ADMINISTRATIVE SERVICES
Purchasing

1551 ROCK QUARRY ROAD
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WAKE COUNTY PUBLIC SCHOOLS — BID ADDENDUM UPDATE

BID Number: 251-24-489

COMMODITY/SERVICE:

CHILLERS REPLACEMENT UNITS-DILLARD DRIVE PLANT

ADDENDUM NAME:

QUESTIONS and REVISED SPECIFICATIONS

ADDENDUM NUMBER: # 1

BUYER: Jim Jaeger

RFP DUE DATE/TIME:
MAY 24, 2024 2:00 pm ET

INSTRUCTIONS:

PLEASE REPLACE THE ORIGINAL RFP DOCUMENT SPECIFICATIONS WITH THE ATTACHED ADDENDUM #1 UPDATED SPECIFICATIONS

RFP 251-24-489 M+O Bid Title: Chillers for Dillard Dr. Plant

VENDOR QUESTIONS	WCPSS ANSWERS
SECTION 23 64 16 – Water-Cooled Chillers *2.4.F Corrosion Protection: Electrolytic Corrosion-inhibitor sacrificial anodes, minimum two per water box.* ** Please confirm if this is a requirement? This is a special option and will have cost and lead time impact.*	***See Addendum #1***
2.11.B.C Provide stainless-steel square bearing plate to load the pad uniformly between 20 and 40 psig with a 0.12- to 0.16-inch deflection. ** Are standard neoprene vibration isolation pads acceptable?*	***See Addendum #1***
We are the Dunham Bush representative and wish submit a bid for Dillard Drive chillers. The RFP included a specification that stated to provide a chiller by either Carrier, Daikin, JCI or Trane. I would intend to bid per the remainder of the specification requirements. Would a Dunham Bush model be acceptable and what would I need to do in order to get acceptance to submit a bid?	***See Addendum #1***

ADDENDUM #1

WATER-COOLED CHILLER SCHEDULE (OWNER PRE PURCHASED)

				REFRIGERANT		CHILLED WATER					
MARK	SERVICE	TYPE	MANUFACTURER / MODEL	TYPE	CHARGE (LBS)	MINIMUM CAPACITY (TONS)	DESIGN FLOW (GPM)	MINIMUM FLOW (GPM)	EWT (F)	LWT (F)	MAXIMUM WPD (FT H2O)
CH-1	CHW LOOP	W/C ROTARY SCREW	CARRIER / 23XRV	R-513A	750	308.2	750	323	54	44	20
CH-2	CHW LOOP	W/C ROTARY SCREW	CARRIER / 23XRV	R-513A	750	308.2	750	323	54	44	20

NOTES

1. REFER TO SECTION 236416 FOR ADDITIONAL REQUIREMENTS OF WATER-COOLED CHILLERS.
2. SOUND PERFORMANCE IS BASED ON SOUND PRESSURE LEVELS MEASURED AT 30 FEET FROM UNIT AT FULL CAPACITY IN ACCORDANCE WITH AHRI 370.
3. CAPACITIES ARE BASED ON 0.00010 EVAPORATOR AND 0.00025 CONDENSER FOULING FACTORS FOR WATER-COOLED CHILLERS.
4. PROVIDE 6-INCH DEEP CONCRETE PAD FOR INDOOR CHILLERS THAT IS 6-INCHES LONGER AND WIDER THAN UNIT FOOTPRINT.
5. PROVIDE UNIT MOUNTED VFD.
6. UNIT TO BE CONFIGURED IN A 2-PASS ARRANGEMENT ON EVAPORATOR AND CONDENSER.
7. PROVIDE CHILLER WITH FACTORY FURNISHED BACNET COMMUNICATION CARD.
8. PROVIDE CHILLER WITH ANALOG CHILLED WATER SETPOINT RESET.
9. CHILLER PRE PURCHASED BY OWNER INCLUDING FACTORY STARTUP. CONTRACTOR SHALL COORDINATE AND RECEIVE CHILLER DIRECTLY FROM MANUFACTURER AND INSTALL COMPLETE. CONTRACTOR TO COORDINATE STARTUP WITH MANUFACTURER.
10. PROVIDE FACTORY STARTUP

