PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes packaged, water-cooled, electric-motor-driven, centrifugal water chillers with the following features:
   1. Motor controller.
   2. Microprocessor-based controls.

B. See Division 23 Section "Refrigerant Detection and Alarm" for refrigerant monitors, alarms, and ventilation equipment interlocks.

1.2 SUBMITTALS

A. Product Data: For each model indicated, provide the following:
   1. Dimensioned prints of water chiller assemblies, including control panels, sections, and elevations, and unit isolation.
   2. Structural support requirements.
   3. Piping roughing-in requirements.
   4. Wiring roughing-in requirements, including spaces reserved for electrical equipment.
   5. Access requirements, including working clearances for mechanical controls and electrical equipment, and tube pull and service clearances.

B. Operation and maintenance data.

C. Warranties: Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

A. ARI Certification: Signed by manufacturer certifying compliance with requirements in ARI 550/590, "Water Chilling Packages Using the Vapor Compression Cycle."

B. ASHRAE Certification: Signed by manufacturer certifying compliance with ASHRAE 15 for safety code for mechanical refrigeration. Comply with ASHRAE Guideline 3 for refrigerant leaks, recovery, and handling and storage requirements.

C. ASME Compliance: Fabricate and label water chiller heat exchangers to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. Comply with NFPA 70.

E. Comply with UL 1995.
1.4 WARRANTY

A. Special Warranty: (5) five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. YORK International Corporation.

2.2 PACKAGED WATER CHILLERS

A. Description: Factory-assembled and -tested water chiller complete with compressor, evaporator, condenser, controls, interconnecting unit piping and wiring, indicated accessories, and mounting frame.

2.3 COMPRESSORS

A. Description: Variable displacement with gear-or direct-drive, [open or] hermetically sealed motor.
   1. Casing: Cast iron, precision ground.
   2. Impeller: High strength, cast-aluminum alloy on carbon or forged-steel shaft; dynamically balanced.

B. Capacity Control: Variable-inlet guide-vane assembly for stable operation that is free of surge, cavitation, or vibration throughout throttling range from 100 to 10 percent of full load.

C. Oil Lubrication System: Positive-displacement submersible pump with heater, oil filter, and sight glass.

D. Refrigerant and Oil: HFC-134a with compatible oil.

E. Refrigerant Compatibility: Seals, O-rings, motor windings on hermetic compressors, and internal water chiller parts exposed to refrigerants shall be fully compatible with refrigerants, and pressure components shall be rated for refrigerant pressures.

2.4 HEAT EXCHANGERS

A. Evaporator:
   1. Description: Shell-and-tube design, ASME labeled.
   3. Tube Construction: Individually replaceable, expanded into tube sheets.
a. Material: Copper.
b. Minimum Size: 3/4-inch OD; 0.028-inch wall thickness.
c. Internal Finish: Enhanced.

4. Water Box: Standard, with design working pressure of 150 psig, and having flanged or grooved mechanical-joint coupling water-nozzle connections with a thermistor-type temperature sensor factory installed in each nozzle. Provide vent and drain connections with plugs.

B. Condenser:

1. Description: Shell-and-tube design, ASME labeled.
3. Tube Construction: Externally enhanced and individually replaceable, expanded into tube sheets.
   a. Material: Copper.
   b. Minimum Size: 3/4-inch OD; 0.028-inch wall thickness.
   c. Internal Finish: Enhanced.
4. Water Box: Standard, with design working pressure of 150 psig, and having flanged or grooved mechanical-joint coupling water-nozzle connections with a thermistor-type temperature sensor factory installed in each nozzle. Provide vent and drain connections with plugs.

2.5 INSULATION

A. Cold Surfaces: Closed-cell, flexible elastomeric, thermal insulation complying with ASTM C 534, Type II, for sheet materials.

2.6 PAINT

A. Paint: Factory coat all exposed surfaces with enamel primer and finish coat, or baked-on powder paint.

2.7 ACCESSORIES

A. Pressure Relief Devices.
   1. Rupture Disc: Frangible carbon disc on HCFC-123 water chillers.
   2. Relief Valve: Single or multiple-reseating-type, spring-loaded relief valve on HFC-134a water chillers.

B. Purge System: On water chiller which utilize HCFC-123 refrigerant, provide a factory mounted, air, water, or refrigerant cooled purge system; with operating controls, piping, elapsed-time meter, and refrigerant service valves to isolate the purge unit from the chilling unit.

2.8 CONTROLS
A. Control Panel: Stand-alone, microprocessor based, factory-wired to control transformer in starter.

B. Enclosure: Unit-mounted, NEMA 250, Type 1 enclosure, hinged and lockable.

C. Status Display: Multiple-character liquid-crystal display or light-emitting diodes and keypad. Display the following conditions:
   1. Date and time.
   2. Operating or alarm status.
   3. Operating hours.
   4. Temperature and pressure operating set points.
   5. Entering and leaving temperatures of chilled water and condenser water.
   6. Refrigerant pressures in evaporator and condenser.
   7. Saturation temperature in evaporator and condenser.
   8. Oil temperature and pressure.
  11. Number of compressor starts.
  12. Purge suction temperature if purge system is provided.
  13. Purge elapsed time if purge system is provided.

D. Control Functions:
   1. Manual or automatic startup and shutdown time schedule.
   2. Leaving chilled-water temperature, and motor load limit.
   3. Current limit and demand limit.
   4. External water chiller emergency stop.

