

Portland General Electric  
Heat Pump Program  
Equipment and Installation Specifications

1. Introduction

- 1.1. Purpose: To establish minimum standards, for equipment and installation, for heat pumps to qualify for Portland General Electric's Heat Pump program.
- 1.2. Scope: This standard applies to residential installations only. Equipment covered by this standard includes unitary heat pumps up to 65,000 Btuh capacity as listed in the ARI Unitary Directory.
- 1.3. Safety and Codes
  - 1.3.1. This specification has as its sole purpose establishing minimum standards for PGE's Heat Pump program. Meeting PGE standards alone does not assure that the installation meets applicable codes or manufacturers' standards. PGE will not knowingly provide incentives to installations that do not meet codes or manufacturers' standards, but PGE cannot inspect for these requirements specifically, nor insure that they have been met.
  - 1.3.2. Codes: It is installers' responsibility to conform to applicable codes and regulations for installing mechanical equipment in residences. Where applicable codes exceed these specifications, installation shall comply with code minimums.
  - 1.3.3. Manufacturers' Specifications: It is installers' responsibility to conform to manufacturers' installation requirements. Where manufacturers' instructions, recommendations or specifications exceed these specifications, installation shall comply with manufacturers' instructions, recommendations or specifications.
- 1.4. Definitions
  - 1.4.1. Shall: Defines a program requirement that must be met for the heat pump to qualify for PGE incentives.
  - 1.4.2. Dual-fuel heat pump: A heating and cooling appliance shipped from the manufacturer that includes both a heat pump for heating and cooling, and a combustion furnace for back-up heat in the same enclosure.
  - 1.4.3. Add-on heat pump: A heat pump added to a combustion furnace with controls that allow the furnace to be used as the back-up heat source.
  - 1.4.4. Back-up heat: This term includes any heating function not provided by the heat pump. This can include auxiliary heat provided whenever the outdoor temperature is below the balance point, and emergency heat provided whenever the heat pump is not functional as a heating unit.
  - 1.4.5. Balance point: The outside temperature below which the back-up heat provides heat, rather than the heat pump or together with the heat pump.

2. Equipment Standards

- 2.1. Certifications: Equipment shall be listed in the Air-Conditioning and Refrigeration Institute's (ARI) *Directory of Certified Unitary Equipment* or successor publications. To qualify for PGE's Heat Pump Program, equipment model numbers shall match ARI listing for outdoor and indoor (if applicable) units.
- 2.2. Performance:
  - 2.2.1. Heating: Minimum ARI listed HSPF shall be 7.7.
  - 2.2.2. Cooling: Minimum ARI listed SEER shall be 13.
- 2.3. Protective Devices:
  - 2.3.1. Equipment should be provided with a crankcase heater and a liquid-line filter drier.
  - 2.3.2. Delay timers to protect against damage from short cycling of the compressor and compressor motor start-assist kits shall be installed when recommended by the manufacturer.
  - 2.3.3. The compressor shall be protected from abnormal operating pressures, temperatures, and loss of refrigerant by suitable pressure or temperature overload devices.
  - 2.3.4. A suction line accumulator shall be installed, unless not recommended by the manufacturer.
- 2.4. Warranty: Installer shall provide to the consumer in writing the manufacturer's warranty. Heat pump equipment, including the compressor, shall be warranted by the manufacturer against defects in material

Effective October 26, 2005.

and workmanship for a minimum of five years from the date of start-up of the equipment. Warranties shall cover parts and labor.

2.5. Use with Combustion Furnace: When heat pump is installed with a combustion furnace that provides back-up heat, installation shall meet manufacturer's requirements for dual fuel or add-on heat pumps.

### 3. Equipment Selection

3.1. Cooling: Heat pump shall be sized no larger than 150% of calculated cooling load.

#### 3.2. Heating:

3.2.1. Heat pump shall be sized large enough to be capable of providing 100% of heat load:

3.2.1.1. If electric back-up heat, at 25 °F to 30 °F outside air temperature

3.2.1.2. If combustion back-up heat, at 25 °F to 40°F outside air temperature.

3.2.2. Back-up heat shall be sized to meet 100% of heating load at 97% design temperature.

3.2.3. For dual fuel or add-on heat pumps balance point temperature shall be set no higher than 40°F unless fuel prices allow more economical operation at higher temperatures.

