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ADDENDUM

Project:	Southwestern Middle - Replace 250 Ton Chiller, Project No. 2347950		
SEG Job No:	22010		
Modification:	Revision 1 - Addendum 1		1 page(s)
Issue Date:	3/31/2023		

Owner:	School Board of Volusia County, Florida 200 N. Clara Avenue DeLand, FL 32720		
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The following modifications shall be incorporated to the previously distributed construction documents.
Any questions regarding these modifications should be faxed to SEG for consideration.

The Drawings and Specifications are hereby modified as follows:

Specification Modifications:

Item MS-1: Replace Section 23 64 26 (Water Chillers – Air Cooled) with attached, revised section.

End of Addendum

SECTION 23 64 26**WATER CHILLERS – AIR COOLED****PART 1 GENERAL****1.1 SECTION INCLUDES**

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1.2 SUMMARY

- A. Section includes microprocessor controlled, air cooled liquid chiller package, charge of refrigerant and oil, controls and control connections, chilled water connections, starters.
- B. Related Sections:

1. Section 03 30 00 - Cast-In-Place Concrete: Execution requirements for concrete housekeeping pads specified by this section.
2. Section 23 05 48 – Vibration Controls for HVAC Piping and Equipment: Product requirements for Vibration Isolators for placement by this section.
3. Section 23 21 14 – HVAC Piping: Product requirements for piping specialties for placement by this section.

1.3 REFERENCES

- A. American Heating and Refrigeration Institute
 1. AHRI 550/590 - Standard for Water Chilling Packages using the Vapor Compression Cycle
 2. AHRI 370 - Sound Rating of Large Outdoor Refrigerating and Air-Conditioning Equipment
- B. American Society of Heating Refrigeration and Air-Conditioning Engineers
 1. ASHRAE 15 - Safety Code for Mechanical Refrigeration
 2. ASHRAE 90.1 - Energy Efficient Design of New Buildings
- C. American Society of Mechanical Engineers:
 1. ASME - Boiler and Pressure Vessel Code SEC VIII, Division 1
- D. Underwriters Laboratories (UL):
 1. UL 1995 - Central Cooling Air Conditioners
- E. American Society for Testing and Materials (ASTM)
 1. ASTM B117 - Standard Method of Salt Spray (Fog) Testing
 2. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 3. ASTM A525 - Zinc (Hot-Dip Galvanized) Coatings on Sheet Steel Products
 4. ASTM D1654 - Evaluation of Painted or Coated Specimens, Subjected to Corrosive Environments
- F. Anti-Friction Bearing Manufacturers Association
 1. ANSI/AFBMA 9-1978 - Load Ratings and Fatigue Life for Ball Bearings.
- G. International Standards Organization
 1. ISO 9001

1.4 SUBMITTALS

- A. Shop Drawings: Indicate components, assembly, dimensions, weights and loads, required clearances, and location and size of field connections. Indicate valves, strainers, and thermostatic valves required for complete system.
- B. Product Data: Submit rated capacities, weights, specialties and accessories, electrical requirements, wiring diagrams, and control diagrams.

- C. Manufacturer's Installation Instructions: Submit assembly, support details, connection requirements, and include startup instructions.
- D. Manufacturer's Field Reports: Submit start-up report for each unit. Indicate results of leak test and refrigerant pressure test.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Submit start-up instructions, maintenance data, parts lists, controls, and accessories. Include trouble-shooting guide.

1.6 QUALITY ASSURANCE

- A. Conform to AHRI 550/590-2011 Standard for testing and certified rating of Water Chilling Packages using the Vapor Compression Cycle.
- B. Conform to ANSI/UL 1995 code for construction of water chillers. In the event the unit is not UL approved, the manufacturer shall, at manufacturer expense, provide for a field inspection by an UL representative to verify conformance to UL standards. If necessary, contractor shall perform modifications to the unit to comply with UL, as directed by the UL representative.
- C. Conform to ANSI/ASME Boiler and Pressure Vessel Code SEC 8 for construction and testing of water chillers.
- D. Conform to ANSI/ASHRAE 15 code for construction and operation of water chillers.
- E. Chiller must be built in an ISO 9001 classified facility.
- F. Factory Functional Test: The chiller shall be pressure tested, evacuated and fully charged with refrigerant and oil. Provide a factory functional test to verify correct operation by cycling condenser fans, compressors and reading data points from temperature and pressure sensors.