E. Manually Reset Safety Controls: The following conditions shall shut down water chiller and require manual reset:
   1. Low evaporator pressure or temperature.
   2. High condenser pressure.
   3. Low chilled-water temperature.
   4. Low oil differential pressure.
   5. High or low oil pressure.
   6. High oil temperature.
   7. High compressor-discharge temperature.
   8. Loss of chilled or condenser-water flow.
  10. Sensor or detection-circuit fault.
  11. Processor communication loss.
  12. Starter fault.
  13. Extended compressor surge.
  14. Excessive air-leakage detection (for water chillers utilizing HCFC-123 refrigerant).
  15. Phase failure and undervoltage conditions.

F. Building Automation System Interface: Furnish terminal strip connections for the following:
   1. Chiller enable/disable.
   2. Leaving chilled water temperature setpoint adjustment (0-10 VDC 4-20mA).
   3. External demand limit setpoint adjustment (0-10 VC 4-20mA).
   4. General chiller alarm contact closure.
2.9 MOTORS

A. Comply with requirements in Division 15 Section "Common Motor Requirements for HVAC Equipment".
   1. Open-drive motors shall have flanged or flexible coupling suitable for direct connection to compressor. Provide OSHA compliant guard over coupling.

2.10 MAGNETIC ENCLOSED STARTERS

A. Enclosure: [Unit mounted] [Floor mounting], NEMA 250, Type 1, with hinged access door with lock and key or padlock and key.

B. Control Circuit: 120 V; obtained from integral control power transformer of enough capacity to operate connected pilot and indicating and control devices.

C. Overload Relay: Shall be sized according to UL 1995 or shall be an integral component of water chiller control microprocessor.

D. Starter Type: Furnish a [star-delta starter] [or] [solid-state, reduced-voltage controller].

E. [Across-the-Line Starter: NEMA ICS 2, Class A, full voltage, nonreversing; include isolation switch and current-limiting fuses.]

F. Star-Delta Starter: NEMA ICS 2, closed transition.

G. Solid-State, Reduced-Voltage Controller: NEMA ICS 2.
   1. Surge suppressor in solid-state power circuits providing 3-phase protection against damage from supply voltage surges 10 percent or more above nominal line voltage.
   2. Light-emitting-diode indicators showing motor and control status, including the following conditions:
      a. Controller on.
      b. Overload trip.
      c. Loss of phase.
      d. Starter fault.

H. Circuit Breaker: High interrupting circuit breaker with ground fault protection meeting all local short circuit withstand ratings. Short circuit withstand rating shall be stamped on breaker. Circuit breaker to be interlocked to disconnect line power from the starter when the starter door is open.

I. Accessories: Devices shall be factory installed in controller enclosure, unless otherwise indicated.
   2. Stop and Lockout Push-Button Station: Momentary-break, push-button station with a factory-applied hasp arranged so padlock can be used to lock push button in depressed position with control circuit open.
2.11 SOURCE QUALITY CONTROL

A. Factory test and rate water chillers, before shipping, according to ARI 550/590, "Water Chilling Packages Using the Vapor Compression Cycle." Stamp with ARI label.

B. Factory test heat exchangers hydrostatically at 1.50 times the design pressure.

C. Factory test and inspect evaporator and water cooled-condenser according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1. Stamp with ASME label.

D. Factory test and inspect water boxes at 150 percent of working pressure.

E. Rate sound power level according to ARI 575 procedure.

PART 3 - EXECUTION

3.1 WATER CHILLER INSTALLATION

A. Install water chillers on concrete base. Concrete base is specified in Division 15 Section "Common Work Results for HVAC," and concrete materials and installation requirements are specified in Division 3.

B. Concrete Bases: Anchor chiller mounting frame to concrete base.
   1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
   2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
   3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
   4. Install anchor bolts to elevations required for proper attachment to supported equipment.
   5. Cast-in-place concrete materials and placement requirements are specified in Division 3.

C. Vibration Isolation: Neoprene pads furnished by the water chiller manufacturer with a minimum deflection of 0.25 inch. Vibration isolation devices and installation requirements are specified in Division 23 Section "Vibration [and Seismic] Controls for HVAC Piping and Equipment."

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

E. Charge water chiller with refrigerant if not factory charged.

F. Install separate devices furnished by manufacturer.

3.2 CONNECTIONS

A. Chilled and condenser-water piping installation requirements are specified in Division 23 Section "Hydronic Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
B. Install piping adjacent to water chillers to allow service and maintenance.

C. Evaporator Connections: Connect inlet to evaporator with controller-bulb well, shutoff valve, thermometer and pressure gage. Connect outlet to evaporator with throttling valve, flow switch, thermometer, pressure gage, and drain line with shutoff valve.

D. Condenser Connections: Connect inlet to condenser with shutoff valve, thermometer, and pressure gage. Connect outlet to condenser with throttling valve, thermometer, pressure gauge, flow switch, and drain line with shutoff valve.

E. Refrigerant Pressure Relief Valve Connections: Extend vent piping to the outside without valves or restrictions.

F. Ground water chillers according to Division 26.

G. Connect wiring according to Division 26.

3.3 STARTUP SERVICE

A. Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assemblies, installations, and connections.

B. Engage a factory-authorized service representative to complete the installation and startup checks according to the manufacturer's written instructions and perform the following:

1. Verify that refrigerant charge is sufficient and water chiller has been leak tested.
2. Verify that pumps are installed and functional.
3. Verify that thermometers and gages are installed.
4. Operate water chiller for run-in period according to manufacturer's written instructions.
5. Check bearing lubrication and oil levels.
6. Verify that refrigerant pressure relief is vented outside.
7. Verify proper motor rotation.
8. Verify static deflection of vibration isolators, including during startup and shutdown.
11. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

C. Prepare a written startup report that records results of tests and inspections.

D. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site outside normal occupancy hours for this purpose.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train the Owner's maintenance personnel adjust, operate and maintain the chiller. Provide not less than 4 hours of training.

END OF SECTION