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PRE-BID MEETING SUMMARY  
DEARNG – ARMY AVIATION SUPPORT FACILITY (AASF)  
CLOSED CIRCUIT COOLER INSTALLATION  
OMB/DFM CONTRACT #'S MC3601000091  
FMO-DEARNG # 17-2016

ADDENDUM #3

Questions

1. Specification section 23 65 33 has been updated.
  - a. Paragraph 2.04B - Has been removed.
  - b. Paragraph 2.08D – Has been removed.
  - c. Paragraph 2.01A, B, C –Has been modified.
  - d. Paragraph 2.03G – Has been revised.
  
2. Dwg M-500 has been revised to include a flow indicator on CCC-1.

Summarized By: DEDC, LLC  
Date: February 15, 2017

**SECTION 23 65 33**  
**LIQUID COOLERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Liquid cooler.
- B. Controls.
- C. Ladder and Handrails.
- D. Inside Sump.
- E. Circulating pump.
- F. Discharge hood.

**1.02 RELATED REQUIREMENTS**

- A. Section 22 10 05 - Plumbing Piping.
- B. Section 23 05 13 - Common Motor Requirements for HVAC Equipment.
- C. Section 23 21 13 - Hydronic Piping.
- D. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.
- E. Section 26 27 17 - Equipment Wiring: Electrical characteristics and wiring connections.

**1.03 REFERENCE STANDARDS**

- A. ASME PTC 23 - Atmospheric Water-Cooling Equipment; The American Society of Mechanical Engineers; 2003.
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2013.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2013.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide rated capacities, dimensions, weights and point loadings, accessories, required clearances, electrical requirements and wiring diagrams, and location and size of field connections. Submit schematic indicating capacity controls.
- C. Shop Drawings: Indicate suggested structural steel supports including dimensions, sizes, and locations for mounting bolt holes.
- D. Certificates: Certify that liquid cooler performance, based on ASME PTC 23 meet or exceed specified requirements and submit performance curve plotting leaving water temperature against wet bulb temperature.
- E. Manufacturer's Instructions: Submit manufacturer's complete installation instructions.
- F. Operation and Maintenance Data: Include start-up instructions, maintenance data, parts lists, controls, and accessories. Include cleaning methods and cleaning materials recommended.
- G. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in State of Delaware OMB - Division of Facilities Management's name and registered with manufacturer.
- H. Maintenance Materials: Furnish the following for Delaware Army National Guard's Facilities Management's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Extra Fan Belts: Two sets, matched, of each type and size.
  - 3. Extra Spray Nozzles: Two.
  - 4. Extra Float Valves: One.

### **1.05 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Factory assemble entire unit. For shipping, disassemble into as large as practical sub-assemblies so that minimum amount of field work is required for re-assembly.
- B. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

### **1.07 WARRANTY**

- A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B. Provide a five year warranty to include coverage for liquid cooler package, labor.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Baltimore Aircoil Company: [www.baltimoreaircoil.com](http://www.baltimoreaircoil.com). (FXV Series)
- B. EVAPCO, Inc: [www.evapco.com](http://www.evapco.com). Basis of design (ESWA Series)
- C. SPX Cooling Technologies/Marley: [www.spxcooling.com](http://www.spxcooling.com). (DT Series)
- D. Substitutions: See Section 01 60 00 - Product Requirements.

### **2.02 IBC COMPLIANCE**

- A. The unit structure shall be designed, analyzed, and constructed in accordance with the latest edition of International Building Code (IBC) for: IP = 1.0, SDS = 0.42, P = 119 psf.

### **2.03 COMPONENTS**

- A. Description: Factory assembled and tested, induced draft counter flow closed circuit cooler complete with fan, coil, fill, louvers, accessories and rigging supports
- B. Cooler Coil:
  - 1. Heat transfer coil shall be tightly spaced elliptical steel tubes, encased in steel framework with the entire assembly hot-dip galvanized after fabrication. The coil assembly shall be designed with sloping tubes for liquid drainage and tested to 400psig air under water. Coil shall meet strength requirements of ASME/ANSI B31.5.
- C. Fill Media:
  - 1. Fill media shall be constructed of Polyvinyl Chloride (PVC) of cross-fluted design and suitable for inlet water temperatures up to 130 F. The bonded block fill shall be bottom supported and suitable as an internal working platform. Fill shall be self-extinguishing, have a flame spread of 5 under A.S.T.M. designation E-84-81a, and shall be resistant to rot, decay and biological attack.
- D. Materials of Construction
  - 1. All cold water basin components including vertical supports, air inlet louver frames and panels up to rigging seam shall be constructed of Type 316 Stainless Steel. All factory cold water basin seams shall be welded for water tight construction.
  - 2. Casing and fan section, including channels and angle supports, shall be constructed of Type 316 stainless steel. Fan cowl and guard shall be constructed of Type 316 Stainless Steel. "Series 300" stainless steel will not be acceptable as equivalent to Type 316 Stainless Steel.
  - 3. Pan and Casing: Shall be constructed with 316 Stainless steel and reinforcing angles and channels with lift out steel strainer.
- E. Fan(s):

