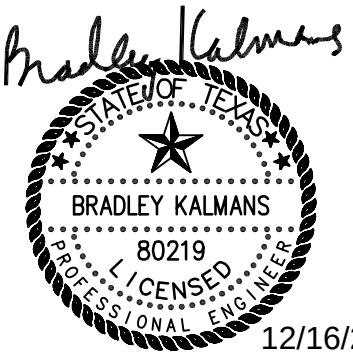

12/16/2024

SECTION 23 65 27

AIR COOLED ROTARY SCROLL CHILLER

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Furnish and install a packaged, electric-driven, air-cooled, water chilling unit with multiple scroll compressors complete with controls.

1.2 RELATED WORK

A. Division 23 - Mechanical
   1. Chilled Water Piping
   2. Insulation
   3. Building Management Control System
   4. Vibration Isolation
   5. Electrical Provisions of Mechanical Work

1.3 REFERENCES

A. ANSI/ARI 550/590 - Water Chilling Packages using the Vapor Compression Cycle.
B. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration.
C. ANSI/ASHRAE 90A - Energy Conservation in New Building Design.
D. ANSI/ASME SEC 8 - Boiler and Pressure Vessel Code
E. ANSI/NEMA MG 1 - Motors and Generators.
F. ANSI/UL 465 - Central Cooling Air Conditioners.
G. ANSI/AFBMA 9-1978 - Load Ratings and Fatigue Life for Ball Bearings. Bearings must have life of not less than 200,000 hours.
H. ANSI/NFPA Standard 70 - National Electrical Code (NEC)
I. ASTM B117 - Standard Method of Salt Spray (Fog) Testing
J. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
K. ASTM A525 - Zinc (Hot-Dip Galvanized) Coatings on Sheet Steel Products
L. ASTM D1654 - Evaluation of Painted or Coated Specimens, Subjected to Corrosive Environments.

1.4 PERFORMANCE

A. Provide performance as scheduled on drawings.

1.5 WARRANTY

A. The Chiller manufacturer shall provide a full machine parts, labor, and refrigerant warranty for a period of five (5) years from substantial completion.
   1. The warranty shall include, but not be limited to the compressor assemblies including motor, condensers, fans, variable frequency drives, controls, evaporator, condenser, refrigeration system and all other auxiliary components and accessories as well as refrigerant and oils in systems.
   2. In the event of failure, provide new or factory authorized rebuilt parts. Shop or job site rebuilt parts are not acceptable.
   3. On all manufacturers warranties the chiller manufacturer shall provide a factory certificate listing as a minimum chiller model, serial, and warranty information as specified above. Each chiller tag shall be provided with an individual and unique warranty certificate. Manufacturer’s representative warranty letters are not acceptable as an alternative to the original manufacturer’s certificates.

4. The chiller manufacturer authorized service agency is required to perform any and all warranty service. Contractor warranty service is not authorized. Warranty work shall be performed with District Representative present.

1.6 SUBMITTALS

A. Submit manufacturer's certified computer generated performance and capacity data in accordance with specification requirements.

B. Submit the following information:
1. Manufacturer's installation instructions.
2. Minimum Circuit Ampacity.
3. Maximum Overcurrent Protection size.
4. Maximum conductor / Terminal Lug size.
5. Minimum flow thru evaporator.
6. Electrical interlocks.

C. Submit recommended clearance dimensions for air flow and service.

D. Submit coordination drawings as specified.
1. Give consideration to adjacent structures as they affect air flow patterns.

E. Submit internal wiring diagram of Control Center.

F. Submit sequence of operation in narrative form.

G. Submit a letter stating chiller being proposed meets the efficiency requirements of Centerpoint Energy's Score Program listed in Centerpoint Energy's Design Guide: HVAC Recommendations document.

H. Mark-up a copy of the specifications, indicating in the margin of each paragraph, the following: COMPLY, DO NOT COMPLY, NOT APPLICABLE.

1.7 STORAGE/HANDLING/SHIPPING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Protect units from physical damage. Factory coil shipping covers shall be kept in place until installation.