CONDENSER WATER					PERFORMANCE				ELECTRICAL				CONTROL POWER
DESIGN FLOW (GPM)	MINIMUM FLOW (GPM)	EWT (F)	LWT (F)	MAXIMUM WPD (FT H2O)	MAXIMUM FULL LOAD (KW/TON)	MAXIMUM IPLV (KW/TON)	MAXIMUM NPLV (KW/TON)	SOUND (dBA)	FLA (A)	MCA (A)	MOCP (A)	VOLTAGE/ PHASE	REQ'D (Y OR N)
940	615	85	95	25	0.6646	0.3882	0.3890	83	299.3	308	500	460/3	NO/INTEGRAL
940	615	85	95	25	0.6646	0.3882	0.3890	83	299.3	308	500	460/3	NO/INTEGRAL

DIMENSIONS AND WEIGHT			
FOOTPRINT (FT x FT)	HEIGHT (FT)	WEIGHT (LBS)	NOTES
14.3 X 6.7	7.6	20,012	1,2,3,4,5,6,7,8,9
14.3 X 6.7	7.6	20,012	1,2,3,4,5,6,7,8,9

ADDENDUM #1

Wake County Public School System
Dillard Drive
Central Plant Upgrades

SECTION 23 64 16 – WATER-COOLED CHILLERS

PART 1 - GENERAL

1.1. SUMMARY

A. Section includes packaged, water-cooled, electric motor driven chillers.

1.2. PERFORMANCE REQUIREMENTS

A. Condenser-Fluid Temperature Performance:

1. Startup Condenser-Fluid Temperature: Chiller shall be capable of starting with an entering condenser-fluid temperature of 60 deg F and providing stable operation until the system temperature is elevated to the minimum operating entering condenser-fluid temperature.

2. Minimum Operating Condenser-Fluid Temperature: Chiller shall be capable of continuous operation over the entire capacity range indicated with an entering condenser-fluid temperature of 60 deg F.

3. Make factory modifications to standard chiller design if necessary to comply with performance indicated.

1.3. SUBMITTALS

A. Product Submittals:

1. For each type of product indicated include refrigerant, rated capacities, operating characteristics, furnished specialties and accessories.

a. Performance at AHRI standard conditions and at conditions indicated.

b. Performance at AHRI standard unloading conditions.

c. Minimum evaporator flow rate.

d. Refrigerant capacity of chiller.

e. Oil capacity of chiller.

f. Fluid capacity of evaporator, condenser.

g. Characteristics of safety relief valves.

h. Minimum entering condenser-fluid temperature.

i. Performance at varying capacities with constant design condenser-fluid temperature. Repeat performance at varying capacities for different condenser-fluid temperatures from design to minimum in 5 deg F increments.

2. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

   a. Detail equipment assemblies and indicate dimensions, weights, load distribution, required clearances, method of field assembly, components, and location and size of each field connection.

   b. Wiring Diagrams: For power, signal, and control wiring.

3. Warranty: Sample of special warranty.

B. Close-Out Submittals:

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

1.4. QUALITY ASSURANCE

A. AHRI Certification: Certify chiller according to AHRI 550 certification program.

B. ASHRAE Compliance:

1. ASHRAE 15 for safety code for mechanical refrigeration.

2. ASHRAE 147 for refrigerant leaks, recovery, and handling and storage requirements.

C. ASME Compliance: Fabricate and label chillers to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, as applicable to chiller design. For chillers charged with R-513a refrigerant, include an ASME U-stamp and nameplate certifying compliance.

