R.E. Dimond and Associates, Inc.

Consulting Engineers

ADDENDUM NO.1

Project Name: BCSC 2023 Eagle Elementary School Central Plant
Equipment Pre-Purchase

DATE: April 19, 2024

This Addendum issued prior to bidding, alters, amends, corrects or clarifies the Proposal Documents to the extent stated herein and does hereby become a part of the Proposal Documents, and will become a part of the Contract Documents of the successful bidder.

GENERAL

A. SPECIFICATIONS

1. Section No. 23 64 02 – Packaged Air-Cooled Water Chillers
   a. Replace this section in its entirety with the attached.

B. DRAWINGS – N/A

Sections Attached:

23 64 02 – Packaged Air-Cooled Water Chillers (Re-Issued)

END OF ADDENDUM

SECTION 23 64 02 – PACKAGED, AIR-COOLED WATER CHILLERS (PRE-PURCHASE)

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes packaged air-cooled water chiller utilizing multiple scroll compressors, with motor controller and microprocessor based controls.

1. Remote evaporator application:

a. Evaporator shall be shipped with chiller by manufacturer in separate crate with holding charge of nitrogen.
b. Installing Contractor will be responsible for remote evaporator installation and system refrigerant charge and oil.
c. Chiller and remote evaporator separation approximately 40 feet horizontally and 5 feet vertically.

2. All refrigerant specialties by manufacturer.
3. Low sound package described herein.

1.2 SUBMITTALS – To be submitted with Bids

A. Product Data.

1. Include refrigerant, rated capacities, operating characteristics, and furnished specialties and accessories.
2. Performance at AHRI standard conditions and at conditions indicated.
3. Performance at AHRI standard unloading conditions as indicated.
4. Acoustical Performance:

a. Sound power data.
b. Semi-hemispherical sound pressure data at 30 feet (AHRI) and 100 feet.

5. NOTE: Provide above performance and acoustics using manufacturer’s standard low sound package, AND manufacturer’s ultra-low sound package.
6. Minimum evaporator flow rate.
7. Refrigerant capacity of water chiller (for evaporator barrel mounted in chiller)
8. Fluid capacity of evaporator.
9. Characteristics of safety relief valves.
10. Force and moment capacity of each piping connection.
11. Sample refrigerant line sizing and requirements.

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

1. Assembled unit dimensions.
2. Weight and load distribution.
3. Required clearances for maintenance and operation.

4. Size and location of piping and wiring connections.

C. Diagrams for power, signal, and control wiring

1. Include wiring diagrams. Clearly indicate factory wiring versus wiring to be field installed by the Contractor.

D. Coordination Drawings:

1. Required structural supports.
2. Piping roughing-in requirements.
3. Wiring roughing-in requirements, including spaces reserved for electrical equipment.
4. Access requirements, including working clearances for mechanical controls and electrical equipment, and tube pull and service clearances.

E. Submit acoustical information at various loading points as required with chiller efficiency form at end of this Section.
F. Chiller efficiency form to be completed with bids and submitted with bids.

1.3 QUALITY ASSURANCE

A. 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.
B. ASME Compliance: Fabricate and label water chiller heat exchangers to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
C. Comply with NFPA 70.
D. Comply with UL 1995.

1.4 WARRANTY

1. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of water chillers that fail in materials or workmanship. The entire chiller assembly shall have a non-prorated two (2) year parts and labor warranty from the date of substantial completion (defined in Section 01 12 00). A Warranty Certificate shall be issued to the Owner from the manufacturer. A copy of the warranty shall be submitted to the Engineer for approval. Repairs required due to defects determined to be at fault by the installing contractor shall be the responsibility of the installing contractor.

1.5 STARTUP/COMMISSIONING

A. Bid includes the following manufacturer’s commissioning services:

1. Factory authorized service representative to perform installation supervision, start, check, and test. Scheduling of start-up shall be in adherence with requested substantial

completion date. Close coordination and regular communication with the installing contractor is required.

2. Furnish copies of factory measured performance criteria to Owners' representative and installation contractor for inclusion in operation and maintenance manuals.
3. Complete factory startup checklist and provide a copy to the Owner's representative and installation contractor for inclusion in operation and maintenance manuals.
4. Assist installation contractor in completing items on commissioning checklist as required.