3.3. Load Calculations: Heating and cooling loads shall be calculated using industry standard methods.

Acceptable methods are Air Conditioning Contractors of America (ACCA) *Manual J*, American Society of Heating Refrigerating and Air-conditioning Engineers (ASHRAE) *Handbook of Fundamentals*, computerized sizing programs based on Manual J or ASHRAE, manufacturers' manual or computerized sizing methods.

### 4. Installation

4.1. Accessibility: Equipment shall be located to allow easy service access and adequate working space for servicing any component without removal of piping, duct work, or other permanently installed fixtures. Special care shall be taken in locating components that require frequent attention, such as filters.

4.2. Indoor unit: Indoor units shall be located to permit smooth duct transitions. They shall be adequately supported in accordance with manufacturers' instructions. All clearances shall meet applicable code provisions.

4.3. Indoor coils: Indoor coils shall be located in the downstream air flow from the furnace heat exchanger.

4.4. Outdoor unit: Outdoor units shall be located to avoid restrictions in the outdoor air stream. Units shall be mounted on an adequate, solid, secure pad that provides proper drainage and prevents a buildup of water, snow, or ice. Minimum clearances shall be provided as per manufacturer's instructions and recommendations. Condensate shall not drain onto areas where ice formation may create a hazard (e.g. walkways).

### 5. Duct System

5.1. Design: Duct system shall be designed to industry standards, so insure that airflow requirements defined by the heat pump manufacturer are met. Acceptable design methods include residential duct design methods of ACCA, the Sheet Metal and Air Conditioning Contractors National Association (SMACNA), and ASHRAE.

#### 5.2. Installation

5.2.1. Standards: Specifications in section 5.3 apply to new ducts installed as part of the heat pump installation and connections to pre-existing ducts. Ducts installation shall follow these standards:

5.2.2. Sheet metal:

5.2.3. Flexible duct: Flexible duct shall be certified and labeled in accordance with UL-181 and UL-181A. When using UL labeled ducts, installers are responsible for installing ducts according to manufacturers' instructions.

5.2.4. Insulated duct board: Insulated duct board shall be certified and labeled in accordance with UL-181 and UL-181A. When using UL labeled ducts, installers are responsible for installing ducts according to manufacturers' instructions.

5.2.5. Building cavities: Building cavities shall not be used as ducts. Where ducts pass through building cavities ducts shall be continuous and sealed to be airtight.

5.2.6. Mechanical connections: Mechanical connections shall not be made using tapes or sealants alone. Mechanical fasteners shall be screws, drives, compression straps, or other hardware approved by the manufacturer or sheet metal standard applicable to the materials being joined. These fasteners shall be installed using methods approved by the manufacturer or standard.

