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Rely on us.

1.0 GENERAL REQUIREMENTS

1.1 Interpretation of Shall and Should

For the purposes of these Eugene Water & Electric Board (EWEB) Program specifications, "Shall and Should" will be interpreted as follows:

1.1.1 Where **shall** or **shall not** is used for a provision, that provision is mandatory if compliance with the standard is claimed.

1.1.2 Where **should** is used it will indicate provisions which are not mandatory but which are desirable as good practice.

1.2 Installation of all Materials and Equipment

All materials and equipment used in the EWEB Ducted Heat Pump™ (retrofit heat pump) Program shall be installed according to manufacturer specifications and comply with applicable building, mechanical and electrical codes.

1.3 Mechanical and Electrical Permits

Mechanical and electrical permits shall be required for all installations.

1.4 EWEB Proposal Form, Exhibit B

Participating contractor shall obtain EWEB's approval prior to installation of the heat pump system. Contractor shall complete and sign the Ducted Heat Pump Program Proposal Form, Exhibit B and submit it to EWEB with the required supporting documentation.

1.5 EWEB Testing and Balancing Checklist, Exhibit C

Participating contractor shall test and balance the heat pump and duct system to meet the Program specifications. Contractor shall complete and sign the Ducted Heat Pump Program Testing and Balancing Checklist, Exhibit C and submit it to EWEB with the required supporting documentation (refer to section 13.1).

2.0 EQUIPMENT REQUIREMENTS

2.1 Approved Manufacturer

Equipment shall be manufactured by a company appearing in the Air Conditioning and Refrigeration Institute (ARI) Unitary Directory of Certified Products.

2.2 Equipment Certification and Ratings

Air-source heat pumps shall be listed in the current ARI Unitary Directory and shall meet the performance, safety, and other rating requirements in the latest version of the ARI Standard 240. Units shall be listed by Underwriters' Laboratories (UL), or equal, and shall display the ARI symbol of certification.

2.3 Equipment Performance Standards

Air-Source Heat Pumps shall have an HSPF rating of not less than 9.0 and SEER ratings of not less than 14.0, as certified by ARI. For both site-built and manufactured homes, the indoor unit shall be replaced and matched with the outdoor unit in order to meet the equipment performance standards.

2.4 Equipment Protective Devices

2.4.1 Compressors

Equipment shall be provided with a crankcase heater and a liquid-line filter drier. Delay timers to protect against damage from short cycling of the compressor and compressor motor start-assist kits shall be installed as recommended by the manufacturer. The compressor shall be protected from abnormal operating pressures, temperatures, and loss of refrigerant by suitable pressure or temperature overload devices.

When the low ambient temperature compressor lockout option is enabled, it shall not be set to lockout the compressor at temperatures above 0 degrees F.

To prevent flood back of liquid refrigerant to the compressor, a suction line accumulator shall be installed, unless not recommended by the manufacturer.

2.4.2 Start-Assist (Soft-Start) Capacitor

Provide a 240 V start-assist capacitor with the following attributes for use in conjunction with the compressor's existing start capacitor. The capacitor shall be between 130 microfarads and 200 microfarads. The device shall switch out of the circuit after compressor startup. The device shall be listed by UL display this mark.

3.0 CONTRACTOR REQUIREMENTS

3.1 Training

Participating contractor shall be responsible for the technical competence and qualifications of all sales people, installers, technicians and service mechanics. These personnel shall participate annually in at least one manufacturer's training session on heat pump application, installation, or service or receive equivalent training. At least one fourth of each contractor's technicians shall be Refrigeration Service Engineers Society (RSES) or North American Technical Excellence (NATE) heat pump certified or have equivalent certification. At least one system installer or technician on each HVAC contractor job shall be certified in Air Conditioning Contractors of America (ACCA) - Manual D - Residential Duct Systems. System Designers shall be certified in ACCA - Manual D and ACCA - Manual J - Residential Load Calculation (7th edition or later).

3.2 Certification

Each heat pump system installed shall be certified as a "Performance Tested Comfort Systems (PTCS™) Commissioned Heat Pump." This requires testing and documentation of auxiliary heat controls (refer to section 4.4), airflow across indoor coil (refer to section 6.3), and refrigerant charge (refer to section 5.4) by a Regional Technical Forum (RTF) approved PTCS Service Provider certified "Heat Pump Technician." The RTF and Bonneville Power Administration (BPA) have approved the Proctor Engineering Group (PEG) CheckMe!® summer and winter protocols as acceptable methods for heat pump commissioning under the PTCS program. EWEB requires that each contractor have at least one CheckMe! certified technician. Heat pump commissioning using the appropriate CheckMe! protocol shall be performed on every installation under the Ducted Heat Pump Program (refer to section 13.1).

