HVC Designer Responsibilities:
- Complete one National HVAC Design Report for each system design for a house plan, created for either the specific plan configuration (i.e., elevation, option, orientation, & county) of the home to be certified or for a plan that is intended to be built with different configurations (i.e., different elevations, options, and/or orientations). Visit [www.energystar.gov/newhomesHVACdesign](http://www.energystar.gov/newhomesHVACdesign) and see Footnote 2 for more information.
- Obtain efficiency features (e.g., window performance, insulation levels, and infiltration rate) from the builder or Rater.
- Provide the completed National HVAC Design Report to the builder or credentialed HVAC contractor and to the Rater.

### 1. Design Overview

1.1 Designer name: ___________________________ Date: __________
1.2 Select which party you are providing these design services to: ☐ Builder or ☐ Credentialed HVAC contractor
1.3 Name of company you are providing these design services to (if different than Item 1.1):
1.4 Area that system serves: ☐ Whole-house ☐ Upper-level ☐ Lower-level ☐ Other ___________________________
1.5 Is cooling system for a temporary occupant load? ☐ Yes ☐ No
1.6 House plan: ___________________________ Check box to indicate whether the system design is site-specific or part of a group: ☐
- ☐ Site-specific design. Option(s) & elevation(s) modeled:
- ☐ Group design. Group #: ______ out of ______ total groups for this house plan. Configuration modeled: ___________________________

### 2. Whole-House-Dwelling Unit Mechanical Ventilation System Design (“Vent System”) & Inlets in Return Duct

<table>
<thead>
<tr>
<th>Airflow</th>
<th>System Type &amp; Controls</th>
<th>Efficiency</th>
<th>Air Inlet Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Ventilation airflow rate &amp; run-time meet the requirements of ASHRAE 62.2-2010, 2013, or 2016. □</td>
<td>2.4 Specified system type: ☐ Supply ☐ Exhaust ☐ Balanced</td>
<td>2.10 If system Vent System controller operates utilizes the HVAC fan, then HVAC fan operation is intermittent and either the specified fan type in Item 4.7 is ECM / ICM; or the specified controls will reduce the standalone ventilation run-time by accounting for hours when the HVAC system is heating or cooling hours. □</td>
<td>2.12 Inlet pulls ventilation air directly from outdoors and not from attic, crawlspace, garage, or adjacent dwelling unit. □</td>
</tr>
<tr>
<td>2.2 Ventilation airflow rate required by 62.2 for a continuous system: _______ CFM</td>
<td>2.5 Specified control location: (e.g., Master bath, utility room) ☐</td>
<td>2.11 If bathroom fans are specified as part of the system, then they are ENERGY STAR certified. □</td>
<td>2.13 Inlet is ≥ 2 ft. above grade or roof deck; ≥ 10 ft. of stretched-string distance from known contamination sources (e.g., stack, vent, exhaust, vehicles) not exiting the roof, and ≥ 3 ft. from known sources exiting the roof. □</td>
</tr>
<tr>
<td>2.3 Design for this system: Vent. airflow rate: ______ CFM Run-time per cycle: ______ minutes Cycle time: ______ minutes</td>
<td>2.6 Specified controls allow the system to operate automatically, without occupant intervention. ☐</td>
<td>3. Room-by-Room Heating &amp; Cooling Loads</td>
<td>3.1 Room-by-room loads calculated using: ☐ Unabridged ACCA Manual J v8 □ 2013 ASHRAE Fundamentals ☐ Other per AHJ □</td>
</tr>
<tr>
<td>3.4 Number of occupants used in loads: □</td>
<td>3.5 Conditioned floor area used in loads: ______ Sq. Ft.</td>
<td>3.2 Indoor design temperatures used in loads are 70°F for heating and 75°F for cooling. □</td>
<td>-</td>
</tr>
<tr>
<td>3.6 Window area used in loads: ______ Sq. Ft.</td>
<td>3.7 Predominant window SHGC used in loads: □</td>
<td>3.3 Outdoor design temperatures used in loads: (See Footnote 13 and <a href="http://energystar.gov/hvacdesigntemps">energystar.gov/hvacdesigntemps</a>)</td>
<td>-</td>
</tr>
<tr>
<td>3.8 Infiltration rate used in loads: ______ CFM</td>
<td>3.9 Mechanical ventilation rate used in loads: □</td>
<td>Cooling season: ______°F Heating season: ______°F</td>
<td>-</td>
</tr>
<tr>
<td>Loads At Design Conditions (kBtuh)</td>
<td>N</td>
<td>NE</td>
<td>E</td>
</tr>
</tbody>
</table>

Revised 11/11/2020
## ENERGY STAR Certified Homes, Version 3 / 3.1 (Rev. 110) \(^1\)