1.6 DELIVERY, STORAGE AND HANDLING

The chiller shall be shipped from the factory to the project site (Eagle Elementary School)via FOB Jobsite. All shipping costs and freight insurance shall be covered in this bid by the manufacturer. The chiller will be unloaded, stored, and installed by the installing contractor under separate contract. Coordinate delivery with installing contractor.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AHRI Rating: Rate water chiller performance according to requirements in AHRI 550/590.
B. ASHRAE Compliance: ASHRAE 15 for safety code for mechanical refrigeration.
C. ASHRAE/IES 90.1 Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
D. ASME Compliance: Fabricate and stamp water chiller heat exchangers to comply with ASME Boiler and Pressure Vessel Code.
E. Comply with NFPA 70.
F. Comply with requirements of UL 1995, "Heating and Cooling Equipment," and include label by a qualified testing agency showing compliance.
G. Operation Following Loss of Normal Power:

1. Equipment, associated factory- and field-installed controls, and associated electrical equipment and power supply connected to backup power system shall automatically return equipment and associated controls to the operating state occurring immediately before loss of normal power without need for manual intervention by an operator when power is restored either through a backup power source, or through normal power if restored before backup power is brought on-line.
2. See drawings for equipment served by backup power systems.
3. Provide means and methods required to satisfy requirement even if not explicitly indicated.

H. Outdoor Installations:

1. Chiller shall be suitable for outdoor installation indicated. Provide adequate weather protection to ensure reliable service life over a 25-year period with minimal degradation due to exposure to outdoor ambient conditions.

2.2 MANUFACTURERS

A. Trane
B. York
C. Daikin

2.3 MANUFACTURED UNITS

A. Description: Factory-assembled and run-tested packaged air-cooled water chiller complete with compressor(s), compressor motors and motor controllers, evaporator, condenser with fans, electrical power, controls, and indicated accessories.
B. Sound-reduction package shall have the following:

1. Acoustic blankets around compressors.
2. Low-speed fans
3. Designed to reduce sound level without affecting performance.

2.4 CABINET

A. Base: Galvanized-steel base extending the perimeter of water chiller. Secure frame, compressors, and evaporator to base to provide a single-piece unit.
B. Frame: Rigid galvanized-steel frame secured to base and designed to support cabinet, condenser, control panel, and other chiller components not directly supported from base.
C. Casing: Galvanized steel.
D. Finish: Coat base, frame, and casing with a corrosion-resistant coating capable of withstanding a 500-hour salt-spray test according to ASTM B117.

2.5 COMPRESSOR-DRIVE ASSEMBLIES

A. Compressors:

1. Compressors Shall be hermetic, scroll-type, including:

a. Compliant design for axial and radial sealing.
b. Refrigerant flow through the compressor with 100% suction cooled motor.
c. Large suction side free volume and oil sump to provide liquid handling capability.
d. Compressor crankcase heaters to provide extra liquid migration protection.

e. Annular discharge check valve and reverse vent assembly to provide low pressure drop, silent shutdown and reverse rotation protection.
f. Initial Oil charge.
g. Oil Level sightglass.
h. Vibration isolator mounts for compressors.
i. Brazed-type connections for fully hermetic refrigerant circuits.
j. Microprocessor controlled, Factory installed Across-the-Line type compressor motor starters.

2. Vibration Isolation: Mount individual compressors on vibration isolators.

B. Compressor Motors:

1. Hermetically sealed and cooled by refrigerant suction gas.
2. High-torque, two-pole induction type with inherent thermal-overload protection on each phase.

