LV Model Guide Specification

1.0 General

Furnish and install FHP water source heat pumps as indicated on the plans with capacities and characteristics as listed in the schedule and the specifications that follow. The units shall be manufactured in an ISO 9001:2000 certified facility.

2.0 Horizontal/Vertical/Counterflow Water Source Heat Pumps

The units shall be designed to operate with entering fluid temperatures between 50˚F (10˚C) and 100˚F (38˚C) in cooling and between 50˚F (10˚C) and 80˚F (27˚C) in heating. With the optional factory installed extended range package, units shall operate with entering fluid temperatures between 50˚F (10˚C) and 110˚F (43.3˚C) in cooling and between 20˚F (-6.6˚C) and 80˚F (27˚C) in heating. Equivalent units from other manufacturers can be proposed, provided approval to bid is given 10 days prior to bid closing. All equipment with a nominal capacity of 135,000 BTUH Total Cooling or lower must be listed in the current AHRI Applied Equipment Directory under the AHRI Standard AHRI/ISO- 13256-1, WLHP, GWHP and GLHP certification points.

All equipment in this section must meet or exceed the DOE mandated minimum EER's and COP's as listed in ASHRAE 90.1 as follows:

For the AHRI/ISO-13256-1, WLHP Rating (12.0 EER and 4.2 COP for units larger than a nominal 17,000 BTUH Total Cooling – 11.2 EER and 4.2 COP for units below a nominal 17,000 BTUH Total Cooling).

For the AHRI/ISO-13256-1, GLHP Rating a minimum 13.4 EER and 3.1 COP. All units shall be listed with Underwriters Laboratories (UL) for safety.

2.01 Basic Construction

A. Units shall have the airflow arrangement as shown on the plans. If units with these arrangements are not used, the contractor supplying the water source heat pumps is responsible for any extra costs incurred by other trades and must submit detailed mechanical drawings showing ductwork requirements and changes or relocation of any other mechanical or electrical system. If other arrangements make servicing difficult, the contractor must provide access panels and clear routes to ease service. The architect must approve all changes 10 days prior to bid.

B. All units shall have stainless steel drain pans to comply with this project's IAQ requirements. Painted steel or plastic is not acceptable.

C. The cabinet shall be fabricated from heavy-gauge G-90 galvanized steel for superior corrosion protection. All interior surfaces shall be lined with 1/2" (12.7mm) thick, multi density, coated, glass fiber insulation. Insulation within the air handling section shall not have any exposed edges. All insulation must meet NFPA 90A and be certified to meet the GREENGUARD® Indoor Air Quality Standard for Low Emitting Products. One blower access panel and two compressor compartment access panels shall be removable with supply and return air ductwork in place.

D. Unit shall have a floating compressor or pan consisting of a 1/2" (12 mm) thick high density elastomeric pad between the compressor base plate and the unit base pan to prevent transmission of vibration to the structure.

E. Units shall have a 1" filter rack and 1" thick throwaway type glass fiber filter as standard. Units shall have an optional 2" thick pleated MERV 8 filter (size 007-070) or MERV 13 filter (size 015 and larger with upgraded ECM) available. The filter rack shall incorporate a 1" duct flange. The units shall have an insulated divider panel between the air handling section and the compressor

section to minimize the transmission of compressor noise, and to permit service testing without air bypass.

F. Cabinets shall have separate holes and knockouts for entrance of line voltage and low voltage control wiring.

Supply and return water connections shall be brass female pipe thread fittings and mounted flush to cabinet exterior. Connections that require a back up wrench or that extrude past the unit corner post are not acceptable. Condensate connections will be stainless steel female pipe thread fittings. Plastic is not acceptable.

G. Hanging brackets shall be provided as standard for horizontal units.

2.02 Fan and Motor Assembly

A. The fan shall be direct-drive centrifugal forward curved type with a dynamically balanced wheel. The housing and wheel shall be designed for quiet low velocity operation. The blower housing shall feature a removable inlet ring to facilitate removal and servicing of the fan motor. The fan motor shall be 3-speed, permanently lubricated, PSC type with thermal overload protection.

B. 15,000 Btu/Hr to 70,000 Btu/Hr models shall have an optional constant torque electronically commutated motor for premium fan efficiency. These motors shall feature 5 pre-programmed torque settings that can be changed in the field to match design requirements. 460 V – 3 Ph – 60 Hz units with these motors must be able to operate without the need for a neutral wire for the motor.