D. Efficiencies shall comply with the State Energy Conservation Code.

E. Electrical Components, Devices and Accessories: UL listed and labeled as defined by NFPA 70, the National Electric Code, or equivalent by a qualified testing agency marked for the intended location and application and accepted by the Authority Having Jurisdiction and Engineer.

F. Mechanical Equipment and Materials: UL listed and labeled as defined by State Building Codes or equivalent by a qualified testing agency marked for the intended location and application and accepted by the Authority Having Jurisdiction and Engineer.

G. Testing and listing laboratories of mechanical and electrical equipment shall be accredited by the North Carolina Building Code Council (NCBCC).

1.5. DELIVERY, STORAGE, AND HANDLING

A. Ship each chiller with a full charge of refrigerant. Charge each chiller with nitrogen if refrigerant is shipped in containers separate from chiller.

B. Ship each oil-lubricated chiller with a full charge of oil.

1.6. COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases.

1.7. WARRANTY

A. Special Warranty: Manufacturer's complete parts, labor and refrigerant warranty for 5-years from the date of Owner Acceptance.

1.8. EXTRA MATERIALS

A. Extra Stock: Provide owner with the following extra materials:

1. Quart container of paint used in application of topcoat to use in touchup applications.

PART 2 - PRODUCTS

2.1. GENERAL-REQUIREMENTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following for single-circuit single-compressor chillers:

1. Carrier (23XRV Series)
2. Dunham Bush (WCHX-VU Series)
3. Johnson Controls/York (YVWA Series)

2.2. WATER-COOLED CHILLERS

A. Description: Factory-assembled and tested water-cooled screw chiller complete with compressor(s), compressor motor(s), compressor motor controller(s), evaporator, condenser, controls, interconnecting unit piping and wiring, and indicated accessories.

B. Compressor Drive Assembly: Single-stage or multi-stage, variable-displacement, screw-type compressor driven by an electric motor. Compressor housing shall be constructed of precision ground cast-iron.

1. Compressor Drive: Semi-hermetic or hermetic design using an electric motor as the driver.

   a. Gear Drives: For chillers with gear drives, provide single- or double-helical gear design continuously coated with oil while chiller is operating. Gears shall comply with American Gear Manufacturer Association standards.

   b. Open Drives: For chillers with open drives, provide flexible disc with all-metal construction and no wearing parts to ensure long life without the need for lubrication.

   c. Seals: Seal drive assembly to prevent refrigerant leakage.

2. Compressor Motor: Continuous-duty, squirrel-cage, induction-type, two-pole motor with energy efficiency required to suit chiller energy efficiency indicated. Factory mounted, aligned, and balanced as part of compressor assembly before shipping. Motor shall be of sufficient capacity to drive compressor throughout entire operating range without overload and with sufficient capacity to start and accelerate compressor without damage. For chillers with open drives, provide motor with open drip-proof enclosure.

C. Capacity Control: Variable speed compressor for capacity modulation. Maintain stable operation that is free of surge, cavitation, and vibration throughout range of operation. Configure to achieve most energy-efficient operation possible.

1. Operating Range: From 100 to 15 percent of design capacity.

2. Condenser-Fluid Unloading Requirements over Operating Range: Drop-in entering condenser-fluid temperature of 2.5 deg F for each 10 percent in capacity reduction.

3. Chillers with variable frequency controllers shall modulate compressor speed with variable-inlet, guide-vane control to achieve optimum energy efficiency.

4. Oil Lubrication System: Consisting of pump, filtration, heater (when applicable), refrigerant or water-cooled oil cooler, factory-wired power connection, piping, oil level visual indicator and controls. Provide lubrication to bearings, gears, and other rotating surfaces at all operating, startup, coast-down, and standby conditions including power failure. Piping shall be factory-installed and pressure-tested with isolation valves and accessories. Oil shall be compatible with refrigerant and chiller components.

2.3. REFRIGERATION

A. Refrigerant: R-513a.

B. Refrigerant Flow Control: Manufacturer's standard refrigerant flow-control device satisfying performance requirements indicated.