- 5.2.7. Air tightness: All new connections, seams, gores, and other joints shall be made airtight using duct sealing mastic.
- 5.2.8. Support: Ducts shall be supported along their length using supports that are wide enough to prevent compressing insulation, structural damage, or distortion of duct cross sections. Ducts shall not sag more than 2" between supports. Premanufactured ducts and duct board shall be supported according to manufacturer's instructions.
- 5.2.9. Insulation: New ducts shall be insulated using a minimum of R-8 insulation. Insulation shall not be compressed except where necessary to fasten insulation or support ducts.
- 5.3. Pre-existing ducts
  - 5.3.1. Disconnects: Existing ducts shall be checked for disconnects which shall be repaired to meet requirements of sections 5.3.6 – 5.3.8.
  - 5.3.2. Connecting to new ducts: When new ducts are connected to pre-existing ducts, connections shall be made to meet requirements of sections 5.3.6 – 5.3.8.
  - 5.3.3. Insulation: Accessible pre-existing ducts that are uninsulated shall be insulated to requirements of section 5.3.9.
- 6. Filters
  - 6.1. Location: Filter access shall be located to that clearance allows removal and replacement of filters without damaging filters and so that a ladder is not required.
  - 6.2. Accessibility: Filters shall be accessible without specialized tools. Filter grills shall be installed so that filters cover is not screwed into structural or finish materials of house.
  - 6.3. Air flow: Filters shall not be installed that cause air flow to be less than heat pump manufacturer's specifications.
- 7. Noise and Vibration Control
  - 7.1. Indoor unit: Permanent means shall be provided to prevent transmission of objectionable noise or vibration generated by the indoor unit in accordance with the manufacturer's instructions and recommendations.
  - 7.2. Outdoor unit: Outdoor units shall be located to avoid transmission of objectionable noise to adjacent properties, sleeping areas, or other areas where noise control is critical. Where outdoor units are found to be in violation of state and local noise control ordinances, the Participating Installer shall be responsible for any modifications necessary to reduce noise. Unit base shall not be connected to the foundation.
- 8. Refrigerant Piping
  - 8.1. Materials: Field-supplied refrigerant piping shall be clean, dehydrated, and sealed Types K and L seamless copper tubing or the manufacturer's pre-charged tubing. Fittings shall be wrought copper. Field supplied tubing shall be evacuated to 500 microns and purged and pressure tested as per manufacturer's recommendation; soft solders shall not be permitted.
  - 8.2. Sizing: Refrigeration piping or refrigeration line set shall be sized and installed in accordance with the manufacturer's instructions and recommendations. Piping between the two sections of split units shall not exceed the manufacturer's maximum recommended length, horizontally or vertically, and shall be run parallel to building lines and in a straight and workmanlike manner to prevent oil traps.
  - 8.3. Support: Refrigerant piping shall be properly supported in accordance with manufacturer's specifications, ARI, and applicable codes.
  - 8.4. Penetrations: Refrigerant piping passing through openings in the unit cabinet or the building structure shall be installed to prevent wear or sound generation due to contact with the cabinet or building structure. All penetrations shall be properly sealed.
  - 8.5. Insulation: Suction lines shall be insulated with a minimum of 1/2" thick continuous closed-cell foam. Where insulation is exposed to the elements, it should have a weatherproof covering. Vapor and liquid lines shall be separated so that heat exchange does not take place. Factory insulated pre-charged lines will be accepted.
  - 8.6. Exposed piping: All refrigerant piping exposed to possible damage from foot traffic around or near an outdoor unit shall be protected or buried in PVC or other corrosion-resistant pipe, in accordance with the manufacturer's instructions, to prevent damage to piping or pipe insulation or injury to people, and to permit replacement if necessary.

- 8.7. Leak testing, evacuation, and charging: All field and factory joints shall be checked and any leaks found shall be repaired. Evacuation and charging shall be done in accordance with the manufacturer's instructions and recommendations and the latest edition of ARI Standard 260-75, 3.5-3.7.
- 8.8. EPA certification: All technicians who handle refrigerant shall possess a valid certification from the United States Environmental Protection Agency.
9. Condensate Piping
  - 9.1. Size: Condensate piping shall be copper, plastic or other corrosion-resistant material.
  - 9.2. Drains: Condensate drain lines shall be trapped and run to an open drain or outside of the building foundation. Condensate shall not be drained into a crawl space or direct connected into a sewer line.
  - 9.3. Slope: Condensate drain lines shall be sloped in the direction of flow to prevent backup or overflow of water in the drain pan.
  - 9.4. Exception: If the indoor unit is lower than the floor drain or dry well, a condensate pump shall be installed to pump condensate to the level of the drain or outlet. An automatic control to shut down system in case of pump failure shall be installed. A check valve shall be installed if pump is not equipped with one.
  - 9.5. Drain pan: When indoor units are located in attics, the installation shall include a secondary drain pan to collect condensate when a problem exists in the primary drain line. The secondary drain pan shall be connected to a drain line that will drip at a location that will draw attention to the problem in the primary drain line.
10. Field Wiring: All field wiring, line and low-voltage, shall comply with the manufacturer's recommendations, the National Electrical Code, and all local codes and ordinances.
11. Controls
  - 11.1. Location: Indoor thermostats should be located and installed according to the manufacturer's instructions and recommendations. Except when such location is not available, thermostats shall be installed approximately 5 feet off the floor on an inside wall in the return airflow pattern, and where they are not in the sun or any other heat source at any time.
  - 11.2. Staging auxiliary electric heat: When auxiliary heat is greater than 9 kW, auxiliary heat will be staged so that maximum second stage heat is 5 kW.
  - 11.3. Emergency heat operation: All indoor thermostats shall include a manual selector switch to permit all supplemental heaters or the furnace to be energized under control of the indoor thermostat (with the compressor and outdoor thermostats bypassed) when the compressor or refrigerant system is inoperative. An indicator light shall be on whenever emergency heat is on.
  - 11.4. Furnace/Compressor Lockout: For dual-fuel or add-on heat pumps, furnace operation shall lock out heat pump unless heat pump manufacturer's specific controls and recommendations permit operation of both.