



# ENERGY STAR Qualified Homes, Version 3 (Rev. 02) HVAC System Quality Installation Rater Checklist<sup>1</sup>

Home Address: _____		City: _____		State: _____	
Inspection Guidelines			Must Correct	Rater Verified	N/A
<b>1. Review of HVAC System Quality Installation Contractor Checklist<sup>2</sup></b>					
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):					
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 <sup>3</sup>			<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 <sup>4</sup>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.4 Conditioned floor area (2.7) is within $\pm 10\%$ 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 $\pm 10\%$ 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 <sup>5</sup>			<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 <sup>6</sup>			<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 <sup>7</sup>			<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) <sup>8</sup>			<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 <sup>8</sup>			<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"/>
<b>2. Duct Quality Installation - Applies to All Heating, Cooling, Ventilation, Exhaust, and Pressure Balancing Ducts</b>					
2.1 Connections and routing of ductwork completed without kinks or sharp bends. <sup>9</sup>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2 No excessive coiled or looped flexible ductwork. <sup>10</sup>			<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 $\leq 5$ 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.			<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 $\leq 3$ Pa (0.012 in. w.c.) with respect to the main body of the house when bedroom doors are closed and the air handler is operating. <sup>11</sup>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>3. Duct Insulation - Applies to All Heating, Cooling, Supply Ventilation, and Pressure Balancing Ducts<sup>12</sup></b>					
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 $\geq$ R-8. <i>Performance Path:</i> Supply ducts in unconditioned attic have insulation $\geq$ 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 $\geq$ R-6.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>4. Duct Leakage - Applies to All Heating, Cooling, and Balanced Ventilation Ducts</b>					
4.1 Total Rater-measured duct leakage $\leq 6$ CFM25 per 100 sq. ft. of conditioned floor area <sup>13,14</sup>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2 Rater-measured duct leakage to outdoors $\leq 4$ CFM25 per 100 sq. ft. of conditioned floor area. <sup>13, 14, 15</sup>			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.3 Duct boots sealed to floor, wall, or ceiling using caulk, foam, mastic tape, or mastic paste.			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



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Inspection Guidelines	Must Correct	Rater Verified	N/A
<b>5. Whole-Building Delivered Ventilation</b>			
5.1 Rater-measured ventilation rate is within 100-120% of HVAC contractor design value (2.11). <sup>16</sup>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>6. Controls</b>			
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"). <sup>17</sup>	<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"). <sup>17</sup>	<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 Ventilation controls labeled, unless function is obvious (e.g., bathroom exhaust fan).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>7. Ventilation Air Inlets &amp; Ventilation Source</b>			
7.1 All ventilation air inlets located $\geq 10$ 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 $\geq 3$ ft. from dryer exhausts and contamination sources exiting through the roof. <sup>18</sup>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.2 Ventilation air inlets $\geq 2$ ft. above grade or roof deck in Climate Zones 1-3 or $\geq 4$ 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.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7.3 Ventilation air inlets provided with rodent / insect screen with $\leq 0.5$ inch mesh. <sup>19</sup>	<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"/>
<b>8. Local Mechanical Exhaust</b>			
In each kitchen and bathroom, system installed that exhausts directly to the outdoors and meets one of the following Rater-measured airflow standards: <sup>16, 20, 21</sup>			
<b>Location</b>	<b>Continuous Rate</b>	<b>Intermittent Rate</b> <sup>22</sup>	
8.1 Kitchen	$\geq 5$ ACH, based on kitchen volume <sup>23</sup>	$\geq 100$ CFM <sup>24</sup>	<input type="checkbox"/>
8.2 Bathroom	$\geq 20$ CFM	$\geq 50$ 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. <sup>25</sup>			<input type="checkbox"/>
8.5 Clothes dryers vented directly to outdoors, except for ventless dryers equipped with a condensate drain.			<input type="checkbox"/>
<b>9. Ventilation &amp; Exhaust Fan Ratings (Exemptions for HVAC and Remote-Mounted Fans)</b> <sup>26</sup>			
9.1 Intermittent supply & exhaust fans rated at $\leq 3$ sones by mfr., unless rated flow $\geq 400$ CFM			<input type="checkbox"/>
9.2 Continuous supply & exhaust fans rated at $\leq 1$ sone by manufacturer.			<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 $\geq 500$ CFM.			<input type="checkbox"/>
<b>10. Combustion Appliances</b>			
10.1 Furnaces, boilers, and water heaters located within the home's pressure boundary are mechanically drafted or direct-vented to outdoors. As an exception, atmospherically vented equipment is allowed in Climate Zone 1-3. For atmospherically vented furnaces, boilers, and water heaters, the Rater has conducted BPI's or RESNET's combustion safety test procedure and determined that the CO test results are less than 25 ppm and the combustion appliance zone depressurization limit is not exceeded. <sup>27, 28, 29</sup>	<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 $\leq 15$ CFM per 100 sq. ft. of occupiable space when at full capacity or the Rater has verified that the pressure differential is $\leq 5$ Pa using BPI's or RESNET's combustion safety test procedure. <sup>20, 28, 29, 30, 31</sup>	<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 conducted RESNET's or BPI's combustion safety test procedure and determined that the ambient CO test results are less than 35 ppm. <sup>32</sup>			
<b>11. Filtration</b>			
11.1 At least one MERV 6 or higher filter installed in each ducted mechanical system. <sup>33</sup>	<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. <sup>34</sup>	<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. <sup>35</sup>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rater Name: _____ Date Checklist Inspected: _____			
Rater Signature: _____ Rater Company Name: _____			