Where heat pump systems are installed in houses with a substantial amount of ductwork in unconditioned space, the duct system shall be certified as a "PTCS Duct System." This requires duct testing and documentation (refer to sections 6.2 and 13.1) by an RTF approved PTCS Service Provider certified "Duct Technician" and may require sealing.

Applicable heat pump commissioning and duct system PTCS certifications shall be submitted to EWEB. EWEB shall maintain record of certifications and make the records available to the BPA, RTF, or RTF approved PTCS Service Provider upon request.

3.3 New System Warranty

Participating contractor shall provide to the customer in writing the manufacturer's warranty. This warranty information shall also be listed on the customer's invoice and provided to EWEB. Heat pump equipment shall be warranted by the manufacturer against defects in material and workmanship for a minimum of 5 years from the date of start-up of the equipment. In addition, the compressor shall be warranted by the manufacturer against defects in material and workmanship for a minimum of five years from the date of start-up. Warranties shall cover parts and labor. Contractor may offer to customers the manufacturer's extended warranty or service agreement to comply with the warranty requirements. This warranty shall not be considered to cover equipment failure caused by failure to perform normal maintenance, abuse, or external causes beyond the control of the installing contractor.

3.4 Customer Instruction

Participating contractor's installer or technician shall instruct the customer in proper operation and maintenance of the heat pump system. Contractor's installer or technician shall provide the customer with the manufacturer's owner's manual, demonstrate filter replacement (or cleaning), and demonstrate the operation of all indoor thermostat controls and indicator lights to the customer. Contractor's installer or technician shall explain to the customer the different operating modes of the heat pump system (e.g., heating, emergency heat, defrost, and the effects of obstructing registers). All this information shall be provided in an operation manual given to the owner.

4.0 EQUIPMENT SELECTION

4.1 Design Heating and Cooling Load Calculations

EWEB shall complete or EWEB shall direct the HVAC contractor to complete and submit a room-by-room design heating and cooling load calculations for each residence. EWEB shall provide the homeowner with a copy of the load calculations and a floor plan showing the room-by-room heating and cooling loads. The HVAC contractor shall size the heat pump system based on these room-by-room design heating and cooling load calculations. EWEB shall hold the load calculations on file and make them available to the BPA, RTF, or RTF approved PTCS Service Provider upon request.

4.1.1 Load Calculation Procedures

The recommended method and form for load calculations is available in the Air Conditioning Contractors of America (ACCA) - Manual J - Residential Load Calculation (7th edition or later). Alternate computer or manual methods of calculating heating and cooling loads may be used if approved in advance by EWEB.

4.1.2 Design Conditions

Heat loss and gain calculations shall be based on the following design conditions:

Winter indoor design temperature	70 degrees F
Winter outdoor design temperature	22 degrees F
Summer indoor design temperature	75 degrees F
Summer outdoor design temperature	89 degrees F
Indoor relative humidity	55 percent

4.1.3 Heat Transfer Coefficients

Component U-values and F-values used in the heat loss and heat gain coefficients shall reflect the actual construction of the building and be generally consistent with those found in ACCA - Manual J - Residential Load Calculation (7th edition or later) or American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) - Fundamentals Handbook.

4.1.4 Infiltration Rate

An infiltration rate of .35 air changes per hour (for houses built in or after 1980) or .5 air changes per hour (for houses built before 1980) shall be used in sizing calculations unless a house (de)pressurization test has been performed and an estimate is made using the result.

4.1.5 Duct System Loss

Where available, the results of duct pressurization testing shall be used to estimate the duct system efficiency used in sizing calculations. If a duct pressurization test has not been performed on the house, a default duct system loss of 15 percent shall be used.

Exception: If the air handler and all ductwork are within the thermal envelope of the house, 0 percent shall be used as the duct system loss in sizing calculations.

4.1.6 Building Shell Insulation Requirements

If insulation measures meeting EWEB's minimum insulation standards have not been previously installed, the insulation measures shall be installed, where feasible, by the homeowner prior to inspection of the heat pump installation by EWEB. The minimum insulation standards or the actual insulation levels shall be used to determine heat transfer coefficients for the purpose of completing load calculations.

