ES Model Guide Specifications

General

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

Equivalent units from other manufacturers can be proposed provided approval to bid is given 10 days prior to bid closing.

Horizontal, Vertical & Counterflow Water Source Heat Pumps

Units shall be designed to operate throughout the range of entering fluid temperature of 50°F to 110°F in the cooling mode and 30°F to 80°F in the heating mode (extended range allows for 20°F to 80°F in the heating mode). All equipment shall be lower than a nominal capacity of 135,000 BTU/h of Total Cooling (TC) listed in the current ARI Applied Equipment Directory under the ARI Standard ARI ISO-13256-1, WLHP, GWHP, and GLHP Rating.

All equipment in this section must meet or exceed the national standard minimum Energy Efficiency Ratio (EER) and Coefficient of Performance (COP) as listed in ASHRAE 90.1 per the following:

ARI-ISO-13256-1, WLHP Rating (13.0 EER and 4.3 COP for units with a nominal cooling capacity of

17,000 BTU/h or larger – 12.2 EER and 4.3 COP for units with a nominal cooling capacity lower than 17,000 BTU/h).

For the ARI-ISO-13256-1, GLHP Rating a minimum 13.4 EER and 3.1 COP.

All units shall be listed with Intertek (ETL), Nationally Recognized Testing Laboratories (NRTL) or Canadian Standards Association (CSA). All units shall have ARI-13256-1 labels with ETL or NRTL or CSA or equivalent labels.

Standard Construction

Units shall have the air flow 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. Contractor 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.**

All units shall have stainless steel drain pans to comply with this project's Indoor Air Quality (IAQ) requirements. No exceptions will be allowed.

All water source heat pumps shall be fabricated from G-90 galvanized sheet metal for corrosion protection.

All interior surfaces are lined with ½" thick, 1.5lb./ cubic foot dual density Micromat insulation for thermal insulation and acoustical attenuation (½" thick closed cell foam insulation is optional). Insulation must be non-combustible, non-hydroscopic and anti-fungal. Insulation must meet NFPA 90A and 90B for fire protection, UL181 erosion requirements, and be certified to meet GREENGUARD™ indoor air quality (IAQ) standards 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.

Unit shall be equipped with double compressor isolation. The unit shall have a floating base pan consisting of the compressor mounted on rubber grommets and a heavy gauge steel plate supported by a ½" (12 mm) thick, high density rubber pad on the base of the unit to prevent transmission of vibration to the structure.

All units shall have a factory installed four sided filter rack with access panel, capable of accepting either one or two inch filters. Units shall have a 1 inch thick, MERV-5 throwaway type glass fiber filter as standard. The filter rack shall incorporate a 1 inch duct flange. The contractor shall purchase one spare set of filters and replace the factory shipped construction filter upon completion of start-up.

High Efficiency Filtration – Units shall include MERV-8 or MERV-13 air filters. (optional)

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

Supply and return water connections shall be brass FPT fittings and shall be securely mounted flush to the cabinet allowing for connection to a flexible hose without the use of a back-up wrench. Water connections which protrude through the cabinet shall not be allowed.

Hanging brackets shall be provided as standard for horizontal units.

Condensate overflow protection sensor shall activate a circuit upon sensing when a high level of condensate water is in the drain pan resulting in a hard lockout in the unit.

Freeze protection sensors shall be provided on both sides of the refrigeration circuit. Sensors that measure water temperature shall not be allowed. (Refer to Solid State Safety Circuit section in this spec guide).

Fan Motor & Assembly

The blower housing shall feature a removable inlet ring to facilitate removal and servicing of the direct- drive centrifugal fan. The fan motor shall be isolated from the fan housing by torsionally flexible isolation.

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 fan housing shall be removable from the unit without disconnecting the supply air ductwork for servicing of the fan motor. The fan motor shall be a Constant CFM (airflow) ECM microprocessor controlled DC type motor with internal programming factory set for the specific unit and featuring soft start/stop and a delay off feature for maximum efficiency and quiet operation. Air flow rates shall be varied according to the staging of the unit. There will further be provisions for adjusting the air delivery of the motor and blower by +/- 15% from rated air flow.

The 460V-3PHz-60Hz units with these motors must be able to operate without the need for a neutral wire for the motor.

The fan and motor assembly must be capable of overcoming the external static pressures (ESP) as shown on the schedule. ESP rating of the unit shall be based on a wet coil. Ratings based on a dry coil will NOT be acceptable.

Refrigerant Circuit Components

Units shall use R-410A refrigerant. All units shall have a factory sealed and fully charged refrigerant circuit.