C. 15,000 Btu/Hr to 70,000 Btu/Hr models shall have an optional constant CFM electronically commutated motor for premium fan efficiency and constant air delivery over a wide range of external static pressures. These motors shall be field adjustable for +/- 15% of nominal design airflow. These motors shall provide feedback to the unit control box to verify motor operating mode and delivered CFM.

2.03 Refrigerant Circuit

Units shall use R-410A refrigerant. All units shall have a factory sealed and fully charged refrigerant circuit with the following components:

A. Hermetic compressor: Hermetic reciprocating, rotary, or scroll compressors shall be specifically designed for R-410A refrigerant and shall be internally sprung (if reciprocating), externally isolated and with thermal overload protection.

B. Refrigerant metering thermal expansion valves or capillary tubes.

C. The finned tube heat exchanger shall be constructed of lanced aluminum fins not exceeding sixteen fins per inch bonded to rifled copper tubes in a staggered pattern and will have a 600 PSIG (4140 kPa) working pressure. The heat exchanger shall have aluminum end sheets. Optional Air Coil Protection: The finned tube heat exchanger shall have optional DuoGuard™ protective coil coating. This corrosion protection shall consist of tin plated copper tubing with coated aluminum fins that must pass 1000 hours of ASTM B117 salt fog testing. Painted, dipped or e-coated heat exchangers are not acceptable.

D. Reversing valve. Reversing valves shall be fourway solenoid activated refrigerant valves which shall fail to the heating operation should the solenoid fail to function. Reversing valves which fail to the cooling operation shall not be allowed.

E. Coaxial (tube in tube) refrigerant to water heat exchanger. Refrigerant to water heat exchangers shall be of copper inner water tube and steel outer refrigerant tube design rated to withstand 600 PSIG working refrigerant pressure and 400 PSIG working water pressure. Shell and Tube style refrigerant to water heat exchangers shall be treated as pressure vessels and shall require refrigerant pressure relief valves piped to the exterior of the building. The contractor supplying the water source heat pumps with Shell and Tube heat exchangers shall be responsible for any additional installation costs. Brazed Plate water to refrigerant heat exchangers shall require additional centrifugal separators added to the supply water piping at each unit. Each separator shall have an automated clean out valve piped to a waste line. The contractor supplying water source heat pumps with Brazed Plate heat exchangers shall be responsible for any additional costs.

   Option for E: Cupro-Nickel water coil – The refrigerant to water heat exchanger shall be of Cupro-Nickel inner water tube construction.

F. Safety controls include both a high pressure and low pressure switch. Temperature sensors shall not replace these safety switches. See the controls section of this specification for additional information.

G. Access fittings shall be factory installed on high and low pressure refrigerant lines to facilitate field service.

H. Activation of any safety device shall prevent compressor operation via a lockout circuit. The lockout circuit shall be reset at the thermostat or at the contractor supplied disconnect switch. Units which may be reset at the disconnect switch only shall not be acceptable. Refer to solid state safety circuit below.

2.04 Electrical

Controls and safety devices will be factory wired and mounted within the unit. Controls shall include fan relay, compressor contactor, 24V transformer, reversing valve coil and solid state lockout controller, Unit Protection Module (UPM). The standard transformer shall be rated for a minimum 50 VA. All units shall be name-plated for use with time delay fuses or HACR circuit breakers. Unit controls shall be 24 volts.

Option: Optional transformers shall be rated 75VA and shall have a push button reset circuit breaker on the secondary power.

2.05 Solid-State Safety Circuit

All units shall have a solid-state UPM safety control circuit with the following features:

1. Anti-short cycle time delay (5 minute delay on break).
2. Random start time delay on initial power.
3. Brown out/surge/power interruption protection.
4. 120 second low pressure switch bypass timer.
5. High refrigerant pressure shutdown.
6. Low refrigerant pressure shutdown.

7. Low water temperature shutdown (adjustable for closed loop systems).

8. Air coil freeze protection shutdown.

9. High condensate level shutdown.

10.24 VAC alarm output for remote fault indication.

The UPM shall automatically reset after a safety shut down. Restart the unit if the cause of the shut down no longer exists (except for low temperature and high condensate level shutdowns). Should a fault re-occur within 60 minutes after reset, then a "hard" lockout will occur. A light emitting diode (LED) shall annunciate the following alarms: brown out, high refrigerant pressure, low refrigerant pressure, low water temperature and a high level of condensate in the drain pan. The LED will display each fault condition as soon as the fault occurs. If a hard lockout occurs, then the fault LED will display the type of fault until the unit is reset.

