SECTION 23 64 23.2

AIR COOLED HEAT RECOVERY MODULAR CHILLER

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Work Included: The air-cooled heat pump modular chiller system shall consist of individual modules that are assembled on site. Each module shall be completely factory wired, and tested prior to shipment and shall include a compressor, brazed plate heat exchanger for use as an evaporator or condenser depending on the operational mode, an aluminum fin/copper tube coil with fans for use as an outdoor evaporator or condenser depending on the operational modeand controls. Controls shall be designed to allow the master controller to operate slave modules in the event of a malfunction of any slave controller. The controls shall also be designed to operate on a distributed master control system which allows each individual slave microprocessor to operate on its own temperature sensor if there is a failure of the master microprocessor.

B. Related Work Specified Elsewhere: General Requirements of Division One and Section 15010 “Basic Mechanical Requirements” pertain to and are hereby made part of the work of this Section of the specifications.

1.2 QUALITY ASSURANCE

A. Heat pump modules shall be constructed in accordance with the UL 1995 and NEC standards and be UL or ETL listed.

B. Heat pump modules shall be rated and tested in accordance with ARI 550/590 – Standard for Water Chilling Packages.

C. Heat pump modules shall meet the safety standards of ANSI/ASHRAE 15 – Safety Standard for Refrigerated Systems.

1.3 SUBMITTALS

A. Submit complete drawings including cabinet dimensional details and anchor point locations, required clearances, location and sizes of field connections, performance data, electrical wiring diagrams, dry and operation weights, and all required electrical data.

B. Submit manufacturer’s installation instructions, including any remote panel installation instructions.

C. Operating and Maintenance manuals: provide two copies of current commercial manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer’s installation instructions for rigging, unloading, and transporting units.

B. Protect modules on site from physical damage after unloading.

1.5 WARRANTY

A. Entire unit: one year parts. Compressor: five years parts.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. ArctiChill, Multistack, GeoClima, ClimaCool, Aermec

2.2 HEAT PUMP MODULAR CHILLER

A. General: Each heat pump module shall be assembled on an integral epoxy coated welded channel steel frame and be enclosed with epoxy painted aluminum panels. The heat pump modules shall be shipped individually and assembled on site. Each module shall be fully charged with refrigerant and factory tested for capacity and controller functions prior to shipment. The heat pump modules must be built for single point power supply connection to a central distribution block. The electrical distribution panel shall incorporate circuit breakers to provide branch circuit overload protection and electrical isolation for each heat pump/heat recovery module. Electrical supply to each module shall consist of flexible conduit. No electrical connection to a module shall carry the load of more than that module. The electrical supply connections shall be factory assembled and shipped with each module for field connection into the electrical distribution panel.

The heat pump modular system is designed to operate in three modes: Cooling Only, Heating Only and Simultaneous Heating and Cooling.

Cooling Only mode: The integral brazed plate heat exchangers shall function as evaporators to cool building load fluid while the aluminum fin/copper tube coils with fans reject refrigerant heat to the atmosphere.

Simultaneous Heating and Cooling mode: Each individual heat pump module shall have the ability to be in either heating mode or cooling ode at any time to satisfy the building load.

Heating Only mode: The refrigerant cycle is reversed from the Cooling Only and Simultaneous Heating and Cooling modes such that the air cooled fin and tube coils function as evaporators and the integral brazed plate heat exchangers function as condensers to heat building load fluid.

B. Frame: Heat pump module frames shall be welded structural channel steel, epoxy powder coated with an oven baked finish.

C. Cabinet: Epoxy coated white aluminum panels on welded steel frame. The cabinet enclosures shall include easily removable access panels for service. Access panels shall be removable via stainless steel fasteners and retaining clips. Unit shall not require access via sheet metal screws or protruding threaded fasteners.

D. Compressors: Hermetically sealed scroll compressor on each refrigeration circuit each with rotalock connections, crankcase heater, oil level sight glasses, suction gas-cooled motor with solid-state sensors in the windings for overload protection, and in-line circuit breaker. There shall be two, independent compressors and refrigerant circuits per module. Compressors shall be mounted to the heavy gauge steel frame with rubber-in-shear isolators.