4.1.7 Minimum Insulation and Ventilation Requirements

The contractor shall follow the insulation and ventilation installation and material provisions outlined in the EWEB Home Comfort Weatherization Program, Installation and Material Specifications, Site-Built Homes (Part 1) and Mobile Homes (Part 2).

4.1.7.1 For site-built homes, the minimum insulation requirements are as follows:

Ceilings

Ceilings shall be insulated to a minimum of R-49 or the highest R-value approaching R-49 that is practical. When duckwork is installed above the ceiling, the contractor shall re-insulate the ceiling to R-49.

Floors

If existing floor insulation is less than R-19, the insulation shall be upgraded to R-30 or the maximum level needed to fill the floor joist cavities, whichever achieves the highest practical R-value.

Walls

If existing wall cavity does not have any insulation, R-11 shall be installed where practical as determined by EWEB and the homeowner. Walls with existing insulation shall have a minimum of R-7.

Metal Ducts

If existing metal duct insulation is less than R-8, the insulation shall be upgraded to R-11. New metal duct insulation shall be a minimum of R-11.

Flex Ducts

Flex duct insulation shall be a minimum of R-8.

4.1.7.2 For manufactured homes, the minimum insulation requirements are as follows:

Ceilings
Ceilings shall be insulated to a minimum of R-22.

Floors
Floors shall be insulated to a minimum of R-19.

Walls
Walls shall be insulated to a minimum of R-7.

Flex Duct Crossovers
Flex duct crossover insulation shall be a minimum of R-8.

Since the ceiling, floor and wall cavities for many manufactured homes are sealed, it may be difficult to add insulation. In such cases, EWEB and the homeowner will determine the best course of action to take.

4.2 Heat Pump System Sizing

Heat pumps shall be sized using an acceptable industry sizing procedure. The recommended procedure is available in the ACCA - Manual S - Residential Equipment Selection. Specifically:

4.2.1 Heat pumps shall be sized 75 to 85 percent of design heating load at 22 degrees F. The cooling capacity of the heat pump shall not be less than 100 percent of the design cooling load. The heating design limit may be exceeded if the cooling capacity is less than the design cooling load. Note: Rounding up or down to the nearest 6,000 Btu/hr heating capacity at ARI rating conditions shall be acceptable providing that the above sizing requirements are met.

4.2.2 Heat pumps shall be sized using a balance point range of 20 degrees F to 30 degrees F,. However, in no case shall the balance point used for sizing be higher than 30 degrees F. EWEB shall complete or EWEB shall direct the HVAC contractor to complete and submit a Balance Chart Worksheet. EWEB shall hold the Balance Chart Worksheet on file and make it available to the BPA, RTF, or RTF approved PTCS Service Provider upon request.

4.3 Electric Resistance Auxiliary Heat Sizing

Electric resistance auxiliary heat shall be sized to make up for any deficiency in output when the heat pump unit cannot provide full heating at the design condition. Installed electric resistance auxiliary heat capacity shall be sized at no less than 80 percent or more than 125 percent of the heating design load.

4.4 Control of Auxiliary Heat

New system installations and systems serviced in accordance with PTCS standards shall employ control strategies that minimize the unnecessary use of auxiliary (supplemental) heat. In all systems, auxiliary heat shall not operate during a first stage heating call (unless system is switched to emergency heat).

Digital thermostats shall be used for the supplemental heat lockout; no mechanical outdoor lockout thermostats are allowed. Method of controlling auxiliary heat shall be documented by the certified heat pump technician and submitted to EWEB and the RTF-approved PTCS Service Provider.

Auxiliary heat shall be controlled in the following manner depending on system type:

4.4.1 For heat pump systems with electric resistance auxiliary heat, the auxiliary heat shall be energized in 5 kW stages.

4.4.2 For systems with a single stage of compression and for systems with multiple stages of compression but without supply air temperature sensor control: Auxiliary heat shall be controlled in such a manner that it does not engage when the outdoor air temperature is above 35 degrees F, except when supplemental heating is required during a defrost cycle or when emergency heating is required during a refrigeration cycle failure.

4.4.3 For systems with a single stage of compression and the option of supply air temperature sensor control, supply air temperature sensor shall not be allowed to bring on auxiliary heat when the outdoor air temperature is above 30 degrees F, except when supplemental heating is required during a defrost cycle or when emergency heating is required during a refrigeration cycle failure.

