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SECTION 23 6423.21 - AIR-COOLED WATER CHILLERS (PREPURCHASE)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other related Specification sections, apply to this section.

1.2 SUMMARY

A. Section includes design, performance criteria, refrigerants, controls, and installation requirements for air-cooled scroll compressor chillers.

1.3 DEFINITIONS

A. BAS: Building automation system.

B. COP: Coefficient of performance. The ratio of the rate of heat removal to the rate of energy input using consistent units for any given set of rating conditions.

C. DDC: Direct digital control.

D. EER: Energy-efficiency ratio. The ratio of the cooling capacity given in Btu/h to the total power input given in watts at any given set of rating conditions.

E. GFI: Ground fault interrupt.

F. IPLV: Integrated part-load value. A single-number part-load efficiency figure of merit for a single chiller calculated per the method defined by AHRI 550/590 and referenced to AHRI standard rating conditions.

G. I/O: Input/output.

H. kW/Ton: The ratio of total power input of the chiller in kilowatts to the net refrigerating capacity in tons at any given set of rating conditions.

I. NPLV: Nonstandard part-load value. A single number part-load efficiency figure of merit for a single chiller calculated per the method defined by AHRI 550/590 and intended for operating conditions other than the AHRI standard rating conditions.

J. SCCR: Short-circuit current rating.

K. TEAO: Totally enclosed air over.

L. TENV: Totally enclosed nonventilating.

1.4 ACTION SUBMITTALS

A. Shop Drawings: Complete set of manufacturer's prints of water chiller assemblies, control panels, sections and elevations, and unit isolation. Include the following:

1. Dimensioned plan and elevation view drawings, required clearances, and location of all field connections
2. Summary of all auxiliary utility requirements such as electricity, water, etc. Summary shall indicate quality and quantity of each required utility.
3. Single line schematic drawing of the field power hookup requirements, indicating all items that are furnished.
4. Schematic diagram of control system indicating points for field interface/connection.
5. Diagram shall fully delineate field and factory wiring.
6. Installation and operating manuals.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:

1. Plans on which the following items are shown and coordinated with each other, using input from installers of the items involved:
   a. Structural supports.
   b. Piping roughing-in requirements.
   c. Wiring roughing-in requirements, including spaces reserved for electrical equipment.
   d. Access requirements, including working clearances for mechanical controls and electrical equipment, and tube pull and service clearances.

2. Coordination drawings showing plan, section and elevation views.
3. Each view to show screened background with the following:
   a. Column grids, beams, columns, and concrete housekeeping pads.
   b. Layout with walls, floors, and roofs, including each room name and number.
   c. Equipment and products of other trades that are located in vicinity of chillers and part of final installation, such as plumbing systems.

B. Certificates: For certification required in “Quality Assurance” Article.

C. Installation instructions.

D. Source quality-control reports.

E. Startup service reports.

F. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each water chiller to include in emergency, operation, and maintenance manuals.

B. Spare Parts List: Recommended spare parts list with quantity for each.

C. Touchup Paint Description: Detailed description of paint used in application of finish coat to allow for procurement of a matching paint.

D. Instructional Videos: Including those that are prerecorded and those that are recorded during training **by the contractor/installer**.

1.7 QUALITY ASSURANCE

A. Comply with applicable Standards/Codes of AHRI 550/590, ANSI/ASHRAE 15, ETL, cETL, NEC, and OSHA as adopted by the State.

B. Units shall meet the efficiency standards of the current version of ASHRAE Standard 90.1, and FEMP standard 2012.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Chiller shall be delivered to the job site completely assembled and charged with refrigerant and oil by the manufacturer.

B. Vendor shall provide manufacturer's instructions for rigging and handling **of** equipment **to the contractor/installer**.

