PART 1 - GENERAL

1.1 SECTION INCLUDES

1. Chiller package
2. Charge of refrigerant and oil
3. Controls and control connections
4. Chilled water connections
5. Starters

1.2 RELATED SECTIONS

N/A

1.3 REFERENCES

1. ARI 550/590
2. ASHRAE 15 ‑ Safety Code for Mechanical Refrigeration
3. ASHRAE 90.1 – Energy Standard for Buildings Except Low-Rise Residential Buildings
4. ASME SEC 8 - Boiler and Pressure Vessel Code
5. NEMA MG 1 - Motors and Generators
6. UL 465 - Central Cooling Air Conditioners
7. ARI 370
8. NFPA 70 – National Electric Code (NEC)

1.4 SUBMITTALS FOR REVIEW

A. Submittals shall be reviewed by engineer prior to awarding bid.

B. Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Indicate valves, strainers, and thermostatic valves required for complete system.

C. Product Data: Provide rated capacities, weights, specialties and accessories, electrical requirements and wiring diagrams.

1.5 SUBMITTALS FOR INFORMATION

A. N/A

B. Submit manufacturer's installation instructions.

C. Manufacturer's Certificate: Certify that components of package not furnished by manufacturer have been selected in accordance with manufacturer's requirements.

1.6 SUBMITTALS AT PROJECT CLOSEOUT

A. N/A

B. Operation and Maintenance Data: Include start‑up instructions, maintenance data, parts lists, controls, and accessories. Include trouble‑shooting guide and written warranty.

1.7 QUALITY ASSURANCE

Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years experience.

1.8 REGULATORY REQUIREMENTS

A. Provide certification of inspection for conforming authority having jurisdiction approval.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.9 DELIVERY, STORAGE, AND PROTECTION

A. Store units at factory until mechanical contractor coordinates installation. Manufacturer shall be responsible for equipment until contractor offloads at site.

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

C. Protect units from physical damage.

1.10 WARRANTY (Base bid)

A. Provide full one year manufacturer’s warranty on entire machine. Include all parts and labor including refrigerant.

B. Warranty: Include coverage for complete assembly including materials and labor.

1.11 MANUFACTURER’S AND MAINTENANCE SERVICE (BID ALTERNATE)

Refer to bid documents for all extended warranty requirements preventative and maintenance service agreements.

1.12 MAINTENANCE MATERIALS

Per O and M manual

1.13 EXTRA MATERIALS

Per O and M manual

PART 2 - PRODUCTS

* 1. MANUFACTURERS
1. Carrier (pre-approved to bid)
2. Trane (pre-approved to bid)
3. McQuay (pre-approved to bid)
4. York (pre-approved to bid)
5. Substitutions: Not permitted. All pre-approved manufacturers shall submit product information to engineer prior to awarding of bid.

2.2 MANUFACTURED UNITS

A. Provide factory assembled and tested outdoor air cooled liquid chillers consisting of compressors, ­condenser, evaporator, thermal expansion valve, refrigeration charge (R134a) and accessories, and control panel. Construction, testing, and ratings shall be in accordance with ARI 590. Provide independent refrigeration circuits with one compressor per circuit.

B. Conform to ASHRAE 15 code for construction and operation of water chillers.

2.3 N/A

2.4 SEMI-HERMETIC COMPRESSORS

 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, oil charging valve.

3) Motor: Suction gas cooled, hermetically sealed, 2 pole squirrel cage induction.

4) Controls:

1. Non-fused molded case disconnect switch
2. Single point power connection and grounding lug. Provide with 2 115 volt power connections for controls and heat strip.
3. Anti-recycle timer
4. Solid state overload relay for each compressor
5. Phase loss/reversal/imbalance monitor
6. Cycle counter and hour meter per compressor
7. Low and high pressure control
8. Automatic shutdown compressor overload and low and high refrigerant pressure
9. Y-delta type starter

5. Automatic Capacity Reduction: Continuously variable slide valve with infinitely variable control to 25 percent of full load.

2.5 SOUNG ATTENUATION:

Provide chiller unit with compressor sound attenuation kit and low sound fan kit. Manufacturer shall provide complete sound data in accordance with ARI Standard 370 for chiller unit with compressor sound attenuation kit and low sound fan assembly installed.

2.6 EVAPORATOR

A. Provide shell and tube type evaporator, seamless or welded steel construction with cast iron or fabricated steel heads, seamless copper tubes or red brass tubes with integral fins, rolled or silver brazed into tube sheets. Provide dual refrigerant circuits on dual compressor units.

B. Design, test, and stamp refrigerant side for 200 psig working pressure and water side for 150 psig working pressure, in accordance with ASME.

C. Insulate with 0.75 inch minimum thick flexible polyurethane foam insulation with maximum K value of 0.26. Provide heat tape to protect evaporator to ‑20 degrees F.

D. Provide water drain connection and thermometer wells for temperature controller and low temperature cutout.

2.7 CONDENSERS

A. Construct condenser coils of aluminum fins mechanically bonded to seamless copper tubing. Provide sub‑cooling circuits with liquid accumulators. Factory Air test under water to 450 psig.

B. Low sound fans: Provide vertical discharge direct driven propeller type condenser fans with fan guard on discharge. Equip with ball bearings with grease fittings extended to outside of casing. Provide factory mounted coil guard panels.