C. Unit controls shall be capable of withstanding 203°F (95°C) storage temperatures in the control compartment for an indefinite period of time.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Daikin Model # AGZ191ETHEPNNOB

2.2 COMPRESSORS

A. Provide a minimum of two independently circuited hermetic rotary scroll type compressors with the following:
1. Direct drive, 3600 rpm, suction gas-cooled hermetic motor.
2. Rubber isolation pads.
3. Crankcase heaters.

4. Oil sight glass.
5. Load and unload solenoid valves.
6. Discharge oil separator.
7. Hot gas bypass for compressor unloading.
8. Centrifugal oil pump.
9. Oil charging valve.

B. Provide capacity modulation from 100% to 25% via compressor cycling.
1. Control to be based upon leaving chilled water.
2. To avoid excessive compressor cycling while maintaining leaving chilled water temperature at desired temperature +/- differential, compressor cycling set points to be separated by a minimum 20% capacity dead band.

2.3 CONDENSER COILS

A. Coil shall be microchannel design and shall have a series of flat tubes containing multiple, parallel flow microchannel 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. Long Life Alloy Microchannel shall pass 4500hr salt spray rating uncoated.

B. Protect all vertical or angled coil sections from hail or physical damage with corrosion resistant louvered hail guard including chiller ends, factory installed to cover compressor and condenser sections.

C. Field adjustable head pressure based fan cycling controls for each circuit capable of maintaining minimum head pressure down to 20°F unless noted otherwise.

D. Protect condenser coils during shipping.

E. Provide condenser coils coated with corrosion resistant epoxy utilizing a dip and bake. Coating shall be flexible and uniformly bonded to all condenser coil surfaces.

2.4 FANS AND MOTORS

A. Direct drive propeller type fans.
1. Vertical discharge with sound reduction.
2. Protect fan blades with a heavy-gauge wire guard.
3. Statically and dynamically balanced
4. Sound reduction type fan blades and shrouds
5. All condenser fans shall have integral drives to provide variable speed for optimized efficiency.

B. Motors with built in thermal overload protection
1. Permanently lubricated ball bearings.
2. Weatherproof (TEAO or TEFC) motors.

2.5 COOLER/EVAPORATOR

A. Provide tube-in-shell direct expansion cooler or brazed plate and frame direct expansion cooled with:
1. Tube-in-shell
a. Copper tube and steel shell construction
b. 300 psig water side working pressure
c. ASME coded 225 psig refrigerant side working pressure
d. Fully independent refrigerant circuit for each group of compressors.
e. Serviceable construction including removable heads and field replaceable tubes.
f. Drain and vent connection.

2. Brazed plate
    a. Copper and stainless steel construction
    b. 150 psig water side working pressure
    c. ASME coded 430 psig refrigerant side working pressure
    d. Fully independent refrigerant circuit for each compressor.
    e. Serviceable construction including removable heads and field replaceable tubes.
    f. Drain and vent connection.

B. Protect cooler with ambient controlled heater cable and minimum 1-1/4" thick flexible elastomeric rubber closed cell insulation. Heater cable to protect evaporator to -20°F (-29°C). Heater cable shall be wrapped helically around the shell under the insulation.

C. Protect insulation and equipment from abrasion by unit enclosure.

D. After completion of successful start-up, installing contractor shall seal all openings.

E. Provide water drain connection, vent and fittings for factory installed leaving water temperature control and low temperature cutout sensors.

F. Water connections shall be grooved or flanged.

G. Proof of flow shall be provided by the equipment manufacturer factory installed.

H. Provide field installed evaporator inlet strainer.

2.6 CASING/ENCLOSURES

A. House components in minimum 14 gauge galvanized steel frame and mounted on welded structural steel base. Hot-dip galvanized steel frame coating shall be Underwriters Laboratories Inc. (UL) recognized as G90-U, UL guide number DTHW2.

B. Unit panels, and control panels shall be 14 gauge, finished with a baked on powder paint. Control panel doors shall have door stays. Paint system shall meet the requirements for outdoor equipment of Federal Government Agencies.