C. **The Vendor shall oversee offloading of chillers to ensure that the manufacturer's requirements are followed.**

1.9 WARRANTY

A. Base Warranty:

1. The Bidders hereby agree to warrant the equipment and services supplied under this Contract to be of good workmanship and of proper materials in accordance with these Bid Documents, free from defects and suitable for the intended use for a minimum period of one (1) year. The warranty shall provide for repair or replacement due to failure by material and workmanship that prove defective within the above period, **including parts, labor, and** refrigerant. The warranty period shall commence on the date of SUBSTANTIAL COMPLETION OF THE PROJECT, as established by the Owner and Engineer of Record and documented in the project close-out documents. It is the Vendor's responsibility to monitor the progress of the installation and to contact the Engineer of Record to ascertain the Date of Substantial Completion.
2. The Vendor agrees to respond to warranty service requests within 4 hours of notification by the Owner or Owner's representative and to repair or replace warranted equipment within **72** hours of receipt of the request. The Vendor agrees, if directed, to provide temporary equipment as necessary to maintain acceptable conditions at no additional cost to the Owner if the repair cannot be completed within **72** hours. However, if the Vendor does not respond within 4 hours or is unable to complete the repair within **72** hours, the

Vendor acknowledges that the Owner has the option to proceed with the repair and agrees to reimburse the Owner for all costs.

3. In addition to the manufacturer's standard warranty, the Vendor shall execute and submit a written Warranty. The required format and details of coverage pertaining to the Vendor's warranty is provided in these Bid Documents.
4. Any coil repairs shall be field coated in the field. Coating shall be compatible and match the original coil's coating performance. Any coil replacements shall be coated in a factory environment.

B. Extended Warranties:

1. **Alternate A - 5-year Parts:** The Vendor shall provide an alternate price to extend the base Warranty. The Alternate A Warranty will begin upon expiration of the base Warranty and will end five years from the base Warranty commencement date. The extended Warranty will provide the same coverage as the base Warranty for parts only. The Vendor agrees to respond to Warranty **parts** requests within 4 hours of **confirmed** notification by the Owner or Owner's representative. Parts shall be delivered to the site within **48**-hours **of confirmed notification**.
2. **Alternate B - 10-year Parts:** The Vendor shall provide an alternate price to further extend the base Warranty. The Alternate B Warranty will begin upon expiration of the base Warranty and will end ten years from the base Warranty commencement date. The extended Warranty will provide the same coverage as the base Warranty for parts only. The Vendor agrees to respond to Warranty **parts** requests within 4 hours of **confirmed** notification by the Owner or Owner's representative. Parts shall be delivered to the site within **48**-hours **of confirmed notification**.
3. **Alternate C - 5-year Parts, Labor, Refrigerant, and Preventative Maintenance:**
   a. The Vendor shall provide an alternate price to extend the base Warranty. The Alternate C Warranty will begin upon expiration of the base Warranty and will end five years from the base Warranty commencement date. The extended Warranty will provide the same coverage as the base Warranty.
   b. The Vendor shall provide an alternate price for all preventive maintenance services listed herein, for a period commencing on the date of SUBSTANTIAL COMPLETION OF THE PROJECT and ending five years from the date of SUBSTANTIAL COMPLETION OF THE PROJECT.
      1) Required Preventative Maintenance tasks are listed below. It will be the responsibility of the Vendor to schedule service calls with the District's Maintenance Department a minimum of 2 weeks in advance of the scheduled date. The report shall be forwarded via e-mail within seven (7) days of the service call.
      2) Provide a report to the Owner, to include the logs and calculations required below, and a checklist in the below-listed format as well as recommendations for corrective actions.
      3) If purchased, the Vendor shall execute and submit a Preventative Maintenance Agreement. The required format of the agreement is provided elsewhere in these Bid Documents.
      4) Tasks to be performed four (4) times per year, beginning 3 months after SUBSTANTIAL COMPLETION OF THE PROJECT:
         a) Log all operating conditions and compare data to original design requirements
         b) Check operating and safety controls
         c) Check overall condition of the unit