E. Integral Heat Exchanger: Dual circuit, 316 stainless steel, copper brazed plate heat exchanger in each module that functions as an evaporator or condenser depending on the cooling or heating demand. The supply and return fluid piping connections shall each include electronic modulating and manual isolation valves to allow servicing of each module individually, while the remaining modules continue to operate and to allow for variable flow and automatic isolation. The fluid connections to each heat exchanger shall use roll grooved couplings for service convenience and ease of installation. Heat exchangers shall be insulated with ¾" closed cell insulation. The minimum working pressure shall be 650 psi. .

F. Electronic control valves: Each heat pump module shall include an electronic isolation valve on the brazed plate heat exchanger that allows system flow to the active modules to match the cooling or heating requirements to the system load. The valves shall be the slow opening type to minimize the sudden change in flow to the previously active modules. The valves shall have a minimum opening cycle time of not less than 60 seconds between the fully closed and open position. The valves shall have a minimum close off pressure of not less than 75 psi.

G. Filters: A 40-mesh industrial grade filter strainer shall be factory installed between the header system and each brazed plate heat exchanger inlet. The strainer shall be serviceable by individual isolation valves that permit each strainer to be removed and cleaned without shutting down fluid flow or power to the entire system and allowing the remaining modules to continue to operate. In-line strainers that require complete system shutdown for service and isolation are not acceptable.

H. Air Cooled Coil: Aluminum fins mechanically bonded to copper tubes with integral subcooling circuits. Fin spacing shall not exceed 12 fins per inch. The coils shall be sized to provide full heat of rejection in Cooling Only mode at jobsite elevation above sea level, at a maximum 25 degree F temperature difference between the condensing temperature and ambient air temperature. The coils shall be factory tested to a minimum of 600 psig. The coil shall be manufactured such that it can operate as a condenser in Cooling Only Mode and Simultaneous Heating and Cooling Mode and as an evaporator in Heating Only mode.

I. Air cooled Coil Fan Motors: Condenser fan(s) shall be ultra-quiet, direct drive axial type with EC variable speed motors and integral head pressure control. The motors shall be rated for high ambient operation with a maximum rating of 60 °C.

J. Refrigerant piping: Piping shall be Type L seamless copper, and shall have an insulated suction line using closed cell pipe insulation, compressor rotalock service valves, solenoid valves for compressor pumpdown, and Schrader service valves in the suction, discharge, and liquid lines. Refrigerant specialties shall be included to allow for the use of the water source and air cooled condensers for heat of rejections.

K. Fluid Piping: The fluid piping shall be Schedule 40 steel and shall be insulated using closed cell pipe insulation to prevent condensation and heat loss. Each module shall have service valves for the independent isolation of the brazed plate heat exchanger and condenser, without affecting the fluid flow to the remaining modules. Each heat pump module shall connect to the adjacent module using Victaulic roll grooved steel couplings and neoprene gaskets.

L. Controls: The master heat pump module shall incorporate the master microprocessor controller. The master microprocessor shall communicate with the remaining slave microprocessors in each module via a local network communications protocol. Each microprocessor shall include; operational switches for each compressor; high and low refrigeration pressure switches; low pressure pump down switches; anti-short cycling compressor timers; minimum compressor run timers; and phase monitor to protect against low voltage, phase unbalance, phase loss, and phase reversal conditions. Each heat pump module shall incorporate its own flow safety switch for system redundancy and service isolation valve to permit changing of each individual flow switch while the remainder of the chiller modules are operational. Systems incorporating only one system flow switch are not acceptable. The master microprocessor controller shall read all analog and fault port values from all slave module controllers and shall be capable of passing values, compatible with the BACnet protocol, to the Building Management System.

Each of the three modes of operation – Cooling Mode, Heating Mode or Simultaneous Heating and Cooling - shall be designated by a BMS command or a command via the master microprocessor interface panel. Defrost of the air cooled coils shall be based on refrigerant pressure.