2.6 REFRIGERATION

A. Refrigerant: R-32, R454B, or R410A. Classified as Safety Group A1 according to ASHRAE 34.
B. Refrigerant Compatibility: Parts exposed to refrigerants shall be fully compatible with refrigerants, and pressure components shall be rated for refrigerant pressures.
C. Refrigerant Circuit: Each circuit shall include expansion valve, refrigerant charging connections, a hot-gas muffler, compressor suction and discharge shutoff valves, a liquid-line shutoff valve, a replaceable-core filter-dryer, a sight glass with moisture indicator, a liquid-line solenoid valve, and an insulated suction line.
D. Refrigerant Isolation: Factory install positive shutoff isolation valves in the compressor discharge line and the refrigerant liquid-line to allow the isolation and storage of the refrigerant charge in the chiller condenser.
E. Pressure Relief Device:

1. Comply with requirements in ASHRAE 15, ASHRAE 147, and applicable portions of ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Select and configure pressure relief devices to protect against corrosion and inadvertent release of refrigerant.
3. ASME-rated, spring-loaded, pressure relief valve; single- or multiple-reseating type. Pressure relief valve(s) shall be provided for each heat exchanger.

F. LEAD compressor shall be equipped with hot gas bypass for reduced chiller minimum capacity.

2.7 EVAPORATOR (REMOTE)

A. Brazed-plate refrigerant side designed for 650 psig working pressure liquid side pressure of 150 psig.
B. Brazed Plate:

1. Direct-expansion, single-pass, brazed-plate design.
2. Type 304 stainless-steel construction.
3. Code Compliance: Tested according to ASME Boiler and Pressure Vessel Code.
4. Fluid Nozzles: Terminate with grooved connections for connection to field piping.
5. Inlet Strainer: Factory-furnished, 20-mesh strainer for field installation in supply piping to evaporator. Manufacturer has option to factory install strainer.

C. Flow Switch: Factory-furnished flow switch wired to chiller operating controls.

2.8 AIR-COOLED CONDENSER

A. Coil(s) with integral subcooling on each circuit.
B. Copper or Alminum Tube with Plate Fin Coils:

1. Construct coils of copper tubes mechanically bonded to aluminum fins.
2. Coating: Corrosion resistant.

C. Condenser shall be sized for full pump-down capacity.
D. Hail Protection: Provide condenser coils with louvers, baffles, or hoods to protect against hail damage.
E. Fans: Direct-drive propeller type with statically and dynamically balanced fan blades, arranged for vertical air discharge.
F. Fan Motors: TENV or TEAO enclosure, with sealed and permanently lubricated bearings, and having built-in overcurrent- and thermal-overload protection.

1. Overcurrent- and thermal-overload protection not integral to motor is acceptable if provided with chiller electrical power package.

G. Fan Guards: Removable steel safety guards with corrosion-resistant **PVC** coating.

2.9 INSULATION

A. Closed-cell, flexible, elastomeric thermal insulation complying with ASTM C534/C534M, Type I for tubular materials and Type II for sheet materials.

1. Thickness: 1-1/2 inches.

B. Adhesive: As recommended by insulation manufacturer.
C. Factory-applied insulation over all cold surfaces of chiller capable of forming condensation. Components shall include, but not be limited to, evaporator, evaporator water boxes including nozzles, refrigerant suction pipe from evaporator to compressor, cold surfaces of compressor, refrigerant-cooled motor, and auxiliary piping.

1. Apply adhesive to 100 percent of insulation contact surface.
2. Before insulating steel surfaces, prepare surfaces for paint, and prime and paint as indicated for other painted components. Do not insulate unpainted steel surfaces.

3. Seal seams and joints to provide a vapor barrier.
4. After adhesive has fully cured, paint exposed surfaces of insulation to match other painted parts.
5. Manufacturer has option to factory or field insulate chiller components to reduce potential for damage during installation.
6. Field-Applied Insulation:

    a. Components that are not factory insulated shall be field insulated to comply with requirements indicated.
    b. Manufacturer shall be responsible for chiller insulation whether factory or field installed to ensure that manufacturer is the single point of responsibility for chillers.
    c. Manufacturer's factory-authorized service representative shall instruct and supervise installation of field-applied insulation.
    d. After field-applied insulation is complete, paint insulation to match factory-applied finish.

