Air-Source Heat Pump and Variable-Speed Heat Pump Installation Specifications

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The program **requires** the following specifications for air-source heat pump (ASHP) or variable-speed heat pump (VSHP) installations. Please check with your local utility about any additional requirements they may have for ASHP and VSHP installations.

- **Equipment Selection:** The new air-source heat pump (ASHP) or variable-speed heat pump (VSHP) must be rated as having an HSPF2 and a SEER2 efficiency rating that meets federal minimum standards according to the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) certificate.

- **HSPF2 and SEER2:** Applies to units manufactured after January 1, 2023, based on DOE's change to the national standard testing methodology. If a unit was manufactured before January 1, 2023, it must meet the current federal minimum efficiency standard for HSPF and SEER that is in place at the time of installation. The efficiency rating must be provided to BPA via the AHRI certificate for the unit.

- **Variable-Speed Heat Pumps**: Installation contractor must provide utility with manufacturer documentation that the outdoor compressor includes variable-speed or inverter-driven technology (e.g., specification sheet or brochure that documents the model has a variable-speed or inverter-driven compressor.)

ASHP and VSHP Installation Best Practices

The program **recommends but does not require** the following as best practices for air-source heat pump (ASHP) or variable-speed heat pump (VSHP) installations. Please check with your local utility about any additional requirements they may have for ASHP and VSHP installations.

Equipment Sizing

- The system should be sized using a balance point based on equipment manufacturer's balance point worksheet. A 70°F indoor design temperature for heating and 75°F for cooling load calculations using ASHRAE winter design temperature (99% winter temperature) and cooling design temperature (1% cooling temperature) for the nearest weather station representative of the installation should be used. The method for calculating heating and cooling loads should be consistent with or equivalent to ACCA Manual J 8th edition, or newer.

- If the basement is part of the conditioned space (i.e., duct work provides conditioned air to a finished or unfinished basement), it should be included in the sizing calculations.

- Make sure openings in the unit cabinet or building structure are properly sealed.

- If a house (de)pressurization test has not been performed, use a default infiltration rate of:

  - 0.8 air changes per hour (ACH) for homes built before 1980
  - 0.5 ACH for homes built between 1980 – 1990
  - 0.35 ACH for homes built after 1990

- If a duct pressurization test has not been performed, use a default duct system loss of:

  - Up to 25% if ducts are insulated and fully located in the attic and/or crawlspace
  - Up to 15% if ducts are insulated, sealed, and fully located in the attic and/or crawlspace
  - If the air handler and all ductwork are within the thermal envelope of the house, use 0%
  - Use a value between 0% - 25% if some ducts are inside conditioned space

- Use window U-Values provided below if National Fenestration Rating Council (NFRC) values are not available:

  - Double-pane Vinyl: 0.30 – 0.40
  - Double-pane Wood: 0.35 – 0.55
  - Double-pane Metal: 0.60 – 0.70
  - Single-pane Wood: 0.80 – 0.95

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External Static Pressure

The total external static pressure acting on the system air handler should not exceed 0.8 inches of water (200 Pa).

<u>For VSHPs only</u> – External Static Pressure should match the target airflow rate as per manufacturer's documentation.

Air Flow

Air flow across the indoor coil should be as specified in the heat pump manufacturer's documentation, or at least 350 to no more than 400 cubic feet per minute (CFM) per 12,000 Btu/hr output at AHRI rating conditions if the manufacturer's documentation is not specific. Verified measurement methods are:

- TrueFlow plate
- External static pressure – CFM manufacturer lookup table
- Duct Blaster pressurization fan matching

<u>For VSHPs only</u> - Air flow should match the target airflow rate as per manufacturer's documentation. Does not need to be measured using the methods above.

Refrigerant Charge

Refrigerant charge and the methods to test at different outdoor temperatures are detailed in the manufacturer's installation instructions. Refrigerant charge should be within +/- 5% of manufacturer's specifications for line set length to ensure proper heat pump operation.

- **Heating:** If the outdoor temperature is 65°F or less, test in heating mode after operating the heat pump for a recommended 15 minutes, with auxiliary back-up heat off, if not specified by manufacturer. Temperature change across the air handler indoor coil must be at or above the minimum temperature split detailed in manufacturer's documented requirements.

- **Cooling:** If the outdoor temperature is greater than 65°F, test in cooling mode after operating the heat pump for a recommended 15 minutes, if not specified by manufacturer. The subcooling (liquid saturation temp.. – liquid line temp.) must meet manufacturer's documented requirements.

Other alternative refrigerant measuring methods approved and documented by the manufacturer are also acceptable.

Refrigerant Leak Protection

Follow industry best practices for vacuum decay text and refrigerant leak test.

Controls

Auxiliary Heat Control: Auxiliary heat lockout should be set only after completing the balance point worksheet for the installed heat pump. Industry best practice is to set the auxiliary heat lockout at, or 5°F above, the balance point temperature.

For dual fuel systems (gas backed up heat pumps), a switchover point of 35°F - 40°F should be used. Refer to the balance point worksheet for the unit for specific information on the switchover point temperature.

Compressor Control: Heat pump compressor lockouts should not be set.