C. Pressure Relief Device:

1. Comply with requirements in ASHRAE 15 and in applicable portions of ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

2. Chillers Using R-513a: ASME-rated, spring-loaded, pressure relief valve; single- or multiple-reseating type. Pressure relief valve(s) shall be provided for each heat exchanger. Condenser shall have dual valves with one being redundant and configured to allow either valve to be replaced without loss of refrigerant.

D. Refrigeration Transfer: Provide service valves and other factory-installed accessories required to facilitate transfer of refrigerant from chiller to a remote refrigerant storage and recycling system. Comply with requirements in ASHRAE 15 and ASHRAE 147.

2.4. EVAPORATOR AND CONDENSER

A. Description: Shell-and-tube design with water in tubes and refrigerant surrounding tubes within shell. Shell is separate from condenser.

B. Shell Material: Carbon-steel rolled plates with continuously welded seams or seamless pipe.

C. Tubes: Copper tubes with smooth internal finish and minimum thickness of 0.025-inches that are individually replaceable from either end without damage to tube sheets and other tubes and mechanically expanded into end sheets and physically attached to intermediate tube sheets.

D. End Tube Sheets: Continuously welded to each end of shell; drilled and reamed to accommodate tubes with positive seal between fluid in tubes and refrigerant in shell.

E. Intermediate Tube Sheets: Installed in shell and spaced along length of tube at intervals required to eliminate vibration and to avoid contact of tubes resulting in abrasion and wear.

2.5. INSULATION

A. Factory-applied closed-cell flexible elastomeric insulation, 3/4-inch minimum thickness, complying with Section 230716 over all cold surfaces of chiller capable of forming condensation. Components shall include, but not be limited to, evaporator shell and end tube sheets, evaporator water boxes including nozzles, refrigerant suction pipe from evaporator to compressor, cold surfaces of compressor, refrigerant-cooled motor, and auxiliary piping. Seal all seams and joints to provide a vapor barrier. Paint exposed surfaces of insulation to match other painted parts.

2.6. ELECTRICAL

A. Factory installed and wired, and functionally tested at factory before shipment.

1. Single-point, field-power connection to circuit breaker. Minimum withstand rating shall be as required by electrical power distribution system, but not less than 65,000A.

a. Branch power circuit to each motor, electric heater, dedicated electrical load, and controls with disconnect switch or circuit breaker.

2. NEMA 1, motor-circuit protector (circuit breaker) with field-adjustable, short-circuit-trip set point.

3. NEMA 2-rated motor controller for auxiliary motors, hand-off-auto switch, and overcurrent protection for each motor. Provide variable frequency controller for each variable-speed motor furnished.

B. Control-circuit transformer with primary and secondary side fuses.

C. Terminal blocks with numbered and color-coded wiring to match wiring diagram. Spare wiring terminal block for connection to external controls or equipment.

D. Factory-installed wiring outside of enclosures shall be in metal raceway except make terminal connections with not more than a 24-inch length of liquid-tight or flexible metallic conduit.

E. Provide a ground terminal and a terminal block or individual connectors for phase connection.

2.7. MOTOR CONTROLLER

A. Enclosure: Factory installed, unit mounted, NEMA 250, Type 4 with hinged full-front access door with lock and key.

B. Control Circuit: Powered from integral control power transformer.

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

2.8. VARIABLE FREQUENCY CONTROLLER

A. Variable speed drives shall be factory-mounted and wired on the chiller to provide a single-point field-power termination to the chiller and its auxiliaries.

B. Variable speed drives shall comply with Section 230514 with the following additional requirements:

1. Enclosure: Unit mounted, NEMA 250, Type 4, with hinged full-front access door with lock and key complying with Section 230511.

2. Manual bypass is not required.

C. Operating Requirements: Capable of driving full load, without de-rating at 32F to 120F ambient temperature range, up to 95 percent (non-condensing) relative humidity and up to 3300-foot elevation.