All units shall contain a sealed refrigerant circuit including a hermetic two stage scroll compressor, bidirectional thermal expansion valve metering device, finned tube air-to-refrigerant heat exchanger, refrigerant reversing valve and service ports. Compressor shall be high efficiency scroll type, designed for heat pump duty, quiet operation and mounted on rubber vibration isolators. Compressor motors shall be equipped with overload protection. Refrigerant reversing valves shall be pilot operated sliding piston type with replaceable encapsulated magnetic coils energized only during the cooling cycle. The finned tube coil shall be constructed of lanced aluminum fins not

exceeding fourteen fins per inch bonded to rifled copper tubes in a staggered pattern not less than three rows deep and have a 600 PSIG (4140 kPa) working pressure. Coils shall be uncoated standard with an optional tin plating on the copper tubing for protection against common forms of chemical and salt corrosion. Coil end plates shall be aluminum. The coaxial water-to-refrigerant heat exchanger shall be constructed of a convoluted copper (optional cupro-nickel) inner tube and steel outer tube with a designed refrigerant working pressure of 600 PSIG (4140 kPa) and a designed water side working pressure of no less than 450 PSIG (3100 kPa). The water-to-refrigerant heat exchanger shall be insulated to prevent condensation at low fluid temperatures.

Coaxial refrigerant to water heat exchanger shall be insulated to allow for geothermal applications.

Refrigerant safety controls shall include both high and low pressure safety switches. Temperature sensors shall not replace these safety switches.

Access fittings (Schrader Valves) shall be factory installed on high and low pressure refrigerant lines to facilitate field service.

Electrical

A control box shall be located within the unit and shall contain a transformer, controls for the compressor, reversing valve and fan motor and shall have a terminal block for low voltage field wiring connections. The transformer shall be rated for a minimum 75VA. All units shall be name- plated for use with time delay fuses or Heating, Air Conditioning & Refrigeration (HACR) circuit breakers.

Control transformer shall be rated for minimum All transformers shall have a push button reset circuit breaker on the secondary power.

Solid State Safety Circuit

All units shall have a solid-state Unit Protection Module (UPM) safety control circuit with the following features.

Anti-short cycle time delay on compressor operation (5 min. delay on break).

Random start on power up mode.

Brown out/surge/power interruption protection. Low Pressure Switch 120 second bypass timer. High refrigerant pressure shutdown.

Low refrigerant pressure shutdown.

Low water temperature shutdown. Freeze sensors shall monitor refrigerant temperature to the water coil in the heating mode and shall activate the lockout circuit when water temperature drops below either 15˚F or 30˚F depending on the selection.

15˚F is field selectable for installations utilizing antifreeze; see IOM for details.

Air coil freeze protection shutdown refrigerant coil in the cooling mode.

Condensate overflow protection: A condensate sensor shall activate the lockout circuit upon sensing a high level of condensate in the drain pan and immediately put the unit into a hard lockout. COP shall be standard on all units.

Alarm output which closes for either dry contact closure or 24 VAC remote fault indication. Alarm output is selectable for constant output for general alarm notification, or pulse output for annunciation of the specific fault alarm. Selectable reset of unit at thermostat or disconnect.

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.

Automatic intelligent reset. Unit shall automatically reset after a safety shut down and restart the unit after the anti-short cycle timer and random start timer expire. Should subsequent faults re-occur within 60 minutes after reset, then a permanent lockout will occur. Reset attempts shall be selectable for either 2 or 4 tries. A condensate overflow will place the unit in an immediate hard lockout.

Ability to defeat time delays for servicing (reduces all time delays to 5 seconds for diagnostic work).

A light emitting diode (LED) to indicate safety alarms. The LED shall annunciate the following alarms:

High refrigerant pressure. Low refrigerant pressure.

Low refrigerant temperature to the water coil in the heating operation

Low refrigerant temperature to the air coil in cooling operation.

High level of condensate in the drain pan.

Brown out/surge/ power interruption.

The LED will display each fault condition as soon as the fault occurs. If a permanent lockout occurs, then the fault will be transmitted to the alarm circuit output terminals until the unit is reset. ETL listed, and RFI, ESD, and transient protected.

Safety devices include:

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

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

Low supply water temperature sensor protection which monitors refrigerant temperature that could result in water heat exchanger freezing.

Low air coil temperature sensor protection which monitors refrigerant temperature that could result in air heat exchanger freezing.

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

On board voltage detection that disables the compressor control circuit if there are extreme variations exceeding +/- 10% in supply voltage.

Factory Installed Options

Extra quiet sound package: shall be provided with a compressor blanket and shall have ½" thick closed-cell foam insulation.

Closed cell foam: All units have available a ½" thick closed-cell foam insulation.

MERV Filtration: All units shall have a factory installed four sided filter rack with access panel and either 2" MERV-8 filter or MERV-13 pleated filter.

Evaporator Coil Tin-Plated: refrigerant to air coils shall have Tin-plated coating for enhanced protection against formicary and other forms of corrosion on copper tubing.

Cupro-Nickel Water Coil: the refrigerant to water heat exchanger shall be of cupro-nickel inner water tube construction.

