



ENERGY STAR Qualified Homes, Version 3 (Rev. 05) HVAC System Quality Installation Rater Checklist ¹

Home Address: _____ City: _____ State: _____			
Inspection Guidelines	Must Correct	Rater Verified	N/A
1. Review of HVAC System Quality Installation Contractor Checklist ²			
1.1 HVAC System Quality Installation Contractor Checklist completed in its entirety and collected for records, along with documentation on ventilation system (1.3), full load calculations (2.18), AHRI certificate (3.15), and balancing report (10.2).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2 Review the following parameters related to system cooling design, selection, and installation from the HVAC Contractor Checklist (Contractor Checklist Item # indicated in parenthesis): ³			
1.2.1 Outdoor design temperatures (2.4) are equal to the 1% and 99% ACCA Manual J design temperatures for contractor-designated design location ⁴	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.2 Home orientation (2.5) matches orientation of rated home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.3 Number of occupants (2.6) equals number of occupants in rated home ⁵	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.4 Conditioned floor area (2.7) is within ±10% of conditioned floor area of rated home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.5 Window area (2.8) is within ±10% of calculated window area of rated home	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.6 Predominant window SHGC (2.9) is within 0.1 of predominant value in rated home ⁶	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.7 Listed latent cooling capacity (3.10) exceeds design latent heat gain (2.12)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.8 Listed sensible cooling capacity (3.11) exceeds design sensible heat gain (2.13)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.9 Listed total cooling capacity (3.12) is 95-115% (or 95-125% for Heat Pumps in Climate Zones 4-8) of design total heat gain (2.14), or next nominal size ⁷	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.10 HVAC manufacturer and model numbers on installed equipment, Contractor Checklist (3.1, 3.3, 5.1), and AHRI certificate or OEM catalog data all match ⁸	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.11 Using reported liquid line (6.3) or suction line (6.5) pressure, corresponding temp. (as determined using pressure / temperature chart for refrigerant type) matches reported condenser (7.1) or evaporator (7.5) saturation temperature (± 3 degrees) ⁹	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.12 Calculated subcooling (7.1 minus 6.4) or superheat (6.6 minus 7.5) value equals reported target subcooling (7.3) or superheat (7.7) temperature ⁹	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.3 Rater-verified supply & return duct static pressure ≤ 110% of contractor values (9.3, 9.4)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Duct Quality Installation - Applies to All Heating, Cooling, Ventilation, Exhaust, and Pressure Balancing Ducts ¹⁰			
2.1 Connections and routing of ductwork completed without kinks or sharp bends. ¹¹	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2 No excessive coiled or looped flexible ductwork. ¹²	<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 unless they meet Items 3.2, 3.3, 4.1, and 4.2 of this Checklist.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6 HVAC ducts, cavities used as ducts, and combustion inlets and outlets may pass perpendicularly through exterior walls but shall not be run within exterior walls unless at least R-6 continuous insulation is provided on exterior side of the cavity, along with an interior and exterior air barrier where required by the Thermal Enclosure System Rater Checklist.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.7 Quantity & location of supply and return duct terminals match contractor balancing report. ¹⁰	<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 / or undercut doors to either: a) provide 1 sq. in. of free area opening per 1 CFM of supply air, as reported on the contractor-provided balancing report; or b) achieve a Rater-measured pressure differential ≤ 3 Pa (0.012 in. w.c.) with respect to the main body of the house when all bedroom doors are closed and all air handlers are operating. ^{10,13,14}	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Duct Insulation - Applies to All Heating, Cooling, Supply Ventilation, and Pressure Balancing Ducts ¹⁵			
3.1 All connections to trunk ducts in unconditioned space are insulated.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2 <i>Prescriptive Path:</i> Supply ducts in unconditioned attic have insulation ≥ R-8. <i>Performance Path:</i> Supply ducts in unconditioned attic have insulation ≥ R-6.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3 All other supply ducts and all return ducts in unconditioned space have insulation ≥ R-6.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Duct Leakage - Applies to All Heating, Cooling, and Balanced Ventilation Ducts			
4.1 Total Rater-measured duct leakage ≤ 8 CFM25 per 100 sq. ft. of conditioned area. ¹⁶	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2 Rater-measured duct leakage to outdoors ≤ 4 CFM25 per 100 sq. ft. of conditioned floor area. ^{16,17}	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