d) Inspect starters
e) Inspect contactors and relays, replace as necessary
f) Inspect condenser fan motors and blades
g) Check for proper condenser fan rotation
h) **Clean** condenser coils **using cleaner/degreaser equivalent to Enviro-coil and salt remover equivalent to CHLOR*RID DTS as directed by the coil coating manufacturer.**
i) Check for unusual noise and vibration
j) Check compressor crankcase heater operation
k) Check vibration eliminators
l) Check condenser coils
m) Check supply voltage. Voltage to be nominal voltage +10%.
n) Check amperage draw of motors
o) Check controller operation and alarm history
p) Check sensor calibration
q) Log chiller operating parameters
r) Check system pressures and temperatures
s) Check refrigerant charge and check sight glass for presence of moisture
t) Check compressor oil level(s)
u) Inspect for refrigerant and oil leaks
v) Check chilled water flow switch operation
w) Inspect pump seal
x) Check accuracy of thermistors, replace if > +2ºF (1.2ºC) variance from calibrated thermometer
y) Check accuracy of transducers, replace if > +5 psi (34.47kPa) variance
z) Check that proper concentration of glycol is present in the chilled water loop where applicable
aa) Check refrigerant filter driers for excessive pressure drop, replace as necessary
bb) Check chilled water strainers, clean as necessary

5) In addition to the above, perform these tasks at the 4th visit. These tasks are to be performed yearly within 2 weeks of the SUBSTANTIAL COMPLETION OF THE PROJECT date:
a) Conduct refrigerant leak test and repair minor leaks
b) Inspect condenser fan mounting hardware
c) Lubricate the condenser fan bearings
d) Meg hermetic motors
e) Check and tighten electrical connections
f) Check tightness of the motor terminal connections
g) Check for software upgrades
h) Calculate refrigerant loss rate
i) Test the low water temperature control device. Calibrate and record setting
j) Test the oil pressure safety device(s). Calibrate and record setting
k) Test oil for acid content and discoloration
l) Clean motor starter and cabinet
m) Check condition of the contacts for wear and pitting
n) Verify the operation of electrical interlocks

4. **Alternate D - 10-year Parts, Labor, Refrigerant, and Preventative Maintenance:**

a. The Vendor shall provide an alternate price to further extend the base Warranty. The Alternate D Warranty will begin upon expiration of the base Warranty and will end ten years from the original Warranty commencement date. The extended Warranty will provide the same coverage as the base Warranty.

b. The Vendor shall provide an alternate price for all preventive maintenance services listed herein, for a period commencing on the date of SUBSTANTIAL COMPLETION OF THE PROJECT and ending **ten** years from the date of SUBSTANTIAL COMPLETION OF THE PROJECT. The required Preventative Maintenance tasks shall be as noted in Alternate C above.

PART 2 - PRODUCTS

2.1 UNIT DESCRIPTION

A. Provide and install as shown on the plans factory-assembled, factory-charged air-cooled scroll compressor packaged chillers in the quantity specified. Each chiller shall consist of hermetic scroll compressor sets (total of 4 to 6 compressors), brazed plate evaporator, air-cooled condenser section, microprocessor-based control system and all components necessary for controlled unit operation.

B. Chiller shall be functionally tested at the factory to ensure trouble free field operation

2.2 DESIGN REQUIREMENTS

A. Flow Range: The chiller shall have the ability to support variable flow range down to 45% of nominal design (based on AHRI conditions).

B. Operating Range: The chiller shall have the ability to control leaving chilled fluid temperature from 40F to 60F.

C. General: Provide a complete scroll compressor packaged chiller as specified herein and as shown on the drawings. The unit shall be in accordance with the standards referenced in section 1.02 and any local codes in effect.

D. Performance: Refer to the schedule of performance on the drawings. The chiller shall be capable of stable operation to a minimum percentage of full load (without hot gas bypass) of 25%. Performance shall be in accordance with AHRI Standard 550/590.