1. Overload Capability: 1.05 times the full-load current for 7 seconds.

2. Starting Torque: As required by compressor-drive assembly.

3. Isolated control interface to allow controller to follow control signal over a 10:1 speed range.
4. To avoid equipment resonant vibrations, provide critical speed lockout circuitry to allow bands of operating frequency at which controller shall not operate continuously.
5. Capable of being restarted into a motor coasting in either the forward or reverse direction without tripping.

D. Internal Adjustability Capabilities:

1. Minimum Output Frequency: 6 Hz.
2. Maximum Output Frequency: 60 Hz.
3. Acceleration: 2 seconds to a minimum of 60 seconds.
4. Deceleration: 2 seconds to a minimum of 60 seconds.
5. Current Limit: 30 percent to a minimum of 100 percent of maximum rating.

E. Self-Protection and Reliability Features: Subjecting the controller to any of the following conditions shall not result in component failure or the need for replacement:

1. Over-temperature.
2. Short circuit at controller output.
3. Ground fault at controller output: Variable frequency controller shall be able to start a grounded motor.
4. Open circuit at controller output.
5. Input under-voltage.
6. Input overvoltage.
7. Loss of input phase.
8. Reverse phase.
9. AC line switching transients.
10. Instantaneous overload, line to line or line to ground.
11. Sustained overload exceeding 100 percent of controller rated current.
12. Starting a rotating motor.

F. Motor Protection: Controller shall protect motor against overvoltage and under-voltage, phase loss, reverse phase, overcurrent, over-temperature, and ground fault.

G. Visual Indication: On face of controller enclosure or chiller control enclosure; indicating the following conditions:

1. Power on.
2. Run.
3. Overvoltage.
4. Line fault.
5. Overcurrent.
6. External fault.
7. Motor speed (percent).
8. Fault or alarm status (code).
9. DC-link voltage.
10. Motor output voltage.
11. Input kilovolt amperes.
12. Total power factor.
13. Input kilowatts.
14. Input kilowatt-hours.
15. Three-phase input voltage.
16. Three-phase output voltage.
17. Three-phase input current.
18. Three-phase output current.
19. Three-phase input voltage total harmonic distortion.
20. Three-phase input current total harmonic distortion.
21. Output frequency (Hertz).
22. Elapsed operating time (hours).
23. Diagnostic and service parameters.

H. Operator Interface: At controller or chiller control panel; with start-stop and auto-manual selector with manual-speed-control potentiometer.

I. Cooling: Air-cooled.

J. Control Relays: Auxiliary and adjustable time-delay relays.

K. Chiller Capacity Control Interface: Equip chiller with adaptive control logic to automatically adjust the compressor motor speed and the compressor pre-rotation inlet vane position independently to achieve maximum part-load efficiency in response to sensor inputs that are integral to the chiller controls.

2.9. CONTROLS

A. Control: Standalone and microprocessor based, with all memory stored in nonvolatile memory so that reprogramming is not required on loss of electrical power.

B. Enclosure: Unit mounted, NEMA 250, Type 4, hinged or lockable; factory wired with a single-point, field-power connection and a separate control circuit.

C. Operator Interface: Multiple-character digital or graphic display with dynamic update of information and with keypad or touch-sensitive display located on front of control enclosure. In either imperial or metric units selectable through the interface, display the following information:

1. Date and time.
2. Operating or alarm status.
3. Fault history with not less than last 10 faults displayed.
4. Set points of controllable parameters.
5. Trend data.
6. Operating hours.
7. Number of chiller starts.
8. Outdoor-air temperature or space temperature if required for chilled-water reset.
9. Entering- and leaving-fluid temperatures of evaporator and condenser.
10. Difference in fluid temperatures of evaporator and condenser.
11. Fluid flow of evaporator and condenser.
12. Fluid pressure drop of evaporator and condenser.
13. Refrigerant pressures in evaporator and condenser.
14. Refrigerant saturation temperature in evaporator and condenser shell.
15. Compressor refrigerant suction and discharge temperature.
16. Compressor bearing temperature.
17. Motor bearing temperature.
18. Motor winding temperature.
19. Oil temperature.
20. Oil discharge pressure.
21. Phase current.
22. Percent of motor rated load amperage.