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5. Whole-Building Delivered Ventilation			
5.1 Rater-measured ventilation rate is within 100-120% of HVAC contractor design value (2.11). ¹⁸	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Controls			
6.1 Air flow is produced when central HVAC fan is energized (set thermostat to "fan").	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.2 Cool air flow is produced when the cooling cycle is energized (set thermostat to "cool"). ^{19,20}	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.3 Heated air flow is produced when the heating cycle is energized (set thermostat to "heat"). ¹⁹	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.4 Continuously-operating ventilation & exhaust fans include readily accessible override controls.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6.5 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 Air Inlets & Ventilation 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. ²¹	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.2 Ventilation air inlets ≥ 2 ft. above grade or roof deck in Climate Zones 1-3 or ≥ 4 ft. above grade or roof deck in Climate Zones 4-8 and not obstructed by snow, plantings, condensing units or other material at time of inspection. ²²	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.3 Ventilation air inlets provided with rodent / insect screen with ≤ 0.5 inch mesh. ²³	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.4 Ventilation air comes directly from outdoors, not from adjacent dwelling units, garages, crawlspaces, or attics.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Local Mechanical Exhaust			
In each kitchen and bathroom, a system shall be installed that exhausts directly to the outdoors and meets one of the following Rater-measured airflow standards: ^{18,24,25}			
Location	Continuous Rate	Intermittent Rate ²⁶	
8.1 Kitchen	≥ 5 ACH, based on kitchen volume ²⁷	≥ 100 CFM ²⁸	<input type="checkbox"/>
8.2 Bathroom	≥ 20 CFM	≥ 50 CFM	<input type="checkbox"/>
8.3 If fans share common exhaust duct, back-draft dampers installed.			<input type="checkbox"/>
8.4 Common exhaust duct not shared by fans in separate dwellings. ²⁹			<input type="checkbox"/>
8.5 Clothes dryers vented directly to outdoors, except for ventless dryers equipped with a condensate drain.			<input type="checkbox"/>
9. Ventilation & Exhaust Fan Ratings (Exemptions for HVAC and Remote-Mounted Fans) ³⁰			
9.1 Intermittent supply and exhaust fans rated at ≤ 3 sones by mfr. when producing no less than the minimum airflow rate required by Section 8 of this Checklist, unless rated flow ≥ 400 CFM.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.2 Continuous supply & exhaust fans rated at ≤ 1 sone by mfr. when producing no less than the minimum airflow required by Section 8 of this Checklist.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9.3 Bathroom fans used as part of a whole-house mechanical ventilation system shall be ENERGY STAR qualified; unless rated flow rate ≥ 500 CFM.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Combustion Appliances			
10.1 Furnaces, boilers, and water heaters located within the home's pressure boundary are mechanically drafted or direct-vented. As an exception, naturally drafted equipment is allowed in Climate Zones 1-3. For naturally drafted furnaces, boilers, and water heaters, the Rater has followed RESNET or BPI combustion safety test procedures and met the selected standard's limits for depressurization, spillage, draft pressure, and CO concentration in ambient air, as well as a CO concentration in the flue of ≤ 25 ppm. ^{31,32,33}	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.2 For fireplaces that are not mechanically drafted or direct-vented to outdoors, total net rated exhaust flow of the two largest exhaust fans (excluding summer cooling fans) is ≤ 15 CFM per 100 sq. ft. of occupiable space when at full capacity or the Rater has verified that the pressure differential is ≤ -5 Pa using BPI's or RESNET's worst-case depressurization test procedure. ^{24,32,33,34,35}	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10.3 If unvented combustion appliances other than cooking ranges are located inside the home's pressure boundary, the Rater has operated the appliance for at least 10 minutes and verified that the ambient CO level does not exceed 35 ppm. ³⁶	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Filtration			
11.1 At least one MERV 6 or higher filter installed in each ducted mechanical system. ³⁷	<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. ³⁸	<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. ³⁹	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rater Name: _____ Date Checklist Inspected: _____			
Rater Signature: _____ Rater Company Name: _____			



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Notes:

1. This Checklist is designed to align with the requirements of ASHRAE 62.2-2010 and published addenda and ANSI / ACCA's 5 QI-2007 protocol, 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, and 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 with supporting documents may also be used to demonstrate compliance with Indoor airPLUS specifications 4.1, 4.2, 4.5, 4.6, and 7.1.