1.7 EFFICIENCY PENALTY

- A. To account for potential financial losses resulting from the installation of a lower efficiency chiller than the basis of design, the following process shall be used:
 - 1. Obtain the AHRI certified IPLV performance ratings of the proposed chiller to calculate the following:
 - 2. $\text{Penalty Amount} = \$20,000 \times (\text{Specified IPLV} - \text{Actual IPLV})$
 - a. Negative penalties will be ignored.
 - 3. $\text{Penalty} = [(551 / A) + (1,217 / B) + (2,309 / C) + (1,305 / D) - 348] \times 1,000$
 - a. Penalty = the estimated net present value of the additional energy used by the less efficient chiller during a 13 year period
 - b. A = the chiller EER at 25% of full load capacity
 - c. B = the chiller EER at 50% of full load capacity
 - d. C = the chiller EER at 75% of full load capacity

- e. D = the chiller EER at 100% of full load capacity
- f. Negative penalties will be ignored.
- 4. Provide the bidding contractor with a price for the chiller(s) AND a separate price for the Penalty amount associated with the use of the quoted chiller(s).
- 5. The bidding contractor shall include the Penalty amount in their bid price and list the Penalty amount separately on their bid form.
- 6. After the Bid is awarded, the Penalty amount shall be refunded to the Owner via a Change Order.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five (5) years experience. Manufacturer shall have a factory trained and supported service organization that is within a 75 mile radius of the site.
- B. Installer: Company specializing in performing Work of this section with minimum five (5) years documented experience installing similar equipment.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Unit controls shall be capable of withstanding 200 F storage temperatures in the control compartment.
- B. Unit shall be stored and handled per unit manufacturer's recommendations.
- C. Accept chillers on site in factory packaging. Inspect for damage.

1.10 WARRANTY

- A. VCSD - Furnish a ten (10) year manufacturer warranty to include coverage for all parts, labor, and refrigerant. Provide 24-hour response time.
 - 1. Repair or replace parts in accordance with manufacturer's operating and maintenance data. Use parts produced by manufacturer of original equipment.

1.11 MAINTENANCE SERVICE AGREEMENT (VCSD)

- A. Furnish service and maintenance of chiller(s) included in the project for ten (10) years from Date of Substantial Completion.
- B. Service agreement shall be with the manufacturer of the chillers and shall not be initiated by or transferred to a third party.
- C. Provide the following service work as a minimum:
 - 1. Chillers with Screw-style compressors:
 - a. Annual Service
 - 1) Customer Notification

- 2) Initial Site Inspection
- 3) Review Diagnostics
- 4) Lock Out Tag Out At Main Disconnect
- 5) Electrical Inspection
- 6) Compressor Starter Inspection (Wye-Delta
- 7) Closed Transition)
- 8) Flow/Differential Mechanical Switch Check
- 9) Remove Lock Out Tag Out At Main Disconnect
- 10) Condenser Fans Check Per Circuit
- 11) Visual Condenser Coil Check
- 12) Oil Return Operation Check Per Circuit
- 13) Oil Level Check Per Compressor
- 14) Oil Analysis Per Compressor
- 15) Low Temperature Sensor Calibration
- 16) Control Panel Calibration Check
- 17) Leak Test Inspection (Positive Pressure)
- 18) Coil Cleaning (Water)
- 19) Start Unit
- 20) Compressor Check
- 21) Compressor And Oil Separator Heater Check
- 22) Internal Chiller Controller Connection
- 23) Run Service Report From Internal Chiller Controller
- 24) Internal Chiller Controller View Disconnection
- 25) Complete Required Paper Work

b. Quarterly Service

- 1) Initial Site Inspection
- 2) Review Diagnostics
- 3) Condenser Fans Check Per Circuit
- 4) Lock Out Tag Out (Standard)
- 5) Visual Electrical Inspection
- 6) Visual Condenser Coil Check
- 7) Remove Lock Out Tag Out
- 8) Start Unit
- 9) Complete Required Paper Work
- 10) Internal Chiller Controller Connection
- 11) Run Service Report From Internal Chiller Controller
- 12) Internal Chiller Controller View Disconnection

- D. Perform work without removing units from service during building normal occupied hours.
- E. Provide emergency call back service during working hours for this maintenance period.
- F. Maintain locally, near Place of the Work, adequate stock of parts for replacement or emergency purposes. Have personnel available to ensure fulfillment of this maintenance service, without unreasonable loss of time.

