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**Part 1            General**

**1.1                RELATED REQUIREMENTS**

- .1    Section 23 05 00 - Common Work Results for HVAC
- .2    Section 23 05 49.01 - Seismic Protection Systems

**1.2                REFERENCES**

- .1    Air-Conditioning, Heating and Refrigeration Institute (AHRI)
  - .1    AHRI-550/590, Performance Rating of Water Chilling Packages Using the Vapor Compression Cycle.
- .2    ASTM International
  - .1    ASTM C547, Standard Specification for Mineral Fiber Pipe Insulation.
- .3    CSA International
  - .1    CSA B52, Mechanical Refrigeration Code.
- .4    Environment Canada, EC/Environmental Protection Services (EPS)
  - .1    EPS 1/RA/2, Environmental Code of Practice for Elimination of Fluorocarbons Emissions from Refrigeration and Air Conditioning Systems.

**1.3                ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Product Data:
  - .1    Submit manufacturer's instructions, printed product literature and data sheets for reciprocating water chillers and include product characteristics, performance criteria, physical size, finish and limitations.
- .3    Shop Drawings:
  - .1    Submit drawings stamped and signed by professional engineer registered or licensed in Canada, member of OIQ.
  - .2    Indicate:
    - .1    Equipment including connections, piping and fittings, valves, strainers, control assemblies and ancillaries, identifying factory and field assembled.
    - .2    Wiring as assembled and schematics.
    - .3    Dimensions, construction details, recommended installation and support, mounting bolt hole sizes and locations and point loads.
    - .4    Type of refrigerant used.

#### **1.4 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for reciprocating water chillers for incorporation into manual.
- .3 Data to include:
  - .1 Description of equipment giving manufacturers name, model type and year, capacity and serial numbers.
  - .2 Submit part load performance curves.
  - .3 Details on operation, servicing and maintenance.
  - .4 Recommended spare parts list.

#### **1.5 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Where materials or products are specified by their trademark, consult the Instructions to Bidders document for the procedures to follow regarding the request for approval for materials or product replacement.

#### **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect reciprocating water chillers from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

### **Part 2 Products**

#### **2.1 GENERAL**

- .1 Provide complete water cooled reciprocating chiller package including: compressor; evaporator; condenser, motor and motor starter; controls; control centre; piping; wiring; refrigeration and oil charge; ready for connection to chilled water circuit, and electric power source, installed in welded steel frame with heavy gauge panels and access doors finished to manufacturers standard.

#### **2.2 CAPACITY**

- .1 Arrangement of five (5) modular chillers to provide at least all of the following.
- .2 Certified ratings based on AHRI 550/590:

- .1 Cooling mode
    - .1 Power of at least 87.5 kW each to the operating conditions as listed in the tables in mechanical drawings.
  - .2 Heating mode
    - .1 Power of at least 87.5 kW each to the operating conditions as listed in the tables in mechanical drawings.
  - .3 Maximum pressure drop
    - .1 Evaporator: 35 kPa.
    - .2 Condenser: 20 kPa.
  - .4 Power input, including all electrical components: 100 kW.
  - .5 Fouling resistance coefficient: 0.000045 m<sup>2</sup>K/W
  - .6 Refrigerant: R410 or R134A.
- .3 Unit power input not to exceed 100 kW and capable of operating at line voltages of 600 V.
  - .4 Acceptable products: Florida Heat Pump FHP, Écogénia Climacool, Creotech, AERMEC or a replacement product approved by addendum in accordance with the Instructions to Bidders.

## **2.3 COMPRESSOR**

- .1 Module assembly provided with at least two compressors with scroll independent circuit with at least 8 stages of modulation by the power compressor deactivation to respond to a variation of the load or any other configuration providing a modulation of the least 8 stages.
- .2 Compressor to include suction and discharge shut-off valves; automatic reversing oil pump; oil sight glass; separate circuit crankcase heater; and cylinder unloading device.
- .3 Provide nameplate to show capacity at design temperature, type of refrigerant used and total weight in system.

## **2.4 COMPRESSOR MOTOR**

- .1 With overload protection and manual restart: 600 V.

## **2.5 EVAPORATOR**

- .1 Steel shell and seamless copper tube, gasketed heads, direct expansion: to CSA B52.
- .2 Stainless steel heat exchanger.
- .3 Insulated to R=0.53 m<sup>2</sup>.degrees C/W minimum.

## **2.6 CONDENSER**

- .1 Water cooled:
  - .1 Steel shell and copper tube, removable heads, pressure relief device, purge and charge cock and liquid shut-off valve: to CSA B52.

- .2 Water regulating valve: sensing condensing or head pressure to control water flow.

## **2.7 REFRIGERANT PIPING**

- .1 Refrigerant piping, valves, fittings and related parts: to CSA B52, Section 23 23 00 - Refrigerant Piping and include, thermal expansion valve; suction and discharge regulators; combination filter/dryer complete with replaceable core; solenoid stop valves; liquid sight glasses; and high side pressure relief device.
- .2 Suction line insulation: flexible elastomeric, unicellular insulation to ASTM C547 and to Section 23 07 15 - Thermal Insulation for Piping.

## **2.8 CONTROL CENTRE**

- .1 To EEMAC standard and include:
  - .1 Control circuit ON/OFF switch.
  - .2 Oil pressure safety switch.
  - .3 High and low pressure safety switch.
  - .4 Water temperature controller.
  - .5 Suction and discharge pressure gauges and shut-off valves.
  - .6 Oil pressure gauges.
  - .7 Chilled water flow switch.
  - .8 Compressor short cycling and restart delay timer.
  - .9 Starting sequence switches.
  - .10 Compressor circuit breakers.
  - .11 Reset low water temperature cut-out switch.
  - .12 Motor contactors, control relays and indicator lights to include: "start-stop" switch; anti-recycle 10 minute time delay; low chilled water temperature cutout and automatic reset; oil heater signal light; manual reset power failure and signal light; chilled water flow interruption light meter to indicate number of compressor starts and elapsed running time.
  - .13 Field power and control circuit terminal blocks.
  - .14 Alarm for refrigerant leakage.

## **Part 3 Execution**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for water chiller installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### **3.2 APPLICATION**

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

### **3.3 GENERAL**

- .1 Provide appropriate protection apparatus.
- .2 Install unit as indicated, to manufacturers recommendations, and in accordance with EPS 1/RA/2.
- .3 Ensure adequate clearances for servicing and maintenance.
- .4 Manufacturer to approve installation, to supervise startup and to instruct operators.
  - .1 Include 2 days per unit.

### **3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
  - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for reuse/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### **3.5 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by water chiller installation.

**END OF SECTION**