2.10 ELECTRICAL

A. Factory installed and wired, and functionally tested at factory before shipment.
B. Factory-installed and -wired switches, motor controllers, transformers, and other electrical devices necessary shall provide a single-point field power connection to water chiller.
C. House in a unit-mounted, Type 3R enclosure with hinged access door with lock and key or padlock and key.
D. Wiring shall be numbered and color-coded to match wiring diagram.
E. Each motor shall have branch power circuit and controls with one of the following disconnecting means having SCCR to match main disconnecting means (meet or exceed 65 kA):

    1. NEMA KS 1, heavy-duty, fusible switch with rejection-type fuse clips rated for fuses. Select and size fuses to provide Type 2 protection according to IEC 60947-4-1.
    2. NEMA KS 1, heavy-duty, nonfusible switch.
    3. UL 489, motor-circuit protector (circuit breaker) with field-adjustable, short-circuit trip coordinated with motor locked-rotor amperes.

F. Each motor shall have overcurrent protection.
G. Overload relay sized according to UL 1995, or an integral component of water chiller control microprocessor.
H. Phase-Failure and Undervoltage: Solid-state sensing with adjustable settings.
I. Controls Transformer: Unit-mounted transformer with primary and secondary fuses and sized with enough capacity to operate electrical load plus spare capacity.
J. Control Relays: Auxiliary and adjustable time-delay relays, or an integral to water chiller microprocessor.
K. Indicate the following for water chiller electrical power supply:

1. Current, phase to phase, for all three phases.
2. Voltage, phase to phase and phase to neutral for all three phases.
3. Three-phase real power (kilowatts).
4. Three-phase reactive power (kilovolt amperes reactive).
5. Power factor.
6. Running log of total power versus time (kilowatt hours).
7. Fault log, with time and date of each.

2.11 CONTROLS

A. Factory installed and wired, and functionally tested at factory before shipment.
B. Standalone, microprocessor based, with all memory stored in nonvolatile memory so that reprogramming is not required on loss of electrical power.
C. Enclosure: Share enclosure with electrical power devices or provide a separate enclosure of matching construction.
D. Operator Interface: Keypad or pressure-sensitive touch screen. Multiple-character, digital display. Display the following:

1. Date and time.
2. Operating or alarm status.
3. Operating hours.
4. Outside-air temperature if required for chilled-water reset.
5. Temperature and pressure of operating set points.
6. Chilled-water entering and leaving temperatures.
7. Refrigerant pressures in evaporator and condenser.
8. Saturation temperature in evaporator and condenser.
9. No cooling load condition.
10. Elapsed time meter (compressor run status).
11. Pump status.
12. Antirecycling timer status.
13. Percent of maximum motor amperage.
14. Current-limit set point.
15. Number of compressor starts.
16. Alarm history with retention of operational data before unit shutdown.
17. Superheat.

E. Control Functions:

1. Manual or automatic startup and shutdown time schedule.
2. Capacity control based on evaporator leaving-fluid temperature.
3. Capacity control compensated by rate of change of evaporator entering-fluid temperature.
4. Chilled-water entering and leaving temperatures, control set points, and motor load limit. Chilled-water leaving temperature shall be reset based on signal from control system.
5. Current limit and demand limit.
6. External water chiller emergency stop.
7. Antirecycling timer.
8. Automatic lead-lag switching.

F. Manual-Reset Safety Controls: The following conditions shall shut down water chiller and require manual reset:

1. Low evaporator pressure or high condenser pressure.
2. Low chilled-water temperature.
3. Refrigerant high pressure.
4. High or low oil pressure.
5. High oil temperature.
6. Loss of chilled-water flow.

G. Building Control System Interface: Factory-install hardware and software to enable system to monitor, control, and display chiller status and alarms.

1. Hardwired I/O Points:

a. Monitoring: On/off status, trouble alarm.
b. Control: On/off operation, chilled-water discharge temperature set-point.

2. Communication Interface: ASHRAE 135 (BACnet) communication interface shall enable control system operator to remotely control and monitor the water chiller from an operator workstation. Control features and monitoring points displayed locally at water chiller control panel shall be available through DDC system for HVAC.

H. Factory-installed wiring outside of enclosures shall be in NFPA 70-complaint raceway.

2.12 ACCESSORIES

A. Factory-furnished neoprene isolators for field installation.
B. Compressor sound blankets.
C. Low sound acoustical fans.
D. Hail guards

2.13 CAPACITIES AND CHARACTERISTICS

A. See Schedule at the end of this Section.
B. Chillers shall be capable of operating down to 35F ambient temperature.

2.14 SOURCE QUALITY CONTROL

A. Perform functional test of water chillers before shipping.
B. Factory test and inspect evaporator according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1. Stamp with ASME label.
C. For water chillers located outdoors, rate sound power level according to AHRI 370 procedure.

