

MODULAR CHILLERS

1. GENERAL

1.1 Related Sections

- .1 Section 01 33 00 - Submittal Procedures.

1.2 References

- .1 American National Standards Institute/Air-Conditioning, Heating and Refrigeration Institute (ANSI/AHRI)
 - .1 ANSI/AHRI 320, Standard for Water-Source Heat Pumps.
- .2 American National Standards Institute/National Fire Protection Association (ANSI/NFPA)
 - .1 ANSI/NFPA 90A-2012, Installation of Air Conditioning and Ventilating Systems.
- .3 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
 - .1 ASHRAE Standard 15-2010, Safety Standard for Refrigeration Systems.
- .4 Canadian Standards Association (CSA)
 - .1 [CSA C13256-2-01\(R2005\)](#) Water-Source Heat Pumps - Testing and Rating for Performance - Part 2: Water-to-Water and Brine-to-Water Heat Pumps .
 - .2 CAN/CSA-C656-2009(R2010), Performance Standard for Single Package Central Air Conditioners and Heat Pumps.
- .5 Environment Canada, (EC)/Environmental Protection Services (EPS)
 - .1 EPS 1/RA/2-1996, Code of Practice for Elimination of Fluorocarbons Emissions from Refrigeration and Air Conditioning Systems.
 - .2 Environment Canada-1994, Ozone-Depleting Substances Alternatives and Suppliers List.

1.3 Shop Drawings and Product Data

- .1 Submit shop drawings in accordance with Sections 01 33 00 - Submittal Procedures.
- .2 Indicate:
 - .1 Full load and Part load performance data for 100%, 75%, 50% and 25% load.
 - .2 Dimensional data and weights of all sections.
- .3 Product Data: Submit manufacturer's technical product data, including rated capacities of selected model clearly indicated, sound data, weights (shipping, installed, and operating), furnished specialties and accessories; and installation and start-up instructions.

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- .4 Shop Drawings: Submit manufacturer's assembly-type shop drawings indicating dimensions, weight loadings, required clearances, location and size of field connections, and methods of assembly of components. Locate any additional valves, strainers control valves required to complete the system.
- .5 Wiring Diagrams: Submit manufacturer's electrical requirements for power supply to units. Submit manufacturer's ladder-type wiring diagrams for interlock and control wiring. Clearly differentiate between portions of wiring that are factory-installed and portions to be field-installed and wiring by others.
- .6 Clearly identify all equipment and accessories included in quotation, as well as any Scope of Work excluded. List and identify any Scope of Work required of other companies.
- .7 Submit manufacturer's detailed warranty(s).

1.4 Start-Up And Installation Data

- .1 Factory certified refrigeration mechanical shall be responsible for:
 - .1 Furnishing complete installation drawings, templates, wiring diagrams, refrigerant piping diagrams, and instruction manuals for the equipment.
 - .2 Supervising and checking installation for compliance with manufacturer's recommendations.
 - .3 Checking out machines and actual start-up of same.
 - .4 Advising and assisting Contractor in making final adjustments, i.e.:
 - .1 Regulating flow of chilled water, sizing of piping, etc.
 - .2 To provide for proper balance and most economical operation, such as setting operating controls and setting and checking safety.
 - .5 Furnishing Engineers with a log of results, all balancing and adjusting for various load conditions including pressures, temperatures, flow quantities, etc.
 - .6 Furnishing Contractor and Engineer with exact location and arrangement of all piping thermostats, flow switches, gauges, thermometers, insertion wells, etc., required.
 - .7 Thoroughly instructing Owner's operating, personnel in proper operation of equipment.
 - .8 A 2 year service contract shall be provided by the manufacturer, using only factory certified technicians. Service contact shall include start-up, mid season operation and shut-down.

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1.5 Warranty

- .1 The refrigeration equipment manufacturer's warranty shall be for a period of five years from date of Total Performance. The warranty shall include parts and labour costs for the repair or replacement of defects in material or workmanship. The refrigerant warranty shall match the parts and labour warranty.