4.4.4 For systems with multiple stages of compression and supply air temperature sensor control:

4.4.4.1 Auxiliary heat shall be controlled in such a manner that it engages only after all stages of compression have been engaged and supply air temperature falls below 85 degrees F.

4.4.4.2 If the staging temperature is set higher than 85 degrees F, the system shall be equipped with an outdoor thermostat that prevents auxiliary heat from operating when outdoor temperatures are above 30 degrees F, except when auxiliary heating is required during a defrost cycle or when emergency heating is required during a refrigeration cycle failure.

4.4.5 For heat pump systems with gas auxiliary heat, the auxiliary heat shall be controlled in such a manner that it does not engage when the outdoor air temperature is above the heating balance point (maximum 40 degrees F), except when supplemental heating is required during a defrost cycle or when emergency heating is required during a refrigeration cycle failure.

4.5 Equipment Selection and Air Handler Performance

Equipment selection shall be based upon the air handler (fan) performance when set at a medium speed to allow for fan speed adjustments that may be required to balance the duct system after installation.

5.0 EQUIPMENT INSTALLATION

5.1 Access

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

5.2 Location and Support of Indoor Units

Indoor units (i.e., air handler/furnace) shall be located to permit smooth duct transitions and shall be adequately supported or placed in a suitable platform in accordance with manufacturer's instructions and recommendations. If the unit is located in an unconditioned space, the cabinet shall be sealed to be airtight. Mastic is the preferred sealant for this application. However, when the use of mastic is not practical (e.g., around access doors), foil tape shall be an acceptable alternative.

5.3 Location and Support of Outdoor Units

Outdoor units shall be located to have minimal effect on the lifestyle of the residence and neighboring residences (i.e., noise, exhaust air, etc.). All local codes and ordinances shall be complied with whenever applicable. Outdoor units shall be located to avoid restrictions in the outdoor air stream. Units shall be mounted on an adequate, solid, secure pad, which provides proper drainage and prevents a buildup of water, snow, or ice. A minimum clearance shall be provided as per manufacturer's instructions and recommendations. In any installation there shall be a minimum of 3 inches of free and clear area under the outdoor coil drainage area. Condensate shall not drain onto areas where ice formation may create a hazard (e.g., walkways).

5.4 Refrigerant Charge

5.4.1 Technician shall follow manufacturer's guidelines when charging a new system and make any needed adjustments for non-standard line set lengths or mismatched coils.

5.4.2 Technician shall perform a refrigerant charge verification test on all systems installed or serviced in accordance with PTCS standards. Refrigerant charge testing shall include at least one of the following:

5.4.2.1 Discharge and (if needed) suction pressure(s) compared to manufacturer's table of expected pressures at various outdoor and indoor temperatures.

5.4.2.2 Heat pump system capacity in heating mode compared to expected capacity at outdoor conditions.

5.4.2.3 Superheat, sub-cooling, or (Lennox) approach temperature compared to manufacturer's targets.

5.4.3 Refrigerant charge test shall be performed and documented using the Proctor Engineering Group CheckMe! summer or winter protocol.

5.4.4 Results and documentation from refrigerant charge test shall be submitted to EWEB and the RTF-approved PTCS Service Provider.

6.0 DUCT SYSTEM REQUIREMENTS

6.1 Duct System Design Requirements

This section applies to all new ductwork, including the addition of duct systems to existing housing or significant alterations to existing duct systems. All new ductwork (including the addition of duct systems to existing housing) shall be designed and installed in accordance with recommended practice as outlined in ACCA - Manual D - Residential Duct Design; ACCA - Manual G - Selection of Distribution Systems; ACCA - Manual T - Air Distribution Basics; Sheet Metal and Air Conditioning Contractors National Association (SMACNA) - HVAC Systems Duct Design or ASHRAE - Fundamentals Handbook.

The HVAC contractor shall design the duct system to provide room-by-room cubic feet per minute (CFM) air delivery rates that are sufficient to meet the heating and cooling load requirements determined by the load calculations. If requested, the contractor shall provide EWEB a copy of the floor plan showing the location and CFM rates of each supply and return grille, as well as the design heating and cooling CFMs for the whole house.

6.1.1 Duct Materials Standards

Duct systems shall be constructed of metal or flex duct provided they are properly designed and installed.