C. Provide fan motors with permanently lubricated ball bearings and built‑in current and overload protection.

1. Coil shall be coated by the manufacturer based on the following:

E-coated aluminum coil shall have a flexible epoxy polymer coating uniformly applied to all coil external surface areas without material bridging between fins and tubes. Coating process shall ensure complete coil encapsulation, including all fin edges. E-coated coils shall have superior hardness characteristics of 2H per ASTM D3363-00 and cross hatch adhesion of 4B-5B per ASTM D3359-02. Impact resistance shall be up to 160 in./lb (ASTM D2794-93). E-coated coil shall have superior impact resistance with no cracking, chipping, or peeling per NSF/ANSI 51-2002 Method 10.2.

Coating specification shall include the following requirements:

1. Complete immersion
2. Thermal loss less than 1%
3. No bridging
4. Cathodic deposition
5. Min. 500 hours salt spray test per ASTM B117-90
6. Alternate bid:
7. Coil shall be air-cooled Novation heat exchangertechnology (CHX) and shall have a series of flat tubes containing a series of multiple, parallel flow microchannels layered betweeen the refrigerant manifolds. Novation coils shall consist of a two-pass arrangement.
8. Coil construction shall consist of aluminum alloys for fins, tubes, and manifolds in combination with a corrosion-resistant coating.
9. Tubes shall be cleaned, dehydrated, and sealed.
	* 1. Assembled condenser coils shall be leak tested and pressure tested at 375 psig (2585 kPa).
		2. E-coated aluminum microchannel coil shall have a flexible epoxy polymer coating uniformly applied to all coil external surface areas without material bridging between fins or louvers. Coating process shall ensure complete coil encapsulation, including all exposed fin edges. E-coat shall have a thickness of 0.8 to 1.2 mil with top coat having a uniform dry film thickness from 1.0 to 2.0 mil on all external coil surface areas including fin edges. E-coated coils shall have superior hardness characteristics of 2H per ASTM D3363-00 and cross hatch adhesion of 4B-5B per ASTM D3359-02. Impact resistance shall be up to 160 in./lb.(ASTM D2794-93). E-coated coil shall have superior impact resistance with no cracking, chipping or peeling per NSF/ANSI 51-2002 Method 10.2.
		3. Provide low ambient controls for operation down to 0 degrees F.
		4. Low sound fans: Provide vertical discharge direct driven propeller type condenser fans with fan guard on discharge. Equip with sealed, permanently lubricated ball bearings and build-in current and overload protection.

2.8 ENCLOSURES

A. House components in welded steel frame with galvanized steel panels with weather resistant, baked enamel finish.

B. Mount starters and disconnects in weatherproof panel provided with full opening access doors. Provide mechanical interlock to disconnect power when door is opened.

2.9 HEAT RECOVERY CONDENSERS

N/A

2.10 REFRIGERANT CIRCUIT

A. Provide refrigerant circuits, factory supplied and piped. 1 circuit per screw compressor.

B. Provide for each refrigerant circuit:

1. Liquid line solenoid valve
2. Filter dryer (replaceable core type)
3. Liquid line sight glass and moisture indicator
4. Electronic expansion valve sized for maximum operating pressure and variable capacity modulation over entire operating range.
5. Charging valve
6. Insulated suction line
7. Discharge line check valve
8. Compressor discharge service valve
9. Condenser pressure relief valve
10. Suction line accumulator

2.11 CONTROLS

A. On chiller, mount weatherproof steel control panel, containing starters power and control wiring, molded ­case disconnect switch, factory wired with single point power connection. Chiller controls shall be compatible with existing control system installed at Districts Schools. Provide a communication card suitable for this purpose.

B. For each compressor, provide wye-delta starter, non‑recycling compressor overload, starter relay, and control power transformer or terminal for controls power. Provide manual reset current overload protection.

C. Provide safety controls with indicating lights, with terminations for connection to controls system, (Alarm sent back to BMS only needs to show alarm) arranged so any one will shut down machine and require manual reset:

 1) Low chilled water temperature switch

 2) High discharge pressure switch for each compressor

 3) Low suction pressure switch for each compressor

 4) Oil pressure switch

5) Factory provided flow switch in chilled water line. Paddle type will not be accepted.

 6) Relay for remote mounted emergency shut‑down switch

D. Provide operating controls:

1) Microcomputer controls multi‑step chilled water temperature controller which cycles compressors and activates compressor unloading, all control functions, electronic expansion valve modulation, fan sequencing, and auto lead/lag compressor starting.

2) Chilled water reset control logic and factory installed sensors to reset leaving chilled water temperature based on ambient temperature or return water temperature.

E. Provide pre‑piped gage board with pressure gages for suction and discharge refrigerant pressures, and oil pressures for each compressor.

F. Provide control interface to allow chiller to communicate with existing control system. BMS shall at a minimum give chiller start/stop command; CHW setpoint; and receive alarm.

2.12 PERFORMANCE

Refer to attached schedule

2.13 ELECTRICAL CHARACTERISTICS AND COMPONENTS

A. Electrical Characteristics:

 1) Refer to schedule

2) Manufacturer exceeding existing electrical characteristics shall be responsible for increased power requirements for wire, conduit, and breaker size.

B. Motor: NEMA rated

C. Disconnect Switch: Factory mount disconnect switch on equipment

PART 3 - EXECUTION

3.1 INSTALLATION

N/A

3.2 MANUFACTURER'S FIELD SERVICES

A. Prepare and start systems.

B. Supply service of factory trained representative to supervise testing, dehydration and charging of machine, start‑up, and instruction on operation and maintenance to Owner.

C. Supply initial charge of refrigerant and oil.

3.3 DEMONSTRATION AND INSTRUCTIONS

A. Provide systems demonstration.

B. Demonstrate system operation and verify specified performance.

**END OF SECTION**