E. Acoustics: Sound pressure levels for the unit shall not exceed the specified levels, see chiller equipment schedule. All manufacturers shall provide the necessary sound treatment (parts and labor) to meet these levels if required. Sound data shall be provided with the quotation. Test shall be in accordance with AHRI Standard 370.

2.3 CHILLER COMPONENTS

A. Compressor

1. The compressors shall be sealed hermetic, scroll type with crankcase oil heater and suction strainer. The compressor motor shall be refrigerant gas cooled, high torque, hermetic induction type, two-pole, with inherent thermal protection on all three phases and shall be mounted on RIS vibration isolator pads. The compressors shall be equipped with an internal module providing compressor protection and communication capability.

B. Evaporator

1. The evaporator shall be a compact, high efficiency, dual circuit, barrel & tube, or brazed plate-to-plate type heat exchanger consisting of parallel stainless-steel plates. The water-side working pressure shall be a minimum of 653 psig (4502 kPa). Vent and drain connections shall be provided in the inlet and outlet chilled water piping by the installing contractor. Evaporators shall be designed and constructed according to, and listed by, Underwriters Laboratories (UL).
2. The water-side maximum design pressure shall be rated at a minimum of 653 psig (4502 kPa). Evaporators shall be designed and constructed according to, and listed by Underwriters Laboratories (UL).

C. Condenser

1. Condenser fans shall be propeller type arranged for vertical air discharge and individually driven by direct-drive fan motors. The fans shall be equipped with a heavy-gauge vinyl-coated fan guard. Fan motors shall be TEAO type with permanently lubricated ball bearings, inherent overload protection, three-phase, direct-drive, 1140 rpm. Each fan section shall be partitioned to avoid cross circulation.
2. Coil shall be microchannel design and shall have a series of flat tubes containing multiple, parallel flow microchannels layered between the refrigerant manifolds. Tubes shall be 9153 aluminum alloy. Tubes made of 3102 alloy or other alloys of lower corrosion resistance shall not be accepted. Coils shall consist of a two-pass arrangement. Each condenser coil shall be factory leak tested with high-pressure air under water.
3. Condenser coils shall include baked epoxy coating providing 6000+ hour salt spray resistance (ASTM B117-90) applied to both the coil and the coil frames.
4. **Alternate E – Copper Tube / Aluminum Fin Condenser Coil:** The Vendor shall provide an alternate price for a condenser coil constructed of a copper tube with aluminum fins. The alternate coil shall be factory coated per 23 6423.21-2.C.3 above.

D. Refrigerant Circuit

1. Each of the two refrigerant circuits shall include a replaceable-core refrigerant filter-drier, sight glass with moisture indicator, liquid line solenoid valve (no exceptions), expansion valve, and insulated suction line.

E. Construction

1. Unit casing and all structural members and rails shall be fabricated of pre-painted or galvanized steel. Painted parts shall be able to meet ASTM B117, **6,000**-hour salt spray test.
2. Upper condenser coil section of unit shall have protective, 12 GA, PVC-coated, wire grille guards.
3. All chilled surfaces shall be factory insulated.

F. Control System

1. A centrally located weatherproof control panel shall contain the field power connection points, control interlock terminals, and control system. Box shall be designed in accordance with NEMA 3R rating. Power and starting components shall include factory circuit breaker for fan motors and control circuit, individual contactors for each fan motor, solid-state compressor three-phase motor overload protection, inherent fan motor overload protection and two power blocks (one per circuit) for connection to remote, contractor supplied disconnect switches. Hinged access doors shall be lockable. Barrier panels or separate enclosures are required to protect against accidental contact with line voltage when accessing the control system.
2. Shall include high short circuit current rating of 65,000 amps (25,000 amps at 575Volt) with single-point disconnect switch