For new duct systems, fiberglass duct board shall not be used. For existing duct systems, fiberglass duct board shall be replaced if practical.

Flex duct shall not be used for main supply trunks in crawl spaces or areas that could be subject to physical damage from normal occupant activities, weather or animals. When flex duct is used, the size shall be determined by using the "Wire Helix Flexible Duct" scale on an ACCA Duct Sizing Slide Rule, a friction chart for flex duct installations or sized at least one (1) inch larger in diameter than properly sized metal ducts. All other requirements in section 6.0 of these specifications shall be met.

6.1.2 Building Cavities and Ducts

In newly installed ductwork, building cavities shall not be used as ducts to convey return or supply air.

6.1.3 Static Losses

Supply and return ducts shall be designed on the basis of not more than 0.10 and 0.08 inches loss per 100 feet, respectively. Supply and return ducts shall be designed so that the total system static pressure does not exceed the available static pressure provided by the air handler at design CFM.

6.1.4 Maximum Velocities

New ductwork shall be designed so air velocities do not exceed the following:

Main Ducts	900 FPM
Branch Ducts	600 FPM
Supply Outlet Face Velocity	700 FPM
Return Grille Face Velocity	500 FPM
Filter Grille Face Velocity	300 FPM

Velocity shall not create unacceptable noise levels and return air shall be sufficient size to meet requirements of installed systems.

6.1.5 Supply and Return Registers

There shall be an air supply and return register in each room that can be isolated from the rest of the house by an operable door. A means of providing passive relief (e.g., pass-through grilles) of a minimum one square inch per CFM of supply air may be used in lieu of providing a return register.

Exception: Bathrooms, kitchens, and rooms with air supply needs that are less than 5 percent of the total system CFM for the house are not required to have a return register.

Return pathways shall limit absolute pressurization of axial zones to 3 Pascal (Pa) or less with reference to the main body of the house when the system is operating at maximum system airflow, tested with all doors closed. (That is, axial zone shall be within ±3 Pa of main body of house with air handler operating at maximum system airflow.)

6.1.6 Volume Dampers and Control Devices

6.1.6.1 Site-Built Homes

Supply ducts shall be equipped with a volume damper to allow for manual balancing of the airflows. Volume dampers can be located at the takeoff end of the branch duct or in the straight line of the duct just before the elbow to the register.

6.1.6.2 Manufactured Homes

Supply ducts may require a volume control device to allow for balancing of airflows. Such devices shall be located directly underneath the register. On installations with a crimping lip connecting the boot to the duct line, galvanized metal strips shall be used and securely fastened to the lip with screws.

Exception: For ducts without a crimping lip, other methods may be used for air balancing installed directly before the supply register, such as duct board material with a reduced size hole, commonly called donuts, or other similar devices. Exposed edges of duct board shall be taped with foil tape.

6.1.7 Other Components

Components such as refrigerant lines, condensate lines or other components (except approved volume dampers or control devices) shall not be installed in ducts.

6.2 Duct System Installation

6.2.1 Installation Requirements

Duct systems shall be installed in accordance with recommended industry standards of the Sheet Metal and Air Conditioning Contractors National Association (SMACNA).

6.2.2 Duct Connections and Supports

6.2.2.1 Metal Ducts

All new and all readily accessible existing metal duct joints and plenum drives shall be mechanically fastened with screws to provide a permanent connection. Field joints and seams, including factory seams on elbows, shall be sealed with mastic to be permanently airtight. Duct mastic, such as RCD Corp. #6 Mastic, is preferred. All metal ducts shall be supported to SMACNA installation standards and Program specifications.

6.2.2.2 Flex Ducts

Flexible ducts shall be attached to the duct-fitting collar using nylon/plastic compression straps tightened with a manufacturer approved tool (hand tightening is not acceptable) or stainless steel worm drive compression clamps. Mastic and/or tape shall not be used as mechanical fasteners.

The inner liner shall be sealed to the duct-fitting collar or metal sleeve using mastic and secured with compression straps or clamps. The insulation shall completely cover the duct-fitting collar or sleeve. The outer vapor barrier shall be sealed with compression strap or clamp.

Flex duct shall be supported in a manner that does not create restrictions in airflow and located to minimize bending. Flex ducts shall be adequately stretched prior to installation and shall be supported at a minimum of every four (4) feet. Sag or droop between supports shall not exceed two (2) inches. Support material shall be a minimum of two (2) inches wide and shall not crimp or crush the duct. Multiple supports shall be used at junctions.