23. Phase voltage.
24. Demand power (kilowatts).
25. Energy use (kilowatt-hours).
26. Power factor.
27. For chillers equipped with variable frequency controllers and harmonic filters, include the following:
    a. Output voltage and frequency.
    b. Voltage total harmonic distortion for each phase.
    c. Supply current total demand distortion for each phase.
    d. Inlet vane position.
    e. Controller internal ambient temperature.
    f. Heatsink temperature.

D. Control Functions:
1. Manual or automatic startup and shutdown time schedule.
2. Entering and leaving chilled-water temperatures, control set points, and motor load limits. Evaporator fluid temperature shall be reset based on return-water or outdoor-air temperature as indicated in the Sequence of Operation.
3. Current limit and demand limit.
4. Condenser-fluid temperature.
5. External chiller emergency stop.
6. Variable evaporator flow.

E. Manually Reset Safety Controls: The following conditions shall shut down chiller and require manual reset:
1. Low evaporator pressure or temperature; high condenser pressure.
2. Low evaporator fluid temperature.
3. Low oil differential pressure.
4. High or low oil pressure.
5. High oil temperature.
6. High compressor-discharge temperature.
7. Loss of condenser-fluid flow.
8. Loss of evaporator fluid flow.

9. Motor overcurrent.
10. Motor overvoltage.
11. Motor under-voltage.
12. Motor phase reversal.
13. Motor phase failure.
14. Sensor- or detection-circuit fault.
15. Processor communication loss.
16. Motor controller fault.
17. Extended compressor surge.
18. Excessive air-leakage detection (low-pressure chillers only)

F. Trending: Capability to trend analog data of up to five parameters simultaneously over an adjustable period and frequency of polling.

G. Security Access: Provide electronic security access to controls through identification and password with at least three levels of access: view only; view and operate; and view, operate, and service.

H. Control Authority: At least four conditions: Off, local manual control at chiller, local automatic control at chiller, and automatic control through a remote source.

I. Communication Port: RS-232 port, USB 2.0 port, or equivalent connection capable of connecting a printer and a notebook computer.

J. BAS Interface: Factory-installed hardware and software to enable the BAS to monitor, control, and display chiller status and alarms.

1. BACnet per ASHRAE 135 communication interface with the BAS shall enable the BAS operator to remotely control and monitor the chiller from an operator workstation. All control features and monitoring points displayed locally at chiller control panel shall be available through the BAS.

2.10. FINISH

A. Paint chiller, using manufacturer's standard procedures, except comply with the following minimum requirements:

1. Provide at least one coat of primer with a total dry film thickness of at least 2 mils.
2. Provide at least two coats of alkyd-modified vinyl enamel, epoxy or polyurethane finish with a total dry film thickness of at least 4 mils.
3. Paint surfaces that are to be insulated before applying the insulation.

4. Paint installed insulation to match adjacent uninsulated surfaces.

5. Color of finish coat to be manufacturer's standard.

2.11. ACCESSORIES

A. Flow Switches: Chiller manufacturer shall furnish a flow switch for each evaporator and condenser and verify field-mounting location before installation.

B. Vibration Isolation: Chiller manufacturer shall furnish vibration isolation for each chiller.

1. Neoprene Pad:

a. Two layers of 0.375-inch thick, ribbed- or waffle-pattern neoprene pads separated by a 16-gage, stainless-steel plate.

b. Fabricate pads from 40 to 50 durometer neoprene.

C. Sound Barrier:

1. Furnish removable and reusable sound-barrier covers over the compressor housing, hermetic motor, compressor suction and discharge piping, and condenser shell.