2. PRODUCTS

2.1 General

- .1 Chiller modules shall be completely factory assembled, wired and tested prior to shipment.
- .2 Chillers shall shut down on condenser high pressure, condenser low pressure, low or no chilled water flow, low leaving chilled water temperature and compressor motor overload.
- .3 Chiller performance shall be rated in accordance with AHRI Standard 550 for the conditions scheduled.
- .4 Chiller shall comply with the requirements of ASHRAE Standard 15 - Safety Code for Mechanical Refrigeration.

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- .1 Provide a complete packaged water chiller unit including: dual scroll compressors, single evaporator, single water cooled condenser, NEMA 4 control panel with through-the-door non-fused disconnect, three-phase fuses, motor starters, safety controls, water piping, refrigerant piping, wiring, mounted on steel base ready for connection to system chilled water piping and electrical power source.
- .2 PROPER FILTRATION AND WATER TREATMENT: To ensure proper operation of the chillers and to maintain the manufacturer's warranty, chiller modules must be installed and operated in accordance with the manufacturer's IOM manuals. Proper water filtration must be supplied with a minimum of a 30 mesh filter and water quality maintained with water treatment in both the evaporator and condenser loops. Provide suitably sized cast-iron basket strainer on condenser main header inlet, complete with valve-operated bypass, minimum 30-mesh filter. Provide suitably sized cast-iron basket strainer on evaporator main header inlet, complete with valve-operated bypass, minimum 30-mesh filter.
 - .1 An MLS-04 strainer complete with an automatic flush timer and differential pressure alarm shall be provided c/w T304 Stainless Steel Housing, T304 Screen Frames, T316 Screen Mesh, EPDM Gasget, Clamp and Handle: T304 Stainless Steel, 1/4" FNPT T304 Stainless Steel Inlet & Outlet Gauge Ports Are Standard (gauges not included)
- .3 The chiller module controller shall monitor all operating and fault conditions of the individual chiller module, display them in English on the door-mounted display, and communicate all of these points to the system Remote Master.
- .4 Refrigerant: 410a. Provide each chiller with a full charge of refrigerant and oil. Refrigerant pressures (high and low) are displayed on the chiller controller display.

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- .5 Compressors: Each chiller module shall be equipped with two (2) high efficiency 3500 rpm scroll compressors with oil-level sight glass, and solid state internal thermal protection, rubber mounted to the chiller module frame. Each compressor must be provided with circuit breaker or in-line fuses. Line voltage crankcase heaters with fuse protection.
- .6 Evaporator: Each chiller module shall be equipped with high efficiency dual-circuit brazed plate evaporator with 316 stainless steel plates and copper brazing, insulated with ¾" flexible elastomeric insulation. Refrigerant side pressure rating 4.48 MPa at 195°C and water side pressure rating 2.75MPa at 195°C. Evaporator shall be tested and certified to UL 207 7th edition and C22.2 no. 140.3-M1987 for refrigerant withstand pressure for use with R410a.
- .7 Condenser: Each chiller module shall be equipped with high efficiency dual-circuit brazed plate evaporator with 316 stainless steel plates and copper brazing. Refrigerant side pressure rating 4.48 MPa at 195°C and water side pressure rating 2.75 MPa at 195°C. Condenser shall be tested and certified to UL 207 7th edition and C22.2 no. 140.3-M1987 for refrigerant withstand pressure for use with R410a.
- .8 Refrigeration System: Each chiller module shall contain two independent refrigeration circuits each with liquid line, solenoid and liquid line filter drier, sight glass moisture indicator and thermal expansion valve. Suction line insulated with flexible elastomeric insulation.
- .9 Evaporator Water Headers: Branch headers shall be fabricated from Schedule 40 steel pipe roll-grooved and insulated with 20mm flexible elastomeric insulation, and equipped with inlet and outlet lever operated butterfly valves, and inlet and outlet water temperature sensors with brass wells. Branch headers shall be connected to 150mm or 200mm Schedule 40 chilled water main headers and insulated with 20mm flexible elastomeric insulation. Each chiller module shall be provided with its own flow switch and inlet and outlet temperature sensors to prevent freezing of the evaporator – use of one common flow switch across a bank of chiller modules shall not be acceptable for use as a safety device.
- .10 Condenser Water Headers: Branch headers shall be fabricated from Schedule 40 steel pipe roll-grooved, and equipped with inlet and outlet lever-operated butterfly valves, and inlet and outlet water temperature sensors with brass wells (on heat pump and heat reclaim chillers), Branch headers shall be connected to 150mm or 200mm Schedule 40 condenser water main headers.
- .11 Chiller Control Panel - NEMA (EEMAC) 4control panel shall be complete with door-mounted non-fused disconnect switch, chiller on-off switch, power on light, compressor fuses, compressor contactors, door-mounted four-line liquid crystal display, 24VAC control transformer with primary and secondary fuses and chiller PLC controller module. Panel shall come pre-wired to compressors, safety controls, and sensors.
- .12 Frame: Chiller base formed shall be formed from 2.5mm galvanized steel with bolted assembly, with 0.99mm stainless steel front panel, 0.9mme galvanized steel side and top panels. Panels shall be factory-installed on chillers with main headers to simplify installation and reduce installation time.
- .13 Chiller Module Controller: Chiller module controller shall monitor all operating and fault conditions and display them in English.