6.2.3 Insulation

6.2.3.1 All newly installed rigid ducts and plenums and accessible un-insulated existing rigid ductwork outside the heated space shall be insulated to the "Minimum Insulation Requirements" stated in section 4.1.7. A vapor barrier meeting a flame spread rating of 25 or less and smoke developed rating of 50 or less (in accordance with ASTM E-84) shall be installed on the outside surface of the insulation.

6.2.3.2 All newly installed flexible HVAC ducts outside the heated space shall be Air Diffusion Council (ADC) certified shall be insulated to the "Minimum Insulation Requirements" stated in section 4.1.7.

6.2.3.3 All newly installed HVAC ducts routed within exterior wall cavities shall be insulated to the "Minimum Insulation Requirements" stated in section 4.1.7 between the duct and the exterior wall sheathing.

6.2.3.4 All duct insulation shall be installed and supported using mechanical fasteners such as permanent plastic straps or nylon twine. Tape is not a mechanical fastener. Approved tape may be used at insulation seams to provide a continuous barrier. Care shall be taken to avoid unnecessary crushing of the insulation.

6.2.4 Air Tightness

Where a substantial amount of ductwork is in unconditioned space, duct air tightness shall be certified by a PTCS Certified Duct Technician to meet PTCS Duct Program Standards and Testing Procedures (Exhibit D, Part 1). Rresults shall be documented on the PTCS Duct Sealing Certification and NW Duct Sealing Form (Exhibit D, Part 2) and submitted to EWEB and to an RTF approved PTCS Service Provider.

For State of Oregon tax credit purposes, contractor shall complete the appropriate Oregon Department of Energy (ODOE) Premium Efficiency Duct System Standards repair/sealing worksheet (Exhibit D, Part 3). Contractor is not required to submit the ODOE worksheets to EWEB.

When a combustion appliance (e.g., fireplace, wood/pellet stove, atmospherically vented gas water heater, etc.) is located within a conditioned space, an UL listed carbon monoxide (CO) detector shall be provided and installed to comply with the PTCS Duct Program Standards and Testing Procedures, and documented on the PTCS Duct Sealing Form.

6.2.4.1 Duct leakage in new construction shall not exceed 0.06 CFM50 x floor area served by the system (in square feet), or 75 CFM50, whichever is greater when tested in accordance with the PTCS duct leakage measurement protocol for "Total Leakage Testing" or "Leakage Testing to Exterior." If the air handler is located completely within conditioned space, it is not required to be in place during the test. If the air handler is located in unconditioned space, and it is not in place during the test, the leakage limit shall be decreased to 0.04 x floor area served by the system (in square feet) or 50 CFM50, whichever is greater.

6.2.4.2 Duct leakage in existing homes with new ducts shall not exceed 0.10 CFM50 x floor area served by the system (in square feet), or 75 CFM50, whichever is greater.

6.2.4.3 Duct leakage in existing homes with existing ducts shall not exceed 0.10 CFM50 x floor area (in square feet) served by the system; or it shall be documented that a 50 percent reduction in leakage to the exterior has been achieved by comparing duct leakage to the outside before and after sealing when tested in accordance with the PTCS duct leakage measurement protocol for "Leakage Testing to Exterior."

Exception: Where return ducts are inaccessible, compliance with either 0.10 CFM50 x floor area or a 50 percent reduction in leakage to the exterior (whichever is less) may be accomplished by testing the supply side only.

6.2.4.4 Duct leakage in manufactured homes shall either:

6.2.4.4.1 Not exceed 100 CFM50 for single wide homes or 150 CFM50 for double wide or larger homes; or

6.2.4.4.2 Be documented to have experienced a 50 percent reduction in leakage to the outside by comparing duct leakage to the outside before and after sealing.

6.3 System Airflow

6.3.1 All existing ductwork shall be inspected by the HVAC contractor for conditions which will affect the efficiency or proper operation of the new heat pump system. It is the participating contractor's responsibility to ensure existing ductwork is compatible with the equipment that is installed.

6.3.2 The air distribution system design and installation shall be such that airflow across the indoor coil is as specified in the heat pump manufacturer's literature, or is between 350 and 425 CFM per 12,000 BTU/hr output at ARI rating conditions if the manufacturer's literature is not specific.