1. Unit shall be provided with Super Low Sound Fan(s). Fan(s) shall be high efficiency axial propeller type with non-corrosive Fiber Reinforced Polyester (FRP) blade construction. Fan(s) shall be heavy duty and utilize a forward swept blade design for superior sound reduction. Each fan shall be dynamically balanced and installed in a closely fitted fan cowl with venturi air inlet for maximum fan efficiency.
- F. Drift Eliminators
1. Drift eliminators shall be constructed entirely of Polyvinyl Chloride (PVC) in easily handled sections. Design shall incorporate three changes in air direction and limit the water carryover to a maximum of 0.001% of the recirculating water rate.
- G. Water Distribution System
1. Spray nozzles shall be precision molded ABS with large orifice threaded into branch piping with internal sludge ring to eliminate clogging, and utilizing fluidic technology for water distribution over the fill media and to minimize water distribution system maintenance. Spray header, branches, and riser shall be Schedule 40 Polyvinyl Chloride (PVC) for corrosion resistance. Branches shall have threaded end caps to facilitate debris removal.
- H. Heat Transfer Media
1. Heat transfer coil shall be tightly spaced tubes of Type 304 Stainless Steel, encased in stainless steel framework. The coil assembly shall be designed with sloping tubes for liquid drainage and air pressure tested to 390 psig under water. Coil shall be in compliance with ASME/ANSI B31.5.
- I. Bleed-off
1. Unit shall have a waste water bleed line with a manual adjustable valve provided.
- J. Air Inlet Louvers
1. The air inlet louver screens shall be constructed from UV inhibited polyvinyl chloride (PVC) and incorporate a framed interlocking design that allows for easy removal of louver screens for access to the entire basin area for maintenance. The louver screens shall have a minimum of two changes in air direction and shall be of a non-planar design to prevent splash-out and block direct sunlight & debris from entering the basin.
- K. Electronic Water Level Control
1. Electronic water level control package shall have five (5) stainless steel water level sensors (one (1) high level, one (1) high level alarm, one (1) low level, one (1) low level alarm and one (1) ground) with a NEMA 4x enclosure mounted in a cleanable Schedule 40 PVC external standpipe with slow closing solenoid valve(s) and "y" strainer(s). Wiring is not included and components must be field mounted. Valves shall be sized for 25 psi minimum to 125 psi maximum pressure. Standpipe may require heat tracing by others in cold weather applications.
- L. Pan Strainer
1. Pan Strainer(s) shall be all Type 304 Stainless Steel construction with large area removable perforated screens.
- M. Discharge Damper w/ Insulation:
1. Closed Circuit Coolers with heat transfer coil below air inlet louvers shall utilize integral water re-distribution basin as heat loss protection. All Closed Circuit coolers that have heat transfer coil above the air inlet shall utilize a discharge hood with dampers and factory supplied insulation on coil casing and discharge hood. Closed Circuit Coolers with heat transfer coils exposed to ambient air conditions will not be acceptable.

## **2.04 MOTORS AND DRIVES**

- A. General requirements for motors are specified in Division 23 Section 23 05 13 "Common Motor Requirements for HVAC Equipment"
- B. Fan Motor

1. Fan motor(s) shall be totally enclosed, ball bearing type electric motor(s) suitable for moist air service. Motor(s) are Premium Efficient, Class F insulated, 1.15 service factor design. Inverter rated per NEMA MG1 Part 31.4.4.2 and suitable for variable torque applications and constant torque speed range with properly sized and adjusted variable frequency drives.
- C. Fan Drive
  1. The fan drive shall be multigroove, solid back V-belt type with QD tapered bushings designed for 150% of the motor nameplate power. The belt material shall be neoprene reinforced with polyester cord and specifically designed for evaporative equipment service. Fan sheave shall be aluminum alloy construction. Belt adjustment shall be accomplished from the exterior of the unit.
- D. Fan Shaft
  1. Fan shaft shall be solid, ground and polished steel. Exposed surface shall be coated with rust preventative.
- E. Fan Shaft Bearings
  1. Fan Shaft Bearings shall be heavy-duty, self-aligning ball type bearings with extended lubrication lines to grease fittings located on access door frame. Bearings shall be designed for a minimum L-10 life of 75,000 hours.
- F. Fan Gaurd
  1. Fan gaurd shall be provided.
- G. Vibration Switch
  1. Unit shall be provided with aVibration Cutout Switch, operating on 120 VAC feed, to protect the fan and drive assembly from damage in the event of excess vibration. Vibration switch shall be DPDT.

## **2.05 CIRCULATING PUMP**

- A. Unit shall have an EISA compliant, close-coupled centrifugal pump with mechanical seal. The pump shall be installed in a vertical position so that water will drain from the pump when the cold water basin is emptied. Pump motor shall be totally enclosed with protective canopy for outdoor operation.
- B. Pump motor: Single speed (1800/900 rpm) open drip proof mounted on pump body.