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- .1 Chiller must be able to automatically operate in a stand-alone mode if the Remote Master fails or the communications cable is cut and automatically report back to the Remote Master when the system communication is restored.
 - .1 Shall set compressor minimum run time, minimum off time, stage up and stage down time when operating in a stand-a-lone mode. Shall stage compressors on entering water temperature. Shall lead – lag compressors on a first in – first out basis and on compressor run time. Shall log compressor run hours and number of compressor starts.
 - .2 When an out-of-tolerance condition exists or a sensor fails the chiller shall stop the appropriate compressor and display the alarm fault condition on its display. (Note: If an optional network communication card is installed, the controller shall also signal the building BMS or DDC that an alarm condition exists.)
 - .3 Points that are sensed, displayed and used for alarm conditions - entering and leaving chilled water temperature, freeze temperature, suction and discharge refrigerant pressure each circuit, suction temperature each circuit (discharge temperature on heat reclaim and heat pump chillers), faults displayed and used for alarm conditions – chilled water flow switch and compressor internal protectors
 - .4 Include provision for interface to the site BMS via BACnet protocols.
 - .5 Shall control evaporator and condenser pump via signal from the building BMS.

3. EXECUTION

3.1 Installation

- .1 General
 - .1 Install in accordance with manufacturer's recommendations.
 - .2 Obtain installation and wiring diagrams, piping diagrams, etc., from manufacturer.
 - .3 Provide piping, valves and accessories to connect flow switches, oil piping, and other miscellaneous special devices or piping required for actual machine selected; obtain exact requirements from manufacturer of equipment before submitting bid.
 - .4 Install thermometers, flexible connectors, drain valves and pressure gauges at all inlets and outlets.
 - .5 Coordinate work in area adjacent to machine to insure adequate clearances for operating and service, as well as tube pulling space.
 - .6 Prevent freeze-up from any cause.
 - .7 Insulate completely as recommended by manufacturer those areas of unit not factory insulated.
- .2 Piping Connections

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- .1 Use flexible connectors at chilled water connections.
- .2 Verify chilled water IN and OUT, before piping.
- .3 Install thermometer wells, flow switches, pressure gauges, etc. as directed by manufacturer.
- .4 Install all necessary air vents, drains, controls, and auxiliary piping or accessories

3.2 .Start-Up and Commissioning

- .1 Manufacturer to certify installation.
- .2 Manufacturer to test and start up units and certify performance.
- .3 Manufacturer to provide verbal, video, and written instructions to operating personnel.
- .4 Submit written report to Contract Administrator.

3.1 Performance

- .1 Refer to Section 23 06 00 – Schedules for HVAC.

END OF SECTION