C. Mount starters and disconnects in weatherproof panel provided with full opening access doors. Provide lockable disconnect operating handle external to panel and clearly visible from outside of unit indicating if power is on or off.

D. Casings fabricated from steel that do not have a Zinc coating conforming to ASTM A 123 or ASTM A525 shall be treated for the prevention of corrosion with a factory coating or paint system. The coating or paint system shall withstand 672 hours in a salt-spray fog test in accordance with ASTM B 117. Each specimen shall have a standard scribe mark as defined in ASTM D 1654. Upon completion of exposure, the coating or paint system shall be evaluated and rated in accordance with procedures A and B of ASTM D 1654. The rating of failure at the scribe mark shall be not less than six (average creepage not greater than 1/8"). The rating of the unscribed area shall not be less than ten (no failure). Thickness of coating or paint system on the actual equipment shall be identical to that on the test specimens with respect to materials, conditions of application, and dry-film thickness.

E. Coated wire mesh to limit access beneath the condenser coils, cooler, and compressor section area.

F. Convenience outlet (GFIC) at control panel connected to 120-vac circuit provided for heat tracing on cooler.

G. A control power transformer shall be factory installed within the chiller control panel to provide unit control power.

2.7 REFRIGERANT CIRCUIT

A. All units shall have a separate independent refrigerant circuit for each compressor. Twenty & 30 Ton single circuit; 40, 50 & 60 Tons, dual individual refrigerant circuits.

B. Provide for each refrigerant circuit:
1. Liquid line isolation valve.
2. Filter dryer (replaceable core type).
3. Liquid line sight glass and moisture indicator.
4. Electronic or thermal expansion valve sized for maximum operating pressure. Expansion valves with less than five years of proven field operation are not acceptable.
5. Charging valve.
6. Discharge and oil line check valves.
7. Compressor suction and discharge service valves.
8. Relief valve.
9. Full operating charge of refrigerant and oil.
10. Unit factory leak tested at 200 psig.

2.8 CONTROL PANEL

A. The Control Center.
1. NEMA 3R weatherproof cabinet with hinged lockable outer door.
2. Control system.
3. Solid-state compressor three phase motor protection.
4. Single point field power connection points.
5. Control interlock terminals.
6. Fan motor and control circuit fuses.
7. Individual contactors for each fan motor.
8. Unit power terminal blocks for connection to remove disconnect switch.
9. Power supply terminals for evaporator heater circuit.
10. Dead front panels over line voltage.
11. Control power / circuit transformer.
12. Provide incoming power terminals, sized to accept the feeder conductors.
13. Chiller run and alarm status relay cards.

B. Microprocessor control system.
1. Stage unit based on leaving water temperature control.
2. Oil differential pressure setpoints.
3. Motor protection.
4. High pressure alarm.
5. Loss of refrigerant alarm.
6. Loss of water flow alarm.
7. Freeze protection alarm.
8. Low refrigerant pressure alarm.
9. Auto start/stop switch.
10. Chilled water setpoint adjustment.
11. Anti-recycle timer.
12. Compressor run status.
13. Password protection.
14. Low water temperature safety (freeze protection).
15. Automatic pump down cycle.
16. Limit supply water temperature pull down on start up to 1° per minute.
17. Automatic lead-lag sequence change of compressors.
18. Unload the compressors if the return water is too high.
19. Compressor starts with the controlled cylinders unloaded.

20. Reset of the chilled water temperature.
21. Indicate status of safeties.
22. Non-volatile memory (EPROM) with setpoints retained with battery backup.
23. Automatic high pressure unloader to unload compressor at pressures above 375 psig.
24. Auto restart after power failure.
25. BacNET interface
26. Alarm Relay
27. Percent of Running Load Amperage

C. Display the following information with 16 key keypad with two line x 40 character clear English Display for outdoor viewing.
1. Supply and Return water temperature.
2. Low water temperature cutout setting.
3. Low ambient temperature cutout setting.
4. Outdoor air temperature.
5. English and Metric data.
6. Suction pressure cutout setting.
7. Each system suction pressure.
8. Each system discharge pressure.
9. Each system oil pressure.
10. Percent of full load motor current.
11. Liquid control range. (2.0 - 20°F above setpoint).
12. Liquid pulldown rate sensitivity adjustment.
13. Anti-recycle timer status for each compressor.
12. Compressor starts & operating run hours.
13. Safety shutdown shall be date and time stamped.
14. Compressor run status.
15. History and alarm diagnostic memory display.