2.15 TRAINING

1. Provide training for components as noted below:

    a. Factory specialist to present 2 sessions of training at 4 hours per session.
    b. Include accessory equipment
    c. Electrical
    d. Controls
    e. Refrigeration and piping
    f. Seasonal considerations
    g. Checklists
    h. Emergency procedures
    i. Manual/Automatic operation
    j. Shutdown

2. Maintenance items, including:

    a. Routine
    b. Periodic
    c. Service
    d. Lubrication
    e. Overhaul
    f. List of recommended spare parts

3. Explanation of warranty
4. Normal or special tools required

PART 3 - EXECUTION – NOT APPLICABLE
PART 4 - BID EVALUATION

4.1 SUMMARY

A. Chillers will be selected with consideration given to all the following criteria:

    1. First Cost
    2. Operating Cost
    3. Physical Dimensions

B. Each chiller manufacturer must submit a Chiller Efficiency Form with their bid (form located at end of this Section.)
C. Provide specified submittal data with bid.
D. Provide acknowledgement of startup/commissioning scope with bid.
E. Include with bid: Statement of earliest date chillers can be delivered on site, based on an anticipated invoice date of June 17, 2024.

PART 5 - AIR COOLED CHILLER DESIGN CONDITIONS

A. MARK NO.: CH-1
B. QUANTITY: 1
C. FLUID: WATER
D. REFRIGERANT: _____
E. NOMINAL VOLTAGE: 480V / 3PH / 60HZ
F. AMBIENT DESIGN TEMPERATURE: 95.0 F
G. EVAPORATOR FOULING FACTOR: 0.0001
H. REMOTE EVAPORATOR SEPARATION: 40 FT. HORIZONTAL, 5 FEET VERTICAL (LOWER THAN CHILLER)
I. EVAPORATOR EWT/LWT: 60.0 F / 45.0 F
J. MINIMUM NET COOLING CAPACITY: 215 TONS
K. MAXIMUM EVAPORATOR PRESSURE DROP INCLUDING STRAINERS: 25 FT. H20
L. MINIMUM OPERATING TEMPERATURE: 35 F

CHILLER PERFORMANCE AND ACOUSTICS SUBMITTAL REQUIREMENTS FOLLOW ON NEXT PAGE.

Chiller Efficiency Form

Project: Eagle Elementary School Central Plant Equipment Pre-Purchase
Engineer: R.E. Dimond and Associates, Inc.

1.	Tag Name	CH-1	
2.	Manufacturer		
3.	Model Number		
4.	Minimum Design Capacity	215	Tons
5.	Entering Chilled Water Temperature	45°F	
6.	Leaving Chilled Water Temp	60°F	
7.	Chilled Water Flow Rate		GPM
8.	Evaporate Water Pressure Drop		Ft
9.	Ambient Air Temperature	95°	F
10.	IPLV (AHRI) / NPLV (52°F/42°F)		kw/ton

Load (%)	Ambient Temp (F)	Capacity (Tons)	Total Power (kW)	Unit Efficiency (Btu/W-h)

Notes:

1. Cut sheets showing weight and dimensions must be included.
2. Chillers must meet or exceed chiller efficiency and all other specified performance criteria.
3. Provide certified HEMISPHERICAL sound ratings for proposed chillers using form below (additional points may be provided). Provide at minimum for both 30 feet (AHRI) and 100 feet.
   All measured data shall be obtained in accordance with most recent ARI Standard “Method of Measuring Machinery Sound within Equipment Rooms,” which provides guidelines for the measurement, evaluation and compilation of sound data for large refrigeration equipment.

Chiller Sound Pressure Levels (Standard)									
Percent Load	Octave Band Center Frequency Hz								A-Weighted (dBA)
	63	125	250	500	1000	2000	4000	8000	
100									
75									
50									
25									

END OF SECTION

PAGE LEFT BLANK