6.3.3 After installation and start-up, total airflow in the heat pump mode (in CFM) across the heat pump coil shall be measured using a TrueFlow™ plate. The total airflow measurement test shall be performed and documented using the Proctor Engineering Group CheckMe! summer or winter protocol. Results and documentation from the total airflow measurement test shall be submitted to Proctor Engineering and EWEB.

6.3.4 The total external static pressure acting on the system air handler shall be tested with approved instruments and recorded at time of startup. A measured external static pressure of more than 0.8" (200 Pa) shall cause installer to consider taking corrective measures with system ductwork. The total external static pressure measurement test shall be performed and documented using the Proctor Engineering Group CheckMe! summer or winter protocol. Results and documentation from the total airflow measurement test shall be submitted to the Proctor Engineering and EWEB.

7.0 FILTERS

7.1 Location

Air filters shall be installed in the return air system in a location that will be easily accessible to the user for filter servicing and in a position where all return air and outside air will pass through the filters before crossing the indoor coil. Filters should not be installed in crawl spaces or attics.

7.2 Type and Size

Filter types and sizes shall meet or exceed the standard manufacturer's instructions and recommendations. Filters and/or air cleaners that are not an integral part of the equipment and selected by the manufacturer shall be accepted if the total CFM is within the range as specified by the manufacturer. Any filter that exceeds 0.22 inches pressure drop as installed shall not be allowed.

8.0 REFRIGERANT PIPING

This section applies to new piping and repairs made to existing 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

To maintain oil return to the compressor and avoid inefficiency and capacity loss, 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 IMC (International Mechanical Code).

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-inch-thick continuous closed-cell foam rubber. 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

Factory, as well as field 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.

9.0 CONDENSATE DRAIN PIPING AND PUMP

9.1 Manufacturer's Recommendations

Condensate drain piping (lines) shall meet IMC and shall be copper, plastic, or other corrosion-resistant material.

9.2 Condensate Drain Piping

Condensate drain lines shall be trapped and run to an open drain or outside of the building foundation. Under no circumstances may condensate be drained into a crawl space or direct connected into a sewer line. 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.

9.3 Condensate Pump

Condensate drain lines shall be pitched in the direction of flow to prevent backup of overflow of water in the drain pan. 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 dry well. 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.

10.0 ELECTRICAL WIRING

10.1 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.

11.0 INDOOR THERMOSTATS

11.1 Thermostat Requirements

A multi-stage digital thermostat shall be used to control the heat pump and the auxiliary/emergency heat. The first stage of the thermostat shall control the operation of the heat pump. The second stage of the thermostat shall control the operation of the auxiliary heat. Mercury-bulb type thermostats are not allowed.

11.2 Installation

Indoor thermostats shall be located and installed according to the manufacturer's instructions and recommendations. Thermostats shall be centrally located to provide a balanced temperature throughout the home. Generally, thermostats are installed 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.

11.3 Heating/Cooling Lockout
Thermostats used for both heating and cooling shall have a manual changeover feature or heating/cooling lockout to prevent cross cycling between heating and cooling.

11.4 Control of Electric Resistance Auxiliary Heat
Electric resistance auxiliary heat shall be energized from the second stage heat mode of the indoor thermostat. When the outdoor temperature is below 35 degrees F, the auxiliary heat shall be energized in 5 kW stages. The auxiliary heat shall be locked out when the outdoor temperature is above 35 degrees F, except during a defrost cycle or when emergency heating is required during a refrigeration cycle failure.

11.5 Auxiliary or Emergency Heat Indicator
Thermostat shall provide a visible indication when the auxiliary heat mode or emergency heat mode is operating.

11.6 Emergency Heat Switch
All indoor thermostats shall include a manual selector switch to permit auxiliary heat to be energized under control of the indoor thermostat (with the compressor and outdoor thermostats bypassed).

11.7 Use of Setbacks
If setbacks are desired, a ramped/intelligent recovery type digital thermostat shall be installed to limit use of auxiliary heat during the recovery period. Maximum recommended setback is 8 to 10 degrees.

12.0 HEAT PUMP SYSTEMS WITH GAS AUXILIARY HEAT

12.1 Approval
Heat pump systems with gas auxiliary heat may be installed under this program.

12.2 Heat Pump Sizing
The heat pump shall be sized to provide up to 125 percent of the cooling load.

12.3 Gas Auxiliary Heat Sizing
The gas auxiliary heat shall be sized to provide 100 percent of the design heating load or the nearest available furnace size shall be used.