- G. Perform maintenance work using competent and qualified personnel under supervision of manufacturer or original installer.
- H. Do not assign or transfer maintenance service to agent or subcontractor without prior written consent of Owner.

~~1.12 MAINTENANCE SERVICE AGREEMENT~~

- ~~A. Furnish service and maintenance of chiller for [one] [five] years from Date of Substantial Completion.~~
- ~~B. Examine unit components [weekly] [semi-monthly] [monthly] [bi-monthly]. Clean, adjust, and lubricate equipment.~~
- ~~C. Include systematic examination, adjustment, and lubrication of unit, and controls checkout and adjustments. Repair or replace parts in accordance with manufacturer's operating and maintenance data. Use parts produced by manufacturer of original equipment.~~
- ~~D. Perform work without removing units from service during building normal occupied hours.~~
- ~~E. Provide emergency call back service [at all hours] [during working hours] for this maintenance period.~~
- ~~F. Maintain locally, near Place of the Work, adequate stock of parts for replacement or emergency purposes. Have personnel available to ensure fulfillment of this maintenance service, without unreasonable loss of time.~~
- ~~G. Perform maintenance work using competent and qualified personnel under supervision of manufacturer or original installer.~~
- ~~H. Do not assign or transfer maintenance service to agent or subcontractor without prior written consent of Owner.~~

1.13 OWNER TRAINING

- A. Basic Training: Include 2 hours of factory chiller training on-site.
- B. Enhanced Training: Include 8 hours of factory chiller training. Training location to be either the project site or the owner's facility as determined by the owner.

PART 2 PRODUCTS

2.1 PACKAGED WATER CHILLERS

- A. Manufacturers (VCSD):
 - 1. Carrier

2. The Trane Company
3. York International

2.2 DESCRIPTION

- A. Product Description: Factory assembled and tested, packaged, air cooled, liquid chillers consisting of compressor(s), compressor motor, condenser(s), evaporator, refrigeration accessories, instrument and control panel including gages, auxiliary components and accessories, and motor starters. Contained within the unit cabinet shall be all factory wiring, piping, controls, refrigerant charge, and special features required prior to field start-up.

2.3 UNIT CABINET

- A. Frame shall be of heavy-gage galvanized steel.
- B. Cabinet shall be galvanized steel casing with a baked enamel powder or pre-painted finish.
- C. Cabinet shall be capable of withstanding 500-hour salt spray test in accordance with the ASTM B-117 standard.

2.4 REFRIGERANT

- A. Acceptable refrigerants are as follows:
 1. R-134a (screw-type compressors)

2.5 COMPRESSOR(S)

- A. Semi-hermetic Helical Rotary Screw Compressors:
 1. Unit: Direct drive, semi-hermetic 3600 RPM, fixed compression, rotary screw compressor with control panel.
 2. Features: Differential refrigerant pressure oil pump, oil heater, oil separator and filter and oil charging valve.
 3. Motor: Suction gas-cooled, hermetically sealed, squirrel cage induction.
 4. Automatic Capacity Reduction:
 - a. Continuously variable slide valve with infinitely variable control
 - b. Variable speed drive
 5. Lubrication system – Oil lubrication system with oil charging valve and oil filter.
 6. External vibration isolation - rubber in shear.

2.6 EVAPORATOR

- A. General
 1. Incorporate two independent refrigerant circuits on chillers with capacities of 30 tons and larger chillers.
 2. Insulate with 1.25-in. closed-cell, UV resistant, polyvinyl-chloride foam with a maximum K factor of 0.28.

3. Cooler shall have an optional factory-installed heater, to protect cooler from ambient temperature freeze.
 4. Cooler shall be designed, tested, rated and stamped with ASME code for a refrigerant working-side pressure of 450 psig and shall be tested for a maximum fluid-side pressure of 150 psig.
 5. Each shell includes a vent, a drain and fittings for temperature control sensors
 6. Furnish water drain connection and thermometer wells for temperature controller and low temperature cutout.
 7. Proof of flow shall be provided by the equipment manufacturer, mechanically installed and electrically wired, at the factory of origin.
- B. Shell and Tube Style
1. Shell and tube type, seamless or welded steel construction with cast iron or fabricated steel, heads, seamless copper tubes or red brass tubes with integral fins, roll expanded into tube sheets.