G. Unit Controller

1. An advanced DDC microprocessor unit controller with a liquid crystal display provides the operating and protection functions. The controller shall take preemptive limiting action in case of high discharge pressure or low evaporator pressure. The controller shall contain the following features as a minimum:
2. The unit shall be protected in two ways: (1) by alarms that shut the unit down and require manual reset to restore unit operation and (2) by limit alarms that reduce unit operation in response to some out-of-limit condition. Shut down alarms shall activate an alarm signal.
3. Shutdown Alarms
   a. No evaporator water flow (auto-restart)
   b. Sensor failures
   c. Low evaporator pressure
   d. Evaporator freeze protection
   e. High condenser pressure
   f. Outside ambient temperature (auto-restart)
   g. Motor protection system
   h. Phase voltage protection

4. Limit Alarms
   a. Condenser pressure stage down, unloads unit at high discharge pressures.
   b. Low evaporator pressure hold, holds stage #1 until pressure rises.
   c. Low evaporator pressure unload, shuts off one compressor.

5. Unit Enable Section
   a. Enables unit operation from either local keypad, digital input, or BAS

6. Unit Mode Selection
   a. Selects standard cooling or test operation mode

7. Analog Inputs:
   a. Reset of leaving water temperature, 4-20 mA\
   b. Current Limit

8. Digital Inputs

a. Unit off switch
b. Remote start/stop
c. Flow switch
d. Motor protection

9. Digital Outputs
   a. Shutdown alarm; field wired, activates on an alarm condition, off when alarm is cleared
   b. Evaporator pump; field wired, starts pump when unit is set to start

10. Condenser fan control - The unit controller shall provide control of condenser fans based on compressor discharge pressure.
11. Building Automation System (BAS) Interface
    a. Factory mounted DDC controller(s) shall support operation on a Schneider Controls BAS network via BACnet®.
    b. The information communicated between the BAS and the factory mounted unit controllers shall include the reading and writing of data to allow unit monitoring, control and alarm notification as specified in the unit sequence of operation and the unit points list.
    c. All communication from the chiller unit controller as specified in the points list shall be via standard BACnet objects. BACnet communications shall conform to the BACnet protocol (ANSI/ASHRAE135-2001). A BACnet Protocol Implementation Conformance Statement (PICS) shall be provided along with the unit submittal.

2.4 OPTIONS AND ACCESSORIES

A. The following options are to be included:

1. Hot Gas Bypass: allows unit operation to 10 percent of full load. Includes factory-mounted hot gas bypass valve, solenoid valve, and manual shutoff valve for each circuit.
2. Phase loss with under/over voltage protection and with LED indication of the fault type to guard against compressor motor burnout.
3. BAS interface module to provide interface with the BACnet MSTP protocol.
4. The following accessories, if selected, are to be included:
   a. Rubber-in-shear vibration isolators for field installation
   b. Factory-mounted thermal dispersion type flow switch
   c. Field provided Wye strainer, to be installed at the evaporator inlet and sized for the design flow rate, with perforation diameter of 0.063" with blowdown valve and Victaulic couplings

2.5 MANUFACTURER

A. Subject to compliance with requirements, provide air handling units of one the following:

1. Daikin Applied (Basis of Design)
2. Carrier Corporation
3. Other prior approved scroll chiller manufacturers will be considered. Requests for prior approval shall be made before the end of the question and answer period.

B. All bidders shall include unit performance data and physical unit dimensions with their bid. Any performance degradation with respect to the chiller placement within the chiller yard and its containment walls shall be noted in the bid submittal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The Chillers must operate on the existing electrical feed.

3.2 INSTALLATION

A. Refer to Specification 23 6423.22 - Installation of Installation of Air-Cooled Water Chillers for installation by the Contractor.

B. The Vendor shall assist with BACnet to Schneider Controls integration in the field as required at no additional cost to the Owner.

3.2 STARTUP SERVICE

A. The installing Contractor (Installer) shall be responsible for the installation of the equipment and any associated piping and wiring in accordance with the manufacturer's recommendations. Contractor (Installer) shall be responsible for coordinating control and electrical control work. Installer shall notify the **manufacturer's representative** 10 days prior to start-up procedure **and shall complete a chiller pre-start checklist and forward it to the manufacturer's representative 5 working days prior to requested start-up date**. The Contractor (Installer) shall also be responsible for placing the pumps and system in proper operation so that a load is available for the start-up of the machines.