### Heating & Cooling Equipment Selection \(^1\)

4.1 Equipment selected per ACCA Manual S (see Footnote \sref{2425} & \sref{2226}, \sref{2821} \& \sref{2822})

**Air Conditioner / Heat Pump** (Complete if air conditioner or heat pump will be installed; otherwise check "N/A")

<table>
<thead>
<tr>
<th>Item</th>
<th>N/A</th>
<th>Cooling-only air conditioner</th>
<th>Cooling &amp; heating heat pump</th>
</tr>
</thead>
</table>

4.2 Equipment type:

- Cooling-only air conditioner
- Cooling & heating heat pump

4.3 Condenser manufacturer & model:

- 

4.4 Evaporator / fan coil manufacturer & model:

- 

4.5 AHRI reference #: \(\sref{2723} \& \sref{2724}\)

- 

4.6 AHRI listed efficiency: \(____ / ____\) EER / SEER

- Air-source heat pump: \(____\) HSPF

- Ground-source heat pump: \(____\) COP

4.7 Evaporator fan type:

- PSC
- ECM / ICM
- Other: \(____\)

4.8 Compressor type:

- Single-speed
- Two-speed
- Variable-speed

4.9 Latent capacity at design conditions, from OEM expanded performance data:

- \(____\) kBTuh

4.10 Sensible capacity at design conditions, from OEM expanded performance data:

- \(____\) kBTuh

4.11 Total capacity at design conditions, from OEM expanded performance data:

- \(____\) kBTuh

4.12 Air-source heat pump capacity:

- At 17°F: \(____\) kBTuh
- At 47°F: \(____\) kBTuh

- N/A

4.13 Cooling sizing % = Total capacity (Item 4.11) divided by maximum total heat gain (Item 3.12): \(____\) %

4.14 Complete this Item if Condition B Climate will be used to select sizing limit in Item 4.15. Otherwise, check "N/A"; \sref{2824}

**4.14.1 Load sensible heat ratio = Max. sensible heat gain (Item 3.10) / Max. total heat gain (Item 3.12) = \(____\) %**

**4.14.2 HDD / CDD ratio (Visit energystar.gov/hvacdesigntemps to determine this value for the design location) = \(____\)**

4.15 Check box of applicable cooling sizing limit from chart below: \sref{2824}, \sref{2825}

#### Equipment Type (Per Item 4.2) & Climate Condition (Per Item 4.14)

<table>
<thead>
<tr>
<th>Compressor Type (Per Item 4.8)</th>
<th>Single-Speed</th>
<th>Two-Speed</th>
<th>Variable-Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>For Cooling-Only Equipment or For Cooling Mode of Heat Pump in Condition A Climate</td>
<td>Recommended: 90 – 115% Allowed: 90 – 130%</td>
<td>Recommended: 90 – 120% Allowed: 90 – 140%</td>
<td>Recommended: 90 – 130% Allowed: 90 – 160%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>For Cooling Mode of Heat Pump in Condition B Climate</th>
<th>90% - 100%, plus 15 kBTuh</th>
<th>90% - 100%, plus 15 kBTuh</th>
<th>90% - 100%, plus 15 kBTuh</th>
</tr>
</thead>
</table>

4.16 Cooling sizing % (4.13) is within cooling sizing limit (4.15).

**Furnace** (Complete if furnace will be installed; otherwise check "N/A").

<table>
<thead>
<tr>
<th>Item</th>
<th>N/A</th>
<th>Furnace manufacturer &amp; model:</th>
</tr>
</thead>
</table>

4.17 Furnace manufacturer & model:

- 

4.18 Listed efficiency:

- \(____\) AFUE

4.19 Total capacity:

- \(____\) kBTuh

4.20 Heating sizing % = Total capacity (Item 4.19) divided by total heat loss (Item 3.14): \(____\) %

4.21 Check box of applicable heating sizing limit from chart below:

<table>
<thead>
<tr>
<th>When Used for Heating Only</th>
<th>When Paired With Cooling</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 – 140%</td>
<td>Recommended: 100 – 140% Allowed: 100 – 400%</td>
</tr>
</tbody>
</table>