2.7 CONDENSER COILS, FANS AND MOTORS

- A. Chiller shall be able to start and operate in ambient conditions down to 32°F and up to 125°F.
- B. Condenser Coils:
1. Traditional Coils: Aluminum fins mechanically bonded to seamless copper tubing. Furnish sub-cooling circuits as applicable. Air test under water to 350 psig, and dehydrate. Seal with holding charge of refrigerant.
- C. Architectural Panels: Provide louvered panels matching the finish of the chiller framework. Panels shall extend from the top of the chiller to the bottom rail and shall be easily removable for chiller servicing.
- D. Coil Guard: Provide louvered coil guards on chillers with vertical condenser coils.
- E. CORROSIVE ENVIRONMENT COIL COATING: Provide an anti-corrosion coating that complies with the following:
1. Coil coating application shall not result in an increase to the manufacturer's standard lead time.
 2. Factory Dip and Bake: Provide a complete, flexible epoxy dip and bake coating of condenser coils. Coil with coating shall be able to withstand 6000-hour salt spray test. All coil surfaces shall be coated with epoxy material giving uniform coverage (minimum of 0.8 mils), without bridging between fins. Any coating showing bridging will be deemed unacceptable. Coatings not covering all parts of the fin and/or parts of condenser frame will be unacceptable. The heat transfer decrease due to the coating shall be less than 1%. Coating shall be able to withstand corrosive environments in the pH range of 3-12. Coating shall be flexible so that bare surfaces will not form. The coating shall be able to withstand temperatures ranging from -50 to 250F without degrading. UV protection

shall be applied on surface of coating to prevent degradation from sunlight.

- a. Acceptable Manufacturer/Products:
 - 1) Chiller manufacturer's factory application
3. Spray Applied (Alternative): Provide water-based synthetic anti-corrosion coating applied at the chiller manufacturer's or coating manufacturer's facility. Dry thickness: 0.6 – 1.2 mils, no bridging allowed, Crosshatch adhesion rating: 5B, Minimum salt spray resistance: 5,000 hours
 - a. Acceptable Manufacturer/Products:
 - 1) Blygold/XT
 - 2) Luvata
 - b. Transportation/coordination requirements:
 - 1) Receive chiller at coating manufacturer's facility
 - 2) Treat condenser coils per manufacturer's recommendations
 - 3) Provide transportation to project site
 - 4) Manufacturer to coordinate schedule with contractor
 - c. Warranty: Provide a 10 year warranty to include annual cleaning and touch-up as required to maintain warranty.

F. FANS

1. Low sound fans balanced and direct driven. Upward vertical discharge and protected by coated steel wire safety guards.
2. Fan motors shall be TEAO with permanently lubricated ball bearings and external overload protection.

2.8 REFRIGERANT CIRCUIT

- A. Factory furnished and piped.
- B. Linear unloading control to maintain leaving water temperature. Refer to Schedule for minimum operating capacity requirement.
- C. Furnish for each refrigerant circuit:
 1. Liquid line shutoff valve
 2. Suction service valve
 3. Discharge service valve
 4. Filter (replaceable core type)
 5. Liquid line sight glass.
 6. Electronic expansion valve sized for maximum operating pressure
 7. Charging valve
 8. Discharge and oil line check valves
 9. High side pressure relief valve
 10. Integrated oil loss sensor

2.9 CONTROLS

- A. Provide BACnet Communication interface with the Building Automation System.