B. Factory Start-up

1. Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assemblies, installations, and connections.
2. Complete installation and startup checks according to manufacturer's written instructions and perform the following:
    a. Verify that refrigerant charge is sufficient and water chiller has been leak tested.
    b. Verify that pumps are installed and functional.
    c. Verify that thermometers and gages are installed.
    d. Operate water chiller for run-in period.
    e. Check bearing lubrication and oil levels.
    f. Verify that refrigerant pressure relief device for chillers installed indoors is vented outside.
    g. Verify proper motor rotation.
    h. Verify static deflection of vibration isolators, including deflection during water chiller startup and shutdown.
    i. Verify and record performance of water chiller protection devices.

j. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

3. Visually inspect chiller for damage before starting. Repair or replace damaged components, including insulation. Do not start chiller until damage that is detrimental to operation has been corrected.
4. Prepare a written startup report that records results of tests and inspections.

3.3 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain water chillers.

1. Instructor shall be factory trained and certified.
2. Provide not less than eight hours of training.
3. Train personnel in operation and maintenance and to obtain maximum efficiency in plant operation.
4. Provide instructional videos showing general operation and maintenance that are coordinated with operation and maintenance manuals.
5. Obtain Owner sign-off that training is complete.
6. Owner training shall be held at Project site.

END OF SECTION

SECTION 23 6423.22 – INSTALLATION OF AIR-COOLED WATER CHILLERS

For reference only – This work is being provided under a different contract and is provided for coordination purposes only

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division – 1 specification sections, apply to work of this section.

B. Division 23 Basic Mechanical Materials and Methods section apply to work of this section.

C. This information pertains to equipment indicated as Owner-furnished ("prepurchased") equipment on the bid documents. The term "Installer" in these notes refers to the awarded General Contractor for the Chiller Replacement Project. All costs associated with the requirements assigned to the Installer herein are to be included in the Bid amount.

D. "Vendor" refers to the firm who is awarded the prepurchased equipment contract. The names of the Vendors and product information for prepurchased equipment will be communicated to the installation bidders prior to receipt of bids.

E. Should any information provided herein conflict with other information in the Chiller Replacement Project plans and specifications, the requirements listed herein shall govern.

1.2 SCOPE:

A. The air-cooled water chiller equipment will be purchased directly by the Owner. The work under this section shall include furnishing of all labor and performing all operations necessary for the complete installation of the prepurchased chiller equipment and all related equipment as shown, detailed, and/or scheduled on the drawings, and/or specified in this section of the specifications. Certain other responsibilities, including delivery, pre start up checkout, Owner's training, manufacturer's warranty, etc. are to be performed by the Vendor under direct contract with the Owner. All work indicated to be performed by the Vendor, Manufacturer, or Manufacturer's Representative is not a part of the Installer's work.

B. Refer for Division 26 sections for the following work; not work of this section.

1. Power supply wiring from power source to power connection on chiller contactor enclosure. Include disconnects and starters as a part of Division 23 where specified as furnished, or factory-installed, by manufacturer.
2. Control power circuit from power source to chiller control panel in chiller.

C. Provide the following electrical work as work of this section, complying with requirements of Division 26 sections:

1. Control wiring and conduit between field-installed controls, indicating devices, and pump control panels.
2. Control wiring and conduit specified as indicated in Section 23 0900 - HVAC Control Systems.
3. Interlock wiring specified as factory-installed is work of this section.

1.3 PRE-PURCHASED EQUIPMENT DELIVERY

A. Vendors are required to deliver the equipment to the job site within a specific delivery window. The Installer may, with a minimum of 4 weeks prior notice to the Vendor, shift the delivery window to start later and/or change the delivery location to the Installer's storage facility.