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1. The HVAC System Quality Installation Rater 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, 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. 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 to verify the accuracy of every input on the Contractor checklist.
3. 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.
4. 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 HVAC System Quality Installation Contractor Checklist, shall be permitted to exceed this limit.
5. "Predominant" is defined as the SHGC value used in the greatest amount of window area in the home.
6. 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.
7. 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.
8. 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.
9. 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.
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 (OBD) or dampers that are located in the duct boot are permitted.
11. For HVAC system with multi-speed fans, the highest design fan speed shall be used when verifying this requirement.
12. EPA recommends, but does not require, that all metal ductwork (e.g., exhaust ducts, duct boots) be insulated and that insulation be sealed to duct boots to prevent condensation.
13. 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. 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.
14. For all homes that have less than 1,200 sq ft of conditioned floor area (CFA), total measured duct leakage shall be  $\leq 8$  CFM25 per 100 sq. ft. of CFA and measured duct leakage to outdoors shall be  $\leq 5$  CFM25 per 100 sq. ft. of CFA.
15. If total duct leakage is  $\leq 4$  CFM25 per 100 sq. ft. of conditioned floor area, or  $\leq 5$  CFM25 per 100 sq. ft. of conditioned floor area for homes that have less than 1,200 sq. ft. of conditioned floor area, then leakage to outdoors need not be tested.
16. 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.
17. 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.
18. 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.
19. 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.
20. 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. Examples include bath exhaust fans, range hoods, and clothes dryers



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21. Per ASHRAE 62.2-2010, a bathroom is any room containing a bathtub, shower, spa, or similar source of moisture.
22. 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.
23. 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.
24. 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 that is  $\geq 200$  CFM may be used in lieu of measuring the actual air flow rate.
25. 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.
26. Fans exempted from this requirement include HVAC air handlers and remote-mounted fans (i.e., fans outside habitable spaces, bathrooms, toilets, and hallways and with  $\geq 4$  ft. ductwork between fan and intake grills). 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.
27. 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.
28. 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.
29. 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 and Writing Work Scope and be BPI-certified or RESNET-accredited to follow the protocol.
30. 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.
31. 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 26 for definition of "habitable spaces".
32. 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.
33. 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.
34. 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.
35. 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.