All transformers shall be rated 100VA and shall have a push button reset circuit on the secondary power.

Hot Gas Reheat: Units as noted on the schedule shall be equipped with optional Hot Gas Reheat (HGRH). 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 setpoint once the thermostat control is satisfied. Cooling or heating requirements shall take precedent over HGRH.

Modulating Hot Gas Reheat (MHGRH) shall be active at all times. 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.

Passive Dehumidification can be achieved with the Constant Airflow ECM by reducing nominal airflow by 15%. This control feature lowers air coil temperature and prevents over-cooling of the space when in dehumidification mode.

Hot Gas Bypass: For units as noted on the schedule, supply each unit with a ETL listed and MEA 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.

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.

Water Flow Regulator (Automatic Flow Control Valves): Units shall have internal automatic flow control valves set to 3.0 GPM for nominal to of refrigeration capacity.

Two-Position Water Valve: Units shall have internally piped and wired 2-position water solenoid valve to close off flow if unit cycles off.

Heat Recovery Package: 208/230V-1Ph-60Hz and 208/230V-3Ph-60Hz units shall be equipped with factory installed internal heat recovery kit for domestic hot water production. This kit shall include an internally protected hot water circulation pump, copper double wall vented coaxial water-to- refrigerant heat exchanger, 140°F (60°C) hot water temperature limit switch and an on/off switch/ circuit breaker.

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

DDC Controls: Unit shall be equipped with a factory installed DDC control capable of interfacing with BACnet™, Modbus, N2 or Lon works® (with optional card).

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 integrated 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.

Unit mounted disconnect: A non fused factory mounted disconnect shall be installed on the unit.

Internal Electric Heat 208/230-1-60 and 208/230-3- 60 volt units shall be equipped with optional factory installed internal electric resistance heat for auxiliary and emergency heat. Electric heater must be Intertek (ETL) approved for safety when installed in the unit. External heater packages or heater packages not specifically listed for use with the unit are unacceptable. Electric heater packages shall include a heater collar mounted to the blower outlet, individual thermal overload protected heater elements no greater than 5kW each and magnetic contactors. Heater packages shall have a separate power supply connection from the compressor and this power supply shall also power the unit blower motor and control transformer for safe operation.

Relays shall be factory installed in the unit as follows:

EMS: Relay for remote enabling of the unit.

Auxiliary pump/valve relay to enable a pump/valve operation when calling for compressor operation.

Compressor monitoring relay – provides a contact closure whenever the compressor contactor is energized.

Blower monitoring relay – provides a contact closure whenever the blower motor is energized.

Boilerless control shall activate an electric heater (internal or external unit) and disable compressor should water temperature drop below set point.

Includes a relay and splitting the power supply to the unit into a blower motor and control power supply and a compressor power supply. The relay (when energized) deactivates the compressor control circuit.

Wire transformer for 208V operation. (available for voltage -1 & -3)

Phase loss and reversal protection shall be provided on the unit to protect the compressor from operating in reverse rotation on three phase units. (available for voltages -3 & -4)

A comfort alert module shall be installed in the unit to assist in service diagnostics (available for voltage -1)

Field Installed Options

All units shall be connected by hoses and have a maximum working pressure 400 PSI for sizes ½" – 1"and 300 PSI for sizes 1 ¼ – 2".

A variety of hose kits are available depending on the job requirement. Kits 2 through 6 include supply and return ported ball shut-off valves with P/T ports. Hose kit options are available in the accessories section of the BST selection software.

Kit 1 – Hose kit either 24" or 36" long.

Kit 2 – Hose kit with ball valves on the supply and return hoses. Valves shall have P/T ports to facilitate pressure and temperature readings.

Kit 3 – Hose kit with automatic flow control valve. The design flow rate is preset at the factory per the specified design conditions and shall automatically limit the flow to this value. This shall facilitate balancing of the fluid loop and allow each unit the required flow.

Kit 4 – Hose kit with an automatic flow control valve and a Y-strainer and blow down valve on the supply side. The filter screen is 20 mesh, 304 stainless steel. This shall prevent dirt and debris from entering the water coil.

Kit 5 – Hose kit with an automatic flow control valve and a 24V, 2-position solenoid valve on the return. This shall be used to shut off flow to the unit when there is not a call for heating or cooling. (Typically used with a VFD pumping.)

Kit 6 – Hose kit with an automatic flow control valve, Y-strainer/BD valve on the return. 24V, automatic flow valve, blow down valve and two position solenoid valve.

Thermostats

The unit control may utilize a multi-stage thermostat or the unit may have a DDC controller integrated into the building management system. All external low voltage control wiring is made to the thermostat terminal located in the unit electrical box. Thermostats may be manual change over, auto change over, programmable or non-programmable depending on the requirements of the project. A full line of thermostats are available for FHP products as an accessory.