B. Delivery will occur between **June 1 and June 15, 2020**, for all equipment.

C. Vendors are required to deliver the equipment between the hours of 8:00 a.m. and 3:00 pm Monday through Friday, excluding holidays. The Vendor is required to contact the Installer a minimum of 48 hours prior to the start of the delivery window to confirm the delivery date and location. In addition, the Vendor is required to contact the Installer a minimum of 24 hours prior to delivery to coordinate the exact time within a 2-hour window.

D. The Vendor will make arrangements with the Installer for offloading. Offloading shall be performed by the Installer at the Installer's expense. Damages occurring during offloading shall be the responsibility of the Installer, unless the damage occurs as a result of insufficient or defective packing by the Vendor, or inadequate instructions or supervision by the Vendor.

E. The Vendor's contract includes the requirement to oversee offloading of chillers to ensure that the manufacturer's requirements are followed. The Installer shall coordinate with the Vendor to ensure that the manufacturer’s requirements are followed.

1.4 PREPURCHASED EQUIPMENT START-UP SUPPORT

A. The Vendor is required to provide a complete checkout of the finished installation and to perform pre-startup inspections by a manufacturer's representative. **Installer shall notify the manufacturer’s representative 10 days prior to start-up procedure. The installer shall complete a chiller pre-start checklist and forward it to the manufacturer’s representative 5 working days prior to requested start-up date.**

B. The initial startup of the chillers shall be performed by the Installer under the supervision of the manufacturer's representative (Vendor).

1.5 PREPURCHASED EQUIPMENT OWNER TRAINING AND CLOSE OUT REQUIREMENTS

A. The Vendor is required to provide Owner Training in the operation and maintenance of the equipment, and is required to obtain a sign-in sheet for **the** session, to be submitted with the Vendor’s Close Out Documents. The Installer shall be responsible for coordinating, scheduling and overseeing the Owner Training immediately upon receiving a written request from the Vendor.

B. The Vendor is required to respond to the Installer's e-mailed or written request for Owner Training and to provide training no later than 2 weeks after substantial completion.

C. The Vendor is required to submit close out documents directly to the Owner for the Owner-furnished equipment not more than two weeks after substantial completion of the project or phase.

1.6. PREPURCHASED EQUIPMENT WARRANTY RESPONSIBILITIES

A. The Vendor is required to provide a minimum one-year warranty on all prepurchased equipment, commencing on the date of substantial completion of the project or phase in which the equipment was accepted. This **parts, labor, and refrigerant** warranty covers all costs associated with the repair or replacement of defective parts, as well as the removal and replacement of incidental materials, provided the defect was deemed to be a manufacturer's defect.

B. During the initial one-year warranty period, the Owner shall contact the Installer for diagnosis of potential warranty issues. Issues deemed to be the responsibility of the Vendor shall be referred to the Vendor, in writing, by the Installer, with a copy to the Owner. Upon completion of the repair, the Installer is required to confirm that the repairs are acceptable and to notify the Owner. The Installer shall not be entitled to additional compensation for the coordination of warranty repairs during the one-year warranty period.

C. The Vendor is required to respond to warranty claims within **4** hours of notification by the Installer and to repair or replace the covered equipment within **72** hours of **confirmed notification**, **or** provide temporary replacement equipment when required to maintain acceptable conditions in an occupied facility.

PART 2 - PRODUCTS

2.1 GENERAL:

A. The Installer shall install as shown on the plans factory assembled, factory charged, and factory run tested air-cooled chillers in the quantity specified. Refer to Specification Section 23 6423.21 - Air-Cooled Water Chillers (which is included for information purposes only) for a description of the chillers. A copy of the submittal for the actual prepurchased chiller will be issued in an addendum.