4.22 Heating sizing % (4.20) is within heating sizing limit (4.21).

## 5. Duct Design (Complete if heating or cooling equipment will be installed with ducts; otherwise check "N/A") \(^1\)

5.1 Duct system designed for the equipment selected in Section 4 per ACCA Manual D.

5.2 Design HVAC fan airflow:

- \(____\) Cooling mode \(____\) CFM Heating mode \(____\) CFM

5.3 Design HVAC fan speed setting (e.g., low, medium, high):

- \(____\) Cooling mode \(____\) Heating mode

5.4 Design total external static pressure (corresponding to the mode with the higher airflow in Item 5.2): \(____\) IWC

5.5 Room-by-room design airflows documented below (which must sum to the mode with the higher airflow in Item 5.2): \sref{3122}, \sref{3123}
8. Item 2.8 applies to any outdoor air inlet connected to a ducted return of the dwelling unit HVAC system, regardless of its intended purpose (e.g., for ventilation air, make-up air, combustion air). This Item does not apply to HVAC systems without a ducted return. For example, if an outdoor air inlet connected to a ducted return is used as a dedicated source of outdoor air for an exhaust ventilation system (e.g., bath fan), the outdoor airflow must be automatically restricted when the exhaust fan is not running and in the event of an override of the exhaust ventilation system. Note that a Rater will generally measure the ventilation rate at the highest HVAC fan speed applicable to ventilation mode (e.g., if the inlet only

Footnotes

1. This report is designed to meet ASHRAE 62.2-2010 / 2013 / 2016 and ANSI / ACCA's 5 QI-2015 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 or occupant behavior). Therefore, system designs documented through the use of this report are not a guarantee of proper ventilation, indoor air quality, or HVAC performance.

2. The report shall represent a single system design for a house plan. Check the box for “site-specific design” if the design was created for the specific plan configuration (i.e., elevation, option, orientation, and county) of the home to be certified. Check the box for “group design” if the design was created for a plan that is intended to be built with potentially different configurations (i.e., different elevations, options, and/or orientations). Regardless of the box checked, the system design as documented on this National HVAC Design Report must fall within the following tolerances for the home to be certified:

- Item 3.3: The outdoor design temperature used in loads are within the limits defined at energystar.gov/hvacdesigntemps.
- Item 3.4: The number of occupants used in loads is within ± 2 of the home to be certified.
- Item 3.5: The conditioned floor area used in loads is between 100 sq. ft. smaller and 300 sq. ft. larger than the home to be certified.
- Item 3.6: The window area used in loads is between 15 sq. ft. smaller and 60 sq. ft. larger than the home to be certified, or, for homes to be certified with >500 sq. ft. of window area, between 3% smaller and 12% larger.
- Item 3.7: The predominant window SHGC is within 0.1 of the predominant value in the home to be certified.
- Items 3.10 - 3.12: The sensible, latent, & total heat gain are documented for the orientation of the home to be certified.
- Item 3.13: The variation in total heat gain across orientations is ≤ 6 kBtuh.
- Item 4.16: The cooling sizing % is within the cooling sizing limit selected.

Provide the National HVAC Design Report to the party you are providing these design services to (i.e., a builder or credentialed HVAC contractor) and to the Rater. The report is only required to be provided once per system design, even if multiple homes are built using this design (e.g., in a production environment where the same plan is built multiple times, only one report is required). As long as a report has been provided that falls within these tolerances for the home to be certified, no additional work is required. However, if no report falls within these tolerances or if any aspect of the system design changes, then an additional report will need to be generated prior to certification.

Visit energystar.gov/newhomeshvacdesign for a tool to assist with group designs and for more information.

3. The term ‘Rater’ refers to the person(s) completing the third-party verification required for certification. The person(s) shall: a) be a Certified Rater or, Approved Inspector, as defined by ANSI / RESNET / ICC Standard 301, or an equivalent designation as determined by a Home Certification Organization (HCO) Verification Oversight Organization such as RESNET; and, b) have attended and successfully completed an EPA-recognized training class. See www.energystar.gov/newhometraining.

4. Check “Yes” if this system is to handle temporary occupant loads. Such a system may be required to accommodate a significant number of guests on a regular or sporadic basis and shall be handled by a supplemental cooling system (e.g., a small, single-package unit or split-coil unit) or by a system that can shift capacity from zone to zone (e.g., a variable volume system).

5. As defined by ANSI / RESNET / ICC Std. 301-2019, a Dwelling Unit Mechanical Ventilation System is a ventilation system consisting of powered ventilation equipment such as motor-driven fans and blowers and related mechanical components such as ducts, inlets, dampers, filters and associated control devices that provides dwelling-unit ventilation at a known or measured airflow rate.

6.5. 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 a whole-house Dwelling Unit Mechanical Ventilation System. Designers may provide supplemental documentation as needed to document the system design.

6.7. In “Warm-Humid” climates as defined by 2009 IECC Figure 301.1 (i.e., CZ 1 and portions of CZ 2 and 3A below the white line), it is recommended, but not required, that equipment be specified with sufficient latent capacity to maintain indoor relative humidity at ≤ 60%.