2. The Rater 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.
3. For homes with a date of final inspection through 12/31/2012: Item 1.2.1 is permitted to be within +/- 5 degrees of the 1% and 99% ACCA Manual J design temperatures for the contractor-designated design location. In addition, for each house plan with multiple configurations (e.g., orientations, elevations, options), the Rater shall confirm that the parameters listed in Items 1.2.2 to 1.2.6 are aligned with either: the rated home or with the plans for the configuration used to calculate the loads, as provided by the contractor.
For homes with a date of final inspection on or after 01/01/2013: Item 1.2.1 shall match the 1% and 99% ACCA Manual J design temperatures for the contractor-designated design location. In addition, for each house plan with multiple configurations (e.g., orientations, elevations, options), the Rater shall confirm that the parameters listed in Items 1.2.2 to 1.2.6 are aligned with the rated home.
4. The Rater shall either confirm that the contractor selected the geographically closest available location or collect from the contractor a justification for the selected location. The Rater need not evaluate the legitimacy of the justification to qualify the home.
5. The number of occupants among all HVAC systems in the home shall be equal to the number of RESNET-defined bedrooms plus one. Occupants listed for systems for which the header of the Contractor Checklist indicates that it is designed to handle temporary occupant loads, as defined in Footnote 3 of the Contractor Checklist, shall be permitted to exceed this limit.
6. "Predominant" is defined as the SHGC value used in the greatest amount of window area in the home.
7. 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 ½ 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.
8. In cases where the condenser unit is installed after the time of inspection by the Rater, 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.
9. If contractor has indicated that an OEM test procedure has been used in place of a sub-cooling or super-heat process and documentation has been attached that defines this procedure, then the box for "N/A" shall be checked for this Item.
10. Items 2.7 and 2.8 do not apply to ventilation ducts.
11. 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.
12. 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.
13. For homes with a date of final inspection through 12/31/2012: Homes are permitted to be qualified without enforcement of this item to provide architects and designers with additional time to integrate these features into their homes.
For homes with a date of final inspection on or after 01/01/2013: Homes shall meet this item to be qualified.
14. For HVAC system with multi-speed fans, the highest design fan speed shall be used when verifying this requirement.
15. EPA recommends, but does not require, that all metal ductwork not encompassed by Section 3 (e.g., exhaust ducts, duct boots, ducts in conditioned space) also be insulated and that insulation be sealed to duct boots to prevent condensation.
16. Duct leakage shall be determined and documented by a Rater using a RESNET-approved testing protocol only after all components of the system have been installed (e.g., air handler and register grilles). Leakage limits shall be assessed on a per-system, rather than per-home, basis.
17. For homes that have ≤ 1,200 sq. ft. of conditioned floor area, measured duct leakage to outdoors shall be ≤ 5 CFM25 per 100 sq. ft. of conditioned floor area. Testing of duct leakage to the outside can be waived if all ducts & air handling equipment are located within the home's air and thermal barriers AND envelope leakage has been tested to be less than or equal to half of the Prescriptive Path infiltration limit for the Climate Zone where the home is to be built. Alternatively, testing of duct leakage to the outside can be waived if total duct leakage is ≤ 4 CFM25 per 100 sq. ft. of conditioned floor area, or ≤ 5 CFM25 per 100 sq. ft. of conditioned floor area for homes that have less than 1,200 sq. ft. of conditioned floor area.