2. Provide for repeated installation and removal without use of tape or calk.

3. Inner and outer cover shall consist of a PTFE-impregnated fiberglass cloth enclosing heavy-density, needled fiberglass insulation material with a mass-loaded vinyl acoustic barrier.

4. Covers shall be double sewn and lock stitched with edges folded and sewn so no raw cut edges are exposed.

5. Form covers around control devices, gages, conduit, piping, and supports without degrading sound-barrier performance.

6. Continuously lap all exposed seams at least 2 inches for better sound containment.

7. Permanently label each section of cover to indicate its location, description, size, and number sequence.

8. Randomly place stainless-steel quilting pins to prevent covers from shifting and sagging.

2.12. NOISE CHARACTERISTICS

A. Noise Rating: 85 dBA sound power level when measured according to ARI 575. Provide factory-installed sound treatment if necessary to achieve the performance indicated.

2.13. SOURCE QUALITY CONTROL

A. Perform functional run tests of chillers before shipping.

B. Factory test and inspect evaporator and condenser, according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

C. For chillers located indoors, rate sound power level according to AHRI 575.

PART 3 - EXECUTION

3.1. EXAMINATION

A. Examine chillers before installation. Reject chillers that are damaged.

B. Examine roughing-in for equipment support, anchor-bolt sizes and locations, piping, and electrical connections to verify actual locations, sizes, and other conditions affecting chiller performance, maintenance, and operations before equipment installation.

1. Final chiller locations indicated on Drawings are approximate. Determine exact locations before roughing-in for piping and electrical connections.

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

3.2. CHILLER INSTALLATION

A. Equipment Mounting:

1. Install chillers on cast-in-place concrete equipment bases.

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

C. Charge chiller with refrigerant and fill with oil if not factory installed.

D. Install separate devices furnished by manufacturer and not factory installed.

3.3. CONNECTIONS

A. Comply with general requirements for piping and specialties as specified in Division 23.

B. Install piping adjacent to chiller to allow service and maintenance.

C. Evaporator Fluid Connections: Connect to evaporator inlet with shutoff valve, strainer, flexible connector, thermometer, and plugged tee with pressure gage. Connect to evaporator outlet with shutoff valve, balancing valve, flexible connector, flow switch, thermometer, plugged tee with shutoff valve and pressure gage and drain connection with valve. Make connections to chiller with a flange or mechanical coupling.

D. Condenser-Fluid Connections: Connect to condenser inlet with shutoff valve, strainer, flexible connector, thermometer, and plugged tee with pressure gage. Connect to condenser outlet with shutoff valve, balancing valve, flexible connector, flow switch, thermometer, plugged tee with shutoff valve and pressure gage and drain connection with valve. Make connections to chiller with a flange or mechanical coupling.

E. Refrigerant Pressure Relief Device Connections: Extend vent piping to the outdoors without valves or restrictions. Comply with ASHRAE 15. Connect to chiller pressure relief device with flexible connector and dirt leg with drain valve.

F. Connect each chiller drain connection with a union and drain pipe, and extend pipe, full size of connection, to floor drain. Provide a shutoff valve at each connection.

3.4. STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that refrigerant charge is sufficient and chiller has been leak tested.
3. Verify that pumps are installed and functional.
4. Verify that thermometers and gages are installed.
5. Operate chiller for run-in period.
6. Check bearing lubrication and oil levels.
7. Verify that refrigerant pressure relief device is vented outside.
8. Verify proper motor rotation.
9. Verify static deflection of vibration isolators, including deflection during chiller startup and shutdown.
10. Verify and record performance of fluid flow and low-temperature interlocks for evaporator and condenser.
11. Verify and record performance of chiller protection devices.
12. Test and adjust controls and safeties. Replace damaged or malfunctioning controls and equipment.

B. Inspect field-assembled components, equipment installation, and piping and electrical connections for proper assembly, installation, and connection.

C. Prepare test and inspection startup reports.

3.5. DEMONSTRATION

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

END OF SECTION