2.2 START-UP SERVICE:

A. The installing Contractor (Installer) shall be responsible for the installation of the equipment and any associated piping and wiring in accordance with the manufacturer's recommendations. Contractor (Installer) shall be responsible for coordinating control and electrical control work. Installer shall notify the manufacturer 10 days prior to start-up procedure. The Contractor (Installer) shall also be responsible for placing the pumps and system in proper operation so that a load is available for the start-up of the machines.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before water chiller installation, examine roughing-in for equipment support, anchor-bolt sizes and locations, piping, controls, and electrical connections to verify actual locations, sizes, and other conditions affecting water chiller performance, maintenance, and operations.

1. Water chiller locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping, controls, and electrical connections.
2. Must operate on the existing electrical feed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT

A. Each piece of equipment shall be installed in accordance with the approved recommendations of the manufacturer to conform to the contract documents. The installation shall be accomplished by personnel skilled in this type of work.

B. Each piece of equipment shall be installed to be free of noise and vibration. Provide vibration isolators as per manufacturer's recommendations and/or as herein specified.

C. The prepurchased chiller equipment will be delivered to the site as part of the direct purchase agreement in manufacturer's original packaging. Clearly mark each item with the proper identification number. Store the equipment in accordance with the requirements of Section 23 0000.

3.3 CHILLER INSTALLATION

A. Coordinate sizes and locations of bases with actual equipment provided.

B. Equipment Mounting:

1. The chillers will be placed on the existing chiller pads.

C. Maintain manufacturer's recommended clearances for service and maintenance.

D. Maintain clearances required by governing code.

E. Chiller shall be factory charged with refrigerant and oil.

3.4 PIPING CONNECTIONS

F. Comply with requirements in Section 23 2113 "Hydronic Piping" and Section 23 2116 "Hydronic Piping Specialties." Drawings indicate general arrangement of piping, fittings, and specialties.

G. Where installing piping adjacent to chillers, allow space for service and maintenance.

H. Evaporator Fluid Connections:

1. Connect directly to evaporator inlet, a field provided **0.063" perforation Wye** strainer. Provide with shutoff valve, flexible connector, thermometer, and plugged tee with pressure gage.
2. Connect to evaporator outlet with shutoff valve, balancing valve, flexible connector, flow switch, thermometer, plugged tee with pressure gage, flow meter, and drain connection with valve.
3. Make connections to water chiller with a flange or mechanical coupling.

I. Connect each drain connection with a drain valve, full size of drain connection.

J. Connect each chiller vent connection with a manual vent, full size of vent connection.

3.5 ELECTRICAL POWER CONNECTIONS

K. Connect wiring according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

L. Ground equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."

M. Provide nameplate for each electrical connection indicating electrical equipment designation and circuit number feeding connection. Nameplate shall be laminated phenolic layers of black with engraved white letters at least 1/2 inch high. Locate nameplate where easily visible.

3.6 CONTROLS CONNECTIONS

N. Install control and electrical power wiring to field-mounted control devices.

O. Connect control wiring between chillers and other equipment to interlock operation as required to provide a complete and functioning system.

P. Connect control wiring between chiller control interface and DDC system for remote monitoring and control of chillers. Comply with requirements in Section 23 09 23 "Direct Digital Control (DDC) System for HVAC." **Controls shall utilize chiller pump start/stop output signal when available to operate pumps.**

Q. Provide nameplate on face of chiller control panel indicating control equipment designation serving chiller and the I/O point designation for each control connection. Nameplate shall be laminated phenolic layers of black with engraved white letters at least 1/2 inch high.

3.7 STARTUP SERVICE

A. Refer to Specification 23 6423.21 – "Air-Cooled Water Chillers" for start-up service by the equipment vendor.

3.8 DEMONSTRATION

A. Refer to Specification 23 6423.21 – "Air-Cooled Water Chillers" for equipment demonstration by the equipment vendor.

3.9 WARRANTY

A. Each chiller shall be provided with a one-year warranty for installing labor **including system and equipment trouble-shooting and diagnostics** by the contractor (Installer). **The installing contractor shall contact the vendor(s) as needed for in-warranty work.**

END OF SECTION