18. The whole-house ventilation air flow and local exhaust air flows shall be measured by the Rater using a flow hood, flow grid, anemometer (in accordance with AABC, NEBB or ASHRAE procedures), or substantially equivalent method.
19. In cases where the condenser unit is installed after the time of inspection by the Rater, the Rater is exempt from verifying Item 6.2 when the condenser is for an AC unit and also Item 6.3 when the condenser is for a heatpump unit.



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20. To prevent potential equipment damage, the Rater shall not conduct this test if the outdoor temperature is $\leq 55^{\circ}\text{F}$ or, if known, below the manufacturer-recommended minimum operating temperature for the cooling cycle. When this occurs, the Rater shall mark 'N/A' on the Checklist for this item.
21. 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.
22. EPA will permit the use of reduced ventilation air inlet heights in North Carolina. The minimum required height in North Carolina for Climate Zone 4 will be reduced from 4 feet to 2 feet and in Climate Zone 5 from 4 feet to 2.5 feet based on historical snowfall data for this state. Note that EPA is evaluating the potential to reduce inlet heights in other regions based upon historical snowfall data.
23. 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.
24. 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, clothes dryers).
25. Per ASHRAE 62.2-2010, a bathroom is any room containing a bathtub, shower, spa, or similar source of moisture.
26. An intermittent mechanical exhaust system, where provided, shall be designed to operate as needed by the occupant. Control devices shall not impede occupant control in intermittent systems.
27. Kitchen volume shall be determined by drawing the smallest possible rectangle on the floor plan that encompasses all cabinets, pantries, islands, and peninsulas and multiplying by the average ceiling height for this area. Cabinet volume shall be included in the kitchen volume calculation.
28. If the flow rate of the selected exhaust fan is less than 5 ACH, based on kitchen volume, then a vented range hood or appliance-range hood combination is required rather than a remote fan that is not integral to the range. Also, for intermittent kitchen exhaust fans that are integrated with microwaves, a rated air flow rate ≥ 200 CFM may be used in lieu of measuring the actual air flow rate.
29. 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.
30. Fans exempted from this requirement include HVAC air handlers and remote-mounted fans. To be considered for this exemption, a remote-mounted fan must be mounted outside the habitable spaces, bathrooms, toilets, and hallways and there shall be ≥ 4 ft. ductwork between the fan and intake grill. Per ASHRAE 62.2-2010, habitable spaces are intended for continual human occupancy; such space generally includes areas used for living, sleeping, dining, and cooking but does not generally include bathrooms, toilets, hallways, storage areas, closets, or utility rooms.
31. 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; 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; and a natural draft system is a venting system designed to remove flue or vent gases under nonpositive static vent pressure entirely by natural draft.
32. The pressure boundary is the primary 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.
33. Raters 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.
34. Per ASHRAE 62.2-2010 and pub. addenda, the term "net-exhaust flow" is defined as flow through an exhaust system minus the compensating outdoor airflow through any supply system that is interlocked to the exhaust system. "Net supply flow" is intended to represent the inverse. If net exhaust flow exceeds allowable limit, it shall be reduced or compensating outdoor airflow provided.
35. Per ASHRAE 62.2-2010, occupiable space is any enclosed space inside the pressure boundary and intended for human activities, including, but not limited to, all habitable spaces, toilets, closets, halls, storage and utility areas, and laundry areas. See Footnote 30 for definition of "habitable spaces".
36. The minimum volume of combustion air required for safe operation by the manufacturer and / or code shall be met or exceeded. Also, in accordance with the National Fuel Gas Code, ANSI Z223.1 / NFPA54, unvented room heaters shall not be installed in bathrooms or bedrooms.
37. 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.
38. 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.
39. 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.