## **2.06 COOLING TOWER CONTROL PANEL**

- A. The cooling tower control panel shall include complete Variable Frequency Drive (VFD) fan control and incorporate control of spray pumps and basin heaters when applicable. The NEMA-3R cooling tower Starter/VFD panel shall be provided by unit manufacturer to include complete Variable Frequency Drive (VFD) for fan and incorporate spray pump motor starter and basin heater contactors. The Variable Frequency Drive shall be provided by ATC Contractor and in conformance to section 23 09 69. ATC vendor shall provide VFD to Unit Manufacturer for Mounting & Wiring into Single Point Power Panel Supplied by Vendor. The Variable Frequency Drive shall be in conformance to section 23 09 69.
- B. A single point power connection for all controlled motors will be included. UL 489 breaker shall include thermal and magnetic trip mechanisms.
- C. The control panel shall include manual bypass functionality which isolates the VFD.
- D. VFD operator controls shall include a VFD/Off/Bypass switch and HOA switch mounted on the enclosure door.'
- E. The control panel shall include all necessary terminal inputs to control the sequence of operations from a Building Management System including at a minimum: VFD start command, VFD reference speed, spray pump operation, basin heater operation.
- F. The control panel must also include a Full Voltage Non-Reversing Starter for a Spray Pump if present. HOA switch to be included and mounted on the enclosure door.

- G. The control panel shall also include a basin heater contactor with Off/Auto switch installed and mounted on the enclosure door.
- H. Terminal inputs shall be provided for Vibration Cut Out Switch.
- I. All internal power and control wiring to be installed and tested in the factory.
- J. A Five Year Warranty shall be provided as a standard option by panel manufacturer.

## **2.07 MAINTENANCE ACCESS**

- A. Fan Section
  - 1. Access door shall be hinged and located in the fan section for fan drive and water distribution system access. Swing away motor cover shall be hinged for motor access.
- B. Basin Section
  - 1. Framed removable louver panels shall be on all four (4) sides of the unit for pan and sump access.
  - 2. Unit shall be provided with removable panels around the coil to permit easy inspection of the coil and basin without unit entry.
- C. Internal Working Platform
  - 1. Internal working platform shall provide easy access to the fans, belts, motors, sheaves, bearings, all mechanical equipment and complete water distribution system. The fill shall be an acceptable means of accessing these components.
- D. External Service Platform with Ladder
  - 1. An external service platform with motor davit compliant with OSHA shall be provided at the motor access door of the unit extending the full length of the access door. Each platform shall have at least a 36 inch wide walking surface. The platforms shall have galvanized steel grating, supported by galvanized steel framework attached to the unit and surrounded by a handrail, knee rail and toe plate system that is compliant with OSHA. Mounting channels shall be the same material as the casing section (galvanized or stainless steel). A vertical ladder shall be provided from the base of the unit to the platform.
  - 2. Safety cage(s) shall be provided on all vertical ladder(s) and ship mounted. Safety cage(s) shall begin between 7 feet (minimum) and 8 feet (maximum) above grade.
  - 3. Ladder extensions shall be provided to extend from the bottom of the service platform ladder to the roof surface.

## **2.08 ACCESSORIES**

- A. Electric Immersion Heaters: Cold water basin shall be fitted with copper-element, electric immersion heater(s) with a separate thermostat and low water protection device. Heaters selected to maintain +40 F pan water at 0 F ambient temperature.
- B. Time Delay Relay: Limits fan motor starts to not more than six per hour.
- C. Control Box Enclosure: The closed circuit cooler shall be provided with a NEMA 4X weatherproof and ventilated control box enclosure that will house all of the electronics for the closed circuit cooler.
- D. Sump Sweeper Piping
  - 1. Cold water basin shall be fitted with schedule 80 PVC sump sweeper piping complete with high-flow eductor nozzles to facilitate basin cleaning. The system shall contain one inlet connection and one outlet connection per basin.

## **PART 3 EXECUTION**

### **2.09 EXAMINATION**

- A. Verify that openings are ready to receive work.
- B. Verify that required utilities are available, in proper location, and ready to use.

**2.10 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install cooler on structural steel beams as instructed by manufacturer.
- C. Connect cooler water piping with flanged connections to cooler.
- D. Connect make-up water piping with flanged or union connections to cooler. Pitch to cooler. Pipe drain, overflow drain, and bleed lint to nearest grade.

**2.11 FIELD QUALITY CONTROL**

- A. Provide the services of the manufacturer's field representative to inspect tower after installation and submit report prior to start-up, verifying installation is in accordance with specifications and manufacturer's recommendations.

**2.12 SYSTEM STARTUP**

- A. Prepare and start systems.
- B. Allow one eight hour days per cooler for start-up and instructions of State of Delaware OMB - Division of Facilities Management's operating personnel.

**2.13 ADJUSTING**

- A. Adjust water level float valves and float controls for proper operating level.
- B. Adjust temperature controls and verify operation.

**END OF SECTION**