M. Microprocessor: The microprocessor shall provide the following minimum functions and alarms:
1. Adjustable fluid temperature set point
2. Multiple stage compressor control, including compressor rotation to provide even compressor usage and wear.
3. High and low fluid temperature alarm set points
4. Fluid inlet and outlet temperature
5. Suction and discharge refrigeration pressures
6. Compressor run status
7. Current alarm status
8. Demand load

9. Compressor run hours
10. Alarm logging with minimum of previously 100 logged alarms with time and date of each occurrence
11. Remote start stop input
12. Dry contact for general alarm

N. Interface Panel: A remote operator interface panel shall be provided to allow operator adjustment of user set points, and alarm monitoring. The remote interface panel shall be installed in the operator's control room. The wiring between the heat pump and the remote panel shall be provided and installed by the electrical contractor. The wiring shall be 6-conductor wiring with straight-through connections. The master microprocessor controller shall be compatible with BACnet gateways and allow for its installation and connection to the electrical service inside the master chiller control panel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Unit shall be installed in accordance with the Manufacturer's recommendations where shown on the drawings and other provided installation documents.

B. Contractor shall provide an automatic air separator on the system piping. The air separator shall include the following:
1. The air separator shall be designed to remove system air by means of creating a low velocity vortex to allow air separation and removal via an integral air collector tube.
2. The air separator shall have 4" flanged or grooved connections to match system piping.
3. Air separator shall have an internal strainer with 5/32" diameter perforations designed to direct the accumulated air to the automatic air vent valve.
4. Separator shall have a minimum working pressure of 125 psi, and shall carry the U-1 stamp as required by Section VIII of the ASME Boiler and Pressure Vessel Code.
5. The air separator shall be installed on the return piping to the chiller prior to warm fluid return connection.
6. Separator shall be manufactured by ITT Bell and Gossett or engineer approved equal.

C. Contractor shall provide an automatic air vent valve on the automatic air separator required in section B. The automatic air separator shall include the following:
1. The air separator shall be constructed of cast iron and fitted with stainless steel, brass and EPDM.
2. The air separator shall be a high capacity air separator with a minimum air vent opening of not less than 3/8".
3. The air vent shall be rated for a minimum working pressure of not less than 150 psi.
4. A gooseneck piping connection shall be installed on the air vent opening to prevent rain from entering into the air vent opening and being subjected to freezing in the air vent.
5. The high capacity air vent shall be ITT Bell and Gossett Model 107A or engineer approved equal.

D. Each heat pump module is shipped individually for field assembly. Field assembly shall consist of the following minimum steps:
1. Manifold load fluid and condenser fluid piping with factory supplied roll grooved connections. Insulate roll grooved connections after assembly.
2. Connect power supply wiring to the load distribution panel. Install wires to the proper terminals for proper phasing.
3. Connect all microprocessors together to form the local communication network. Wiring must be 20-gauge minimum, single twisted pair, shielded wiring.

3.2 PIPING FLUSHING PROCEDURE

A. Prior to connecting the heat pump modules to the building chilled fluid and hot fluid loops, the piping shall be flushed with a detergent and hot water (110-130 F) mixture to remove previously

accumulated dirt and other organic residue. In old piping systems with heavy encrustation of inorganic materials, consult a water treatment specialist for proper passivation and/or removal of these contaminants.

B. Prior to flushing, install a 60 mesh Y-type strainer or equivalent in the system piping. During the flushing process, examine and clean the strainer periodically as necessary to remove collected residue. The flushing process shall take not less than 6 hours or until the strainers, when examined after each flushing, are clean. Old systems with heavy encrustation shall be flushed for a minimum of 24 hours or until the strainers run clean. Detergent and acid concentrations shall be used in strict accordance with the respective chemical manufacturer's instructions. After flushing with detergent and/or dilute acid concentrations, the system loop shall be purged with clean water for at least one hour to ensure that all residual cleaning chemicals have been flushed out.

3.3 REFRIGERATION SYSTEM START-UP AND TESTING

A. Factory-supervised start-up and checkout with start-up report shall be provided for each module. Owner training by factory representative shall be provided.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK