation be sealed to duct boots to prevent condensation.
12. Leakage limits shall be assessed on a per-system, rather than per-home, basis. To demonstrate compliance with the total measured duct leakage requirement, a Performance Tested Comfort Systems[®] (PTCS[®]) certified technician shall provide a completed 2011 PTCS Duct Sealing Certificate & Sealing Form to the Program Verifier. The factory-supplied air handler shall be in place at the time of the test, with the following exceptions:
 - a. If the air handler is not in place during the test, the leakage limit shall be decreased to $0.04 \times$ floor area served by the system (in square feet) or 50 CFM50, whichever is greater.
 - b. 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.

Balanced ventilation systems (e.g., HRV or ERV) are not required to be tested if their duct system is separate from the home's main distribution system and ≤ 175 lineal ft.

13. The whole-house ventilation air flow and local exhaust air flows shall be measured by the Verifier using a flow hood, flow grid, anemometer (in accordance with AABC, NEBB or ASHRAE procedures), or substantially equivalent method. In multi-family dwellings, whole-house ventilation requirements 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. Point-source ventilation requirements may be met by use of individual in-unit exhaust fans or central systems. For additional guidance on ventilation in multi-family buildings, please refer to the Northwest ENERGY STAR Homes Program Requirements for Multi-family Homes.



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14. The outlet and inlet of balanced ventilation systems shall meet these spacing requirements unless manufacturer instructions indicate that a smaller distance may be used. However, if this occurs, the manufacturer's instructions shall be collected for documentation purposes.
15. Without proper maintenance, ventilation air inlet screens often become filled with debris. Therefore, EPA recommends, but does not require, that these ventilation air inlets be located so as to facilitate access and regular service by the owner.
16. Per ASHRAE 62.2-2010, an exhaust system is one or more fans that remove air from the building, causing outdoor air to enter by ventilation inlets or normal leakage paths through the building envelope (e.g., bath exhaust fans, range hoods, and clothes dryers).
17. Per ASHRAE 62.2-2010, a bathroom is any room containing a bathtub, shower, spa, or similar source of moisture.
18. Exhaust outlets from more than one dwelling unit may be served by a single exhaust fan if the fan runs continuously or if each outlet has a back-draft damper to prevent cross-contamination when the fan is not running.
19. Remote-mounted fans (i.e., fans outside habitable spaces, bathrooms, toilets, and hallways and with ≥ 4 ft. ductwork between fan and intake grills) are exempt from some rating requirements.
20. Per the 2009 International Mechanical Code, a direct-vent appliance is one that is constructed and installed so that all air for combustion is derived from the outdoor atmosphere and all flue gases are discharged to the outside atmosphere. Furthermore, a mechanical draft system is a venting system designed to remove flue or vent gases by mechanical means consisting of an induced draft portion under non-positive static pressure or a forced draft portion under positive static pressure.
21. The pressure boundary is the primary air enclosure boundary separating indoor and outdoor air. For example, a volume that has more leakage to outside than to conditioned space would be outside the pressure boundary.
22. Verifiers shall use either the Building Performance Institute's (BPI's) Combustion Safety Test Procedure for Vented Appliances or RESNET's Interim Guidelines for Combustion Appliance Testing & Writing Work Scope and be BPI-certified or RESNET-certified to follow the protocol. If using RESNET's worst-case depressurization protocol to evaluate fireplaces, per Item 10.2, the blower door shall not be set to exhaust 300 CFM to simulate the fireplace in operation, but the remainder of the protocol shall be followed.
23. Per ASHRAE 62.2-2010, ducted mechanical systems are those that supply air to an occupiable space through ductwork exceeding 10 ft in length and through a thermal conditioning component, except for evaporative coolers. Systems that do not meet this definition are exempt from this requirement. Also, mini-split systems typically do not have MERV-rated filters available for use and are, therefore, also exempted under this version of the guidelines.
24. HVAC filters located in the attic shall be considered accessible to the owner if drop-down stairs provide access to attic and a permanently installed walkway has been provided between the attic access location and the filter. HVAC filters located in crawlspaces shall not be considered accessible to the owner.
25. The filter media box (i.e., the component in the HVAC system that houses the filter) may be either site-fabricated by the installer or pre-fabricated by the manufacturer to meet this requirement. These requirements only apply when the filter is installed in a filter media box located in the HVAC system, not when the filter is installed flush with the return grill.