



## PORTLAND CLEAN ENERGY COMMUNITY BENEFITS FUND

# Installation Checklist

## HVAC Ductless Heat Pumps

This guide does not replace the manufacturer's specifications. Follow the manufacturer's installation instructions and building code requirements.

### BEFORE YOU BEGIN

- Discuss your plan with the occupant and property owner.
- Choose inverter-driven, variable-speed heat pumps that are sized with a heat load calculation for the area to be served.
- Perform and document a load calculation. Match the system capacity to the calculation as closely as possible.
  - The load calculation shall show that the heat pump will meet the load of the area of the house that it is intended to heat at 23-degree outdoor temperature in heating with an interior temperature of 68-degrees and a 100-degree outdoor temperature in cooling with an interior temperature of 78-degrees.
  - Establishing how much heating and cooling the space needs at design conditions is essential to maximizing the performance, comfort, and longevity of a heat pump system.
  - HVAC Sizing Tool [www.hvac/betterbuiltNW.com](http://www.hvac/betterbuiltNW.com)
- Plan to install system on a dedicated electrical circuit.
- Plan to install power disconnect and service outlet to code.
- For ducted heat pump installations refer to ducted air source heat pump requirements and best practices.
- Heat load calculation provided to PCEF is to reflect actual zone surface areas and insulation levels.
- If a single zone ductless system is specified, areas outside of the main zone must have supplemental heat (i.e., If a single zone system is in the main living area, bedrooms must have supplemental heat)

## INSTALLATION

### OUTDOOR UNIT (COMPRESSOR)

- Set the unit on a permanent pad on a stable, level surface.
- Use risers to prevent debris and snow buildup and allow better drainage.
- Secure outdoor unit to the pad, risers and/or resting surface using bolts and/or adhesive.
- Allow clearance around unit for airflow.
- Install service outlet and shut off to code.
- Installation of anti-vibration pads is recommended to mitigate potential noise complaints.
- The outdoor unit may be wall-mounted using appropriate hardware and installed per the manufacturer's instructions.

### INDOOR UNIT

- Indoor unit securely mounted, level and plum per manufacturer specs to a permanent surface.
- Primary indoor unit, or largest capacity unit, installed in main living area.
- Ensure adequate spacing of the indoor unit to allow for routine maintenance and cleaning.

### REFRIGERANT TUBING

- Create new flares using appropriate R410A flaring tool and measurement gauge. DO NOT REUSE manufacturer provided tubing flares or fittings. Only use flare fittings once. Cut refrigerant line and build a new flare fitting whenever the fitting is opened for service.
- Apply refrigerant oil to the end of each flare and use a torque wrench to tighten to the manufacturer's torque specifications.
- Connect tubing with R410A nuts (supplied with your outdoor unit) and tighten to manufacturer's specifications.

### CONDENSATE DRAIN

- Ensure the condensate drain is sloped down and away from the building and runs to a suitable termination point, away from crawl spaces and walkways.
- Condensate line termination points need to be properly screened off to prevent critters from forming a blockage.
- Avoid using a condensate pump unless necessary to minimize failure risk and maintenance costs.

### REFRIGERANT CHARGE

- Adjust refrigerant charge ONLY IF NECESSARY. Many DHPs do not require adjustments from pre-charge levels for a standard line set. Consult the manufacturer's current installation manual to verify refrigerant charge adjustments as needed. When needed, use a digital scale to weigh in/out refrigerant.
- Document lineset length and any changes to refrigerant charge. Best practice is to add this note to the interior service panel door.
- Consult the manufacturer's installation manual to verify refrigerant protocols.

### LINE SET INSULATION AND PROTECTION

- Insulation must cover entire line set length to avoid condensation and decreased efficiency. Protect the outdoor line set from insulation damage with rigid line hide and building code-approved line set protection.
- An insulative sealant must seal penetrations through the shell of the home; return any insulation disturbed by installed line set to original (or better) condition.
- Seal the line set cover by using spray foam at any termination points.
- Also protect any exposed line set insulation with UV protection. Electrical tape works well.

### COLD WEATHER RECOMMENDATIONS

- Avoid installing outdoor units along pathways; freezing discharge can pose a slip hazard.
- Use a pan heater to prevent defrost discharge from freezing inside the compressor.

### COMMISSIONING

- Start-up commissioning to manufacturer's specifications by installers that have received manufacturer's installation training.

### HOMEOWNER EDUCATION

- Instruct homeowners to clean the filter(s) on the indoor head/cassette every 3-4 months to ensure long life and efficient performance.
- Ensure homeowner has a copy of the manufacturer's operation manual; refer to the manual during your unit operation walk-through or training.
- Provide guidance on the importance of keeping snow and debris away from the outdoor unit.
- Instruct homeowners to use "heat" or "cool" settings (rather than "auto"), and generally turn off the unit when neither is needed. Using "auto heat/cool" settings to maintain a specific comfort setting can significantly increase energy use and cause the system to interact poorly with other heating systems.
- Instruct homeowners to use "automatic" fan speed setting to allow the fan speed to respond to the compressor speed and allow the fan speed to operate as quietly as possible.
- Instruct homeowners not to set the thermostat with more than four degrees (4°F) of nighttime setback, as this forces the unit to operate at high power mode in the morning to bring temperature back up. A DHP provides best efficiency and comfort with a steady temperature setpoint and a small night setback.
- Instruct the homeowner to set the backup heating thermostat 3-4 degrees lower than the DHP thermostat. This ensures that the DHP provides the majority of the heating.
- Homeowner to prioritize using heat pump over backup electric resistance heat or wall/window AC units.

## APPLICATION SPECIFIC CONSIDERATIONS

- ❑ **Homes with Electric Forced Air Furnaces** - Homes with Electric Forced Air Furnaces (EFAFs) can be good candidates for DHPs. However, if the existing EFAF duct work is in good condition and is either insulated or located inside the conditioned space, it is generally cheaper, more effective and more efficient to use a cold climate unitary heat pump to heat and cool the entire home rather than installing a multi-head DHP solution.

A single head DHP is a better solution however in small homes (single-story or manufactured homes) when the EFAF is connected to ductwork that is old, leaky and/or located in the crawlspace under the house. In such cases a DHP provides low-cost heating and cooling without air from the leaky ducts drawing dirty air from the crawlspace or adding to the house heating and cooling loads. Properly installed, a cold climate DHP will cost one-third as much to operate as the EFAF system.

- ❑ **Moisture Condensation Risk Areas** - Installing a single head DHPs can exacerbate moisture condensation risks, especially in older homes with limited wall insulation. The added risk occurs when the DHP is installed in one part of the home and other rooms or locations are no longer heated as much. The areas of highest risk in back bedrooms and closets that get very little air circulation. These spaces are difficult to heat regardless of the type of heating system being used. If the surface gets cool enough, moisture from the air will condense and cause mold or mildew to grow, which is a health risk. The best way to avoid this is to ensure all areas have some air flow and avoid placing boxes or stacks of clothing against poorly insulated walls. In addition, make sure that supplemental heating (like a cadet or baseboard heater) is not turned off, but rather just set at a lower than the DHP so that the DHP can do most of the work, but when it gets very cold, the backup heating prevents condensation on exterior wall surfaces.