12.4 Control of Gas Auxiliary and Emergency Heat
Except in the defrost mode, the heat pump and gas auxiliary heat (furnace) shall be prevented from operating simultaneously (unless heat pump manufacturer's special add-on heat pump control permits operation of both). At the heating balance point (maximum 35 degrees F), the heat pump shall switch off and the gas furnace shall switch on to provide the heat needed by the home. If the system uses staging or zonal control, such as Harmony or Infinity, then a 40 degrees F changeover point is acceptable. In the emergency heat mode, the gas furnace shall switch on and the heat pump shall be bypassed.

12.5 Indoor Coil Location

The indoor coil of the heat pump shall always be installed downstream of the heat exchanger for the gas furnace (according to the International Mechanical Code). Condensate from the indoor coil shall not be allowed to drip onto the heat exchanger for the gas furnace.

12.6 Airflow Requirements

The indoor fan and duct system shall be sized to meet the airflow requirements of the heat pump.

12.7 Installations in Conditioned Spaces

If the gas auxiliary furnace is installed within the conditioned space, it shall be a direct vent unit with combustion air ducted directly to the combustion chamber.

13.0 TESTING, BALANCING AND FINAL INSPECTIONS

13.1 Contractor Testing and Balancing

Participating contractor shall test and balance the heat pump and duct system to meet the Program specifications. Contractor shall complete and sign the Ducted Heat Pump Program Testing and Balancing Checklist, Exhibit C and submit it to EWEB with the following required supporting documentation.

13.1.1 Itemized customer invoice(s) for heat pump system and insulation as required by the contractor agreement including a summary of the system warranty information.

13.1.2 Completed CheckMe! summer or winter protocol data entry form (Exhibit F).

13.1.3 Completed PTCS Duct Sealing Form (Exhibit D, Part 2). For State of Oregon tax credit purposes, contractor shall complete the appropriate Oregon Department of Energy (ODOE) Premium Efficiency Duct System Standards repair/sealing worksheet (Exhibit D, Part 3). Contractor is not required to submit the ODOE worksheets to EWEB. However, contractor shall provide the customer with complete documentation to obtain any State of Oregon tax credit(s), if applicable. Note: The Oregon Department of Energy requires that a “proof of payment” (e.g., itemized receipts, contracts, or invoices dated and marked paid by the contractor) shall be submitted by the customer with the application for a Residential Energy Tax Credit.

13.2 EWEB Final Inspections

EWEB shall inspect all installations to ensure that each is completed in accordance with these specifications. Final inspections shall include some or all of the following methods: visual observation, blower door and duct blaster diagnostics, pressure pan measurements, measurement of air temperature rise across the heating coil, measurement of airflow at the air handler using a TrueFlow plate, verification of indoor thermostat settings (e.g., auxiliary heat lockout and compressor lockout).

14.0 REFERENCES

14.1 Regional Technical Forum (RTF) and Industry Standards

The Ducted Heat Pump Program Equipment and Installation Specifications are based upon the RTF and industry standards described in the following:

14.1.1 RTF PTCS - Air-Source Heat Pump System Installation Standards (April 15, 2007)

14.1.2 RTF PTCS - Duct Program Standards and Testing Procedures (June 6, 2006)

14.1.3 ACCA - Manual D - Residential Duct Systems

14.1.4 ACCA - Manual G - Selection of Distribution Systems

14.1.5 ACCA - Manual H - Heat Pump Systems Principles and Applications

14.1.6 ACCA - Manual J - Residential Load Calculation (7th edition or later)

14.1.7 ACCA - Manual RS - Comfort, Air Quality, & Efficiency by Design

14.1.8 ACCA - Manual S - Residential Equipment Selection

14.1.9 ACCA - Manual T - Air Distribution Basics

14.1.10 ACCA - Residential Duct Diagnostics and Repair

14.1.11 ACCA - Good HVAC Practices for Residential and Commercial Buildings

14.1.12 ASHRAE - Cooling and Heating Load Calculation Manual

14.1.13 ASHRAE - Fundamentals Handbook

14.1.14 SMACNA - HVAC Systems Duct Design

14.1.15 SMACNA - Installation Standards for Residential Heating and Air Conditioning Systems

14.1.16 American National Standards Institute (ANSI) / Air Conditioning Contractors of America (ACCA) - HVAC Quality Installation Specification (standard number ANSI / ACCA 5 QI-2007)