D. All control functions and information shall be available at the unit control panel or via RS 232 cable and phone modem to personal computer.

E. Chiller shall include a relay board with dry contacts for alarms to notify a Building Automation System of certain events or statues of the chiller.

F. Chiller shall include input for leaving chilled water temperature setpoint based upon a 2-10VDS or 4-20mA signal from a Building Automation System.

G. Chiller shall include input for chiller current limit setpoint based upon a 2-10VDC or 4-20mA signal from a Building Automation System.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install system in accordance with manufacturer's instructions. Install conduit and controls in bottom of unit electrical. No penetration into top of cabinet.

B. Where the chiller unit is mounted on a grade, a concrete pad shall be provided that is a minimum of 4" high and extends 6" all around the chiller.

C. Align chiller package on steel or concrete foundations.

D. Locate away from overhead restrictions. Maintain side clearances according to manufacturer's recommendations and maintain overhead clearance to allow full elimination of hot air discharge.

E. Install units on vibration isolation pads.

F. Arrange piping for easy dismantling to permit tube cleaning, removing and or repair.

G. Level chiller.

H. Provide flexible elastomeric rubber closed cell insulation to prevent condensation from occurring at cooler and suction piping. After completion of successful start-up, installing contractor shall seal all openings in insulation and apply a protective aluminum sheetmetal jacket over insulation.

3.2 CHILLER MANUFACTURER START-UP/ FIELD SERVICES

A. Provide the services of a factory trained service technician employed full time by the chiller manufacturer to start-up the system. Technicians, as required, shall be factory trained and experienced in the work they perform. (Contractor startup is unacceptable.)

B. The technicians shall utilize comprehensive report forms to document results. Sample forms shall be submitted for review prior to commencing work.

C. Upon completion of the work, the report forms shall be signed by the technicians and their supervisor and included in the final report and Owner's manual.

D. Submit four copies of the final report to the Architect/Engineer for approval within 10 working days of start-up.

E. Follow the manufacturer's start-up procedures.
1. Verify interlocks.
2. Test and verify operation of safety controls.
3. Calibrate controls.
4. Verify microprocessor based control operation.
5. Test, calibrate, and set the chilled water temperature controls.
6. Verify chilled water temperature reset sequence.
7. Verify operation of the integrated control panel.

F. Measure and record the following data:
1. Chilled water entering/leaving temperature.
2. Chilled water flow through the chiller.
3. Suction pressure/condensing pressure.
4. Suction pressure/unloading steps.
5. Air entering/leaving condenser; dry bulb temperature.
6. Outdoor ambient; dry bulb.
7. Motor nameplate voltage; phase and full load amperes.
8. Heater coil in starter (as applicable)
    a. Rating in amperes.
    b. Manufacturer's recommendation.
9. Power reading (voltage and amperes of legs at motor terminals).

G. Test and calibrate the operation of the electronic ground current sensing devices.

H. If the system has been shipped with a holding charge, provide the following:
1. Leak test.
2. Refrigerant pressure test.
3. Evacuate, dehydrate and charge.

I. Verify that accessories are installed and performing the specified functions. Insert certification in

Owner's manual.

J. Instruct the Owner's operating personnel. Provide Owner with 8 hours of training prior to substantial completion.

K. Do not operate the equipment for any reason until the factory start-up service has been completed.

L. Provide a print-out from the unit micro-computer control system showing the correct operation of all system controls and components.

M. Provide minimum 24 hour history log displaying accuracy of temperature control system in 15 minute intervals and documented number of compressor cycles during the 24 hour period.

END OF SECTION