8. Item 2.8 applies to any outdoor air inlet connected to a ducted return of the dwelling unit HVAC system, regardless of its intended purpose (e.g., for ventilation air, make-up air, combustion air). This Item does not apply to HVAC systems without a ducted return. For example, if an outdoor air inlet connected to a ducted return is used as a dedicated source of outdoor air for an exhaust ventilation system (e.g., bath fan), the outdoor airflow must be automatically restricted when the exhaust fan is not running and in the event of an override of the exhaust ventilation system. Note that a Rater will generally measure the ventilation rate at the highest HVAC fan speed applicable to ventilation mode (e.g., if the inlet only
19. Orientation represents the direction that the front door of the house is facing. The designer is only required to document the loads for this one orientation.

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

16. The difference between the window area used in the design and the actual home to be certified must fall within the tolerance specified in Footnote 2, as verified by a Rater. Be advised, the Rater will calculate window area using the on-site inspection protocol provided in Normative Appendix B of ANSI / RESNET / ICC Standard 301-2019, which defines this value, in part, as the floor area of the Conditioned Space Volume within a building or Dwelling Unit, not including the floor area of attics, crawlspaces, and basements below air sealed and insulated floors. See https://codes.iccsafe.org/content/chapter/16185/ for the complete definition.

14. 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 occupant.

12. Note that the 'fan-on' setting of a thermostat would not be an acceptable controller because it would continuously operate the HVAC fan.

10. Notebook the 'fan-on' setting of a thermostat would not be an acceptable controller because it would continuously operate the HVAC fan.

8. In addition, consult manufacturer requirements to ensure return air temperature requirements are met.

6. If a jurisdiction-specified design temperature is used that exceeds the limit in the ENERGY STAR Certified Homes Design Temperature Limit Reference Guide, designers must submit a Design Temperature Exception Request available at energystar.gov/hvacdesigntemps-'

4. The difference between the Conditioned Floor Area (CFA) used in the design and the actual home to be certified must fall within the tolerance specified in Footnote 2, as verified by a Rater. Be advised, the Rater will calculate CFA using the definition in ANSI / RESNET / ICC Standard 301-2019, which defines this value, in part, as the floor area of the Conditioned Space Volume within a building or Dwelling Unit, not including the floor area of attics, crawlspaces, and basements below air sealed and insulated floors. See https://codes.iccsafe.org/content/chapter/16185/ for the complete definition.

2. As an alternative, measurement of the outdoor airflow can be waived if a Constant Airflow Regulating (CAR) damper with a manufacturer-specified maximum flow rate no higher than 15 CFM or 15% above the ventilation design value is installed on the inlet.

1. New building construction, such as the LEED building certification program, and Southern California Edison certified “Green” homes are exempted from the requirement to be ENERGY STAR certified.
20.24. Determine the orientation with the largest and smallest Total Heat Gain. Verify that the difference in Total Heat Gain between the orientation with the largest and smallest value is ≤ 6 kBtuh. If not, then assign the orientations into one or more groups until the difference is ≤ 6 kBtuh and then complete a separate National HVAC Design Report for each group.


22.26. As an alternative for low-load spaces, a system match-up including a single-speed compressor with a total capacity ≤ 20 kBtuh is permitted to be used in spaces with a total cooling load ≤ 15 kBtuh. A system match-up including a two-speed or variable-speed compressor with a total capacity ≤ 25 kBtuh is permitted to be used in spaces with a total cooling load ≤ 18 kBtuh.

23.27. If an AHRI Reference # is not available, OEM-provided documentation shall be attached with the rated efficiency of the specific combination of indoor and outdoor components of the air conditioner or heat pump, along with confirmation that the two components are designed to be used together.

24.28. Per ACCA Manual S, Second Edition, if the load sensible heat ratio is ≥ 95% and the HDD/CDD ratio is ≥ 2.0, then the Climate is Condition B, otherwise it is Condition A.

25.29. Design HVAC fan airflow is the design airflow for the blower in CFM, as determined using the manufacturer’s expanded performance data.

26.30. Design HVAC fan speed setting is the fan-speed setting on the control board (e.g., low, medium, high) that corresponds to the Design HVAC fan airflow.

27.31. Design total external static pressure is the pressure corresponding to the Design HVAC fan airflow, inclusive of external components (e.g., evaporator coil, whole-house humidifier, or ≥ MERV 6 filter).

28.32. Designers may provide supplemental documentation with room-by-room and total design airflow in lieu of completing Item 5.5. Sample supplemental documentation can be found at http://www.energystar.gov/newhomeshvacdesign.

29.33. Orientation-specific room-by-room design airflows are recommended, but not required, to distribute airflow proportional to load, thereby improving comfort and efficiency.