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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
- .3    Screw chillers should be selected together with inland water towers to optimize the energy efficiency of the cooling system - cooling tower (see Section 23 65 10 - Condensers, Coolers and Cooling Towers).

**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    CSA International
  - .1    CSA B52, Mechanical Refrigeration Code.
- .3    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 rotary-screw water chillers and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2    The performance criteria must demonstrate that the proposed operation temperatures of the chiller – cooling tower system optimizes the energy efficiency of the system.
- .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.

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## **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 [rotary-screw 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 Provide 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 rotary-screw 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 screw type chiller package including: compressor; evaporator; condenser, motor and motor starter; controls; control centre; piping; wiring; refrigeration and oil change; ready for connection to chilled water circuit, and electric power source, installed in welded steel frame with heavy gauge panels finished to manufacturers standard.

## **2.2 CAPACITY**

- .1 Certified ratings based on AHRI 550/590:
  - .1 350 KW, when cooling 10.85 L/s of water and propylene glycol 40% from 12.2 degrees C to 3.89 degrees C; pressure drop not to exceed 80 kPa.
  - .2 Water cooled condenser supplied with 13.95 L/s of water at 31.67 degrees C, pressure drop not to exceed 30 kPa.
  - .3 Power input, including electrical components: 100 kW.
  - .4 Fouling resistance coefficient: 0.000045 m<sup>2</sup>K/W
  - .5 With two compressor and independent refrigeration circuits.
  - .6 Refrigerant: R410 or R134a.
- .2 Temperatures and flow at condenser are indicative. These should minimize water tower size and maximize energy efficiency of the cooler.
- .3 Unit power input not to exceed 100 kW and capable of operating at line voltages of 600 V.
- .4 Acceptable products: Trane RTWD, Carrier, York, Daikin or a replacement product approved by addendum in accordance with the Instructions to Bidders.

## **2.3 COMPRESSOR**

- .1 At least two semi-hermetic scroll compressors and screw design
- .2 Unloaded start with capacity modulation by continuous linear modulation of slide valve in response to load change.
- .3 Compressor to include suction and discharge shut-off valves; oil sight glass; separate circuit crankcase heater; and cylinder unloading device.
- .4 Provide nameplate to show capacity at design temperature, type of refrigerant used and total weight in system.

## **2.4 COMPRESSOR MOTOR**

- .1 Open type with overload protection and manual restart: 600 V.
- .2 High performance efficiency.

## **2.5 STARTER**

- .1 Supplied Starter manufactured according to the supplier's requirements.
- .2 The construction, their individual components, cables, testing and installing comply with electrical codes "National Electrical Code" and "Code of the National Electrical Manufacturers Association" and all other requirements of the competent authorities.

## 2.6 EVAPORATOR

- .1 Steel shell and seamless copper tube, gasketed heads, direct expansion: to CSA B52. Insulated to  $R=0.53 \text{ m}^2 \cdot \text{degrees C/W}$  minimum.
- .2 Designed for operating pressures of 1035 kPa on the water side and of 1380 kPa on the refrigerant side.

## 2.7 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 Designed for operating pressures of 1035 kPa on the water side and of 1380 kPa on the refrigerant side.

## 2.8 CONTROL CENTRE

- .1 To EEMAC standard and include:
  - .1 Control circuit ON/OFF switch.
  - .2 Bacnet MS/TP interface.
  - .3 Oil pressure safety switch.
  - .4 High and low pressure safety switch.
  - .5 Water temperature controller.
  - .6 Suction and discharge pressure gauges and shut-off valves.
  - .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 30 minute time delay; low chilled water temperature cutout and automatic reset; excess purge signal light and reset switch; manual/automatic oil pump operating switch and signal light; oil heater signal light; manual reset power failure and signal light; chilled water flow interruption light metre to indicate number of compressor starts and elapsed running time.
  - .13 Field power and control circuit terminal blocks.
  - .14 Alarm for refrigerant leakage.

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**Part 3            Execution**

**3.1                EXAMINATION**

- .1      Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for rotary-screw 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. Include 3 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 rotary-screw water chiller installation.

**END OF SECTION**