The UPM shall feature the following field configurable adjustments:

1. Lock out reset on thermostat interruption or power reset.

2. 2 or 4 restart attempts before a hard lockout.

3. Test mode (reduces all time delays to 5 seconds for diagnostic work).

4. Antifreeze setting for low water temperature sensor.

Safety devices include:

1. Low pressure cutout set a 40 PSIG (280 kPA) for loss of charge protection (freezestat and/or high discharge gas temperature sensor is not acceptable).

2. High pressure cutout control set at 600 PSIG (4125 kPA).

3. Low supply water temperature sensor that detects drops in refrigerant temperature that could result in water coax heat exchanger freezing.

4. Low air coil temperature sensor that detects drops in refrigerant temperature that could result in air heat exchanger freezing.

5. High level condensate sensor that shuts off the compressor if the condensate drain pan fills with water.

6. 6. On board voltage detection that disables the compressor control circuit if there are extreme variations in supply voltage.

An optional energy management relay that allows unit control by an external source shall be factory installed. A terminal block with screw terminals shall be provided for control wiring.

2.06 Options

A. Units shall have an optional 2-way electrically operated shut-off valve mounted internally in the unit cabinet.

B. Units shall have an optional water flow regulating valve set to 3 gallons per minute of water flow per nominal ton of refrigeration capacity.

C. Extra quiet construction: Optional compressor blanket shall be provided on units having a capacity above 18,000 BTUH.

D. Hot Gas Reheat: Units as noted on the schedule shall be equipped with optional Hot Gas Reheat (HGRH) on units having a capacity above 12,000 BTUH. HGRH shall be either on/off control or modulating as noted in the specifications.

   On/Off HGRH shall be controlled by a humidistat connected to the unit H terminal and shall start the unit in the reheat mode should the humidity be above set-point once the thermostat control is satisfied. Cooling or heating requirements shall take precedent over HGRH.

   Modulating Hot Gas Reheat (MHGRH) shall be active during the cooling mode. A 0 – 10 VDC signal from a sensor located in the unit discharge air supply shall modulate the hot gas valve to maintain an adjustable preset leaving air temperature to the conditioned space.

E. Hot Gas Bypass: For units as noted on the schedule, supply each unit with a ETL listed modulating hot gas bypass valve with factory supplied and installed controls to prevent air coils from frost development by taking hot gas and bypassing the water coil and expansion device and reintroducing the hot gas into the refrigerant line prior to the air coil. The hot gas bypass valve shall maintain a minimum refrigerant suction pressure to allow for a light load cooling mode or a low entering air temperature cooling mode.

F. Water Differential Pressure Switch: Prevents unit operation if there is no fluid flow. This factory installed, internally mounted device shall be rated at 600psi and disable the compressor if a lack of water-flow occurs.

G. Water Side Economizer: Water side economizer shall be completely installed at the factory, with an additional condensate drain pan, motorized 3 way valve, aqua stat, and all internal electric controls. Water side economizer shall be rated at 400 psi and UL listed for application with the heat pump. This option is externally mounted outside the unit.

H. Factory-installed control options: Water differential pressure switch, 75 VA transformer (resettable), phase loss and reversal protection, and unit mounted disconnect switch.

I. A 2", four-sided filter rack is optional to accommodate nominal 2" thick pleated filters.

J. DDC Controls: Unit shall be equipped with a factory installed DDC control capable of interfacing with BacNet, Modbus, N2 and Lonworks. The controller shall be preprogrammed to control the unit and monitor the safety controls. The unit shall be able to operate as a standalone or be incorporated into the building management system. A leaving water and leaving air sensor shall be installed in the unit. Wall sensors shall be available for controlling zone temperature.

3.0 Hose Kits

All units shall be connected with hoses. The hoses shall be either 2 or 3 feet long, braided stainless steel, fire rated hoses complete with adapters. Non-fire rated hoses are not acceptable. Optional ball valves with P/T ports, flow controller, Y strainer and electric valve shall be in included as specified in the schedule.