- B. Building Automation System Interface: Refer to the Sequences of Operation and control diagrams in the Drawings. Coordinate with the EMS contractor and provide additional hardware and/or software as required to interface with the EMS to provide the specified functionality.
- C. Chiller mounted weatherproof control panel, containing starters, power and control wiring, factory wired with terminal block power connection. Provide primary and secondary fused control power transformer and a single 115 volt 60 Hz single phase connection for evaporator freeze protection heaters.
- D. All controls and sensors shall be factory mounted and tested prior to shipment.
- E. Unit controls shall include the following minimum components:
 - 1. Microprocessor.
 - 2. Power and control circuit terminal blocks.
 - 3. ON/OFF control switch.
 - 4. Replaceable solid-state relay panel.
 - 5. Clear language, expandable, alpha-numeric diagnostic display/set point panel.
 - 6. Thermistors installed to measure the following:
 - a. Saturated condensing temperature
 - b. Cooler saturation temperature
 - c. Compressor return gas temperature
 - d. Cooler entering and leaving fluid temperatures.
- F. Microcomputer controls shall be provided to control all chiller functions including the following:
 - 1. Start-up and shut down
 - 2. Leaving chilled water temperature control
 - 3. Compressor and electronic expansion valve modulation
 - 4. Fan sequencing
 - 5. Anti-recycle logic
 - 6. Automatic lead/lag compressor starting
 - 7. Load limiting
 - 8. Pumpout at beginning and end of every circuit cycle.
 - 9. Limiting of the chilled fluid temperature pulldown rate at start-up to 1° F per minute to prevent excessive demand spikes (charges) at start-up.
- G. The unit control module shall automatically take action to avoid unit shutdown due to abnormal operating conditions associated with the following conditions:
 - 1. Low refrigerant pressure
 - 2. High condensing pressure
 - 3. Motor current overload
- H. Should the abnormal operating condition continue until a protective limit is violated, the unit shall shut down.
- I. The unit control module shall automatically shutdown the chiller due to the following abnormal operating conditions:

1. Loss of chilled water flow
 2. Evaporator freezing
 3. Substantial loss of refrigerant
 4. Substantially low refrigerant pressure
 5. High refrigerant pressure
 6. Reverse rotation
 7. Compressor running over current
 8. Phase loss, imbalance, or reversal
 9. Loss of oil flow.
- J. A digital display shall indicate the following information, at a minimum:
1. Chilled water setpoint
 2. Leaving chilled water temperature
 3. Chiller Percent loaded or stages operating.
- K. The diagnostic display module shall be capable of indicating the safety lockout condition by displaying a code for which an explanation may be scrolled at the display. Information included for display shall be:
1. Compressor lockout.
 2. Loss of charge.
 3. Low fluid flow.
 4. Low oil pressure.
 5. Cooler freeze protection.
 6. High or low suction superheat.
 7. Thermistor malfunction.
 8. Entering and leaving-fluid temperature.
 9. Evaporator and condenser pressure.
 10. Electronic expansion valve positions.
 11. All set points.
 12. Time of day.
- L. The display module, in conjunction with the microprocessor, must also be capable of displaying the output (results) of a service test. Service test shall verify operation of every switch, thermistor, fan, and compressor before chiller is started.

2.10 STARTERS:

- A. Starters are housed in a weather tight enclosure with removable cover plate to allow for customer connection of power wiring.
- B. For each compressor, furnish the following:
1. Across-the-line starter (wye-delta starters for 460v compressor motors over 40 hp)
 2. Non-recycling compressor overload
 3. Starter relay
 4. Control power transformer (if indicated on the schedule) or terminal for control power
 5. Manual reset

6. Current overload protection.

2.11 DISCONNECT

- A. Provide unit mounted disconnect if required by the equipment schedule.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install packaged outdoor chiller on a reinforced concrete foundation minimum 6 inches thick and 6 inches wider than equipment base on each side.
- B. Install units on vibration isolation. Refer to Section 23 05 48.
- C. Connect to chilled water piping. Arrange piping for easy dismantling.
- D. Install chiller accessories furnished loose for field mounting.
- E. Install electrical devices furnished loose for field mounting. Connect to electrical service.
- F. Install control wiring between chiller control panel and field mounted control devices.

3.2 INSULATION

- A. Insulate all chiller cold surfaces with 1.5 inch minimum thickness flexible closed cell foam insulation with maximum K factor of 0.26. Insulation shall be finished with
 1. UV protective paint, dark gray color.
 2. PVC jacketing
 3. Aluminum jacketing
- B. This scope shall be coordinated by the chiller manufacturer representative. The work may be provided either by the project insulator or by a separate insulator contracted through the chiller manufacturer.

3.3 MANUFACTURER'S FIELD SERVICES

- A. Furnish services of factory trained representative for minimum of one day to leak test, refrigerant pressure test, evacuate, dehydrate, charge, start-up, calibrate controls, and instruct Owner on operation and maintenance.
- B. The manufacturer shall furnish complete submittal wiring diagrams of the package unit as applicable for field maintenance and service.
- C. Furnish initial charge of refrigerant and oil.

- D. Review factory installed insulation and repair and/or replace any chiller insulation not adhering adequately.

END OF SECTION