

**SECTION 23 65 00
COOLING TOWER**

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Mechanical induced draft Cooling Tower
- B. Controls
- C. Ladder and handrails

1.2 REFERENCES

- A. ABMA 9 - Load Rating and Fatigue Life for Ball Bearings
- B. ABMA 11 - Load Rating and Fatigue Life for Roller Bearings
- C. ASME PTC-23 - Atmospheric Water Cooling Equipment
- D. Cooling Tower Institute (CTI) ATC-105 - Acceptance Test Code for Water Cooling Towers
- E. Cooling Tower Institute (CTI) - Certification Standard STD 201
- F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum)

1.3 SUBMITTALS

- A. Submit shop drawings under provisions of Section 01 33 00.
- B. Submit shop drawings indicating suggested structural concrete supports including dimensions, sizes, and locations for mounting bolt holes using manufacturer's recommendations.
- C. Submit product data under provisions of Section 01 33 00.
- D. Submit product data indicating rated capacities, dimensions, weights and point loadings, accessories, required clearances, electrical requirements and wiring diagrams, and location and size of field connections.
 - 1. Submit schematic indicating capacity controls.
- E. Certify performance, based on CTI STD 201, and submit performance curve plotting leaving water temperature against entering air wet bulb temperature.
- F. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

1.4 OPERATION AND MAINTENANCE DATA

- A. Submit operation data under provisions of Section 01 77 00.
- B. Include start-up instructions, maintenance data, parts lists, controls, and accessories.
- C. Submit maintenance data under provisions of Section 01 77 00.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Section 01 60 00.
- B. Factory assemble entire unit.
 - 1. For shipping, disassemble into as large as practical sub-assemblies so that minimum amount of fieldwork is required for reassembly.
- C. Store and protect products under provisions of Section 01 60 00.
- D. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

1.6 WARRANTY

- A. Provide 5-year warranty under provisions of Section 01 77 00.
- B. Warranty: Include coverage for cooling tower package, labor, and materials.

1.7 EXTRA MATERIALS

- A. Provide one set of matched fan belts, three spray nozzles for each cell, and water make-up valve-assembly.

1.8 COMMISSIONING

- A. Commissioning of a system or systems specified in this section is part of the construction process.

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- B. Documentation and testing of these systems, as well as training of the Owner's operation and maintenance personnel, is required in cooperation with the Owner's Representative and the Commissioning Authority.
- C. Project Closeout is dependent on successful completion of all commissioning procedures, documentation, and issue closure.
- D. Refer to Section 01 77 00 - Contract Closeout, for substantial completion details.
- E. Refer to Section 01 91 00, Commissioning, for detailed commissioning requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. BAC, stainless steel
- B. Tri-Thermal Inc., stainless steel
- C. Marley Quadraflow, stainless steel
- D. Evapco, stainless steel
- E. Berg, stainless steel
- F. Tower-Tech Series, anti-corrosion pultruded fiberglass reinforced polyester and stainless steel

2.2 MANUFACTURED UNITS

- A. Provide cross-flow type units for outdoor use, factory assembled, sectional, with gravity operated hot deck distribution system, vertical discharge, mechanical induced draft type, with sump, surface sections, drift eliminators, fan, motor, and drive assembly.
- B. Provide one cooling tower per chiller having thermal capacity to cool the required flow (GPM) of condenser water from 95°F to 85° F at a design entering air wet-bulb temperature of 80° FWB, certified in accordance with 1.3.E.

2.3 COMPONENTS

- A. Framework and Casing: Total Stainless Steel construction
- B. Louvers: Stainless Steel material, sight tight spaced to minimize air resistance and splash.
- C. Fan: Multi blade, cast aluminum, fixed axial vertical discharge type, with stainless steel shaft, multi-grooved neoprene/polyester belt drive, bearings with ABMA 9 or ABMA 11 L-10 life expectancy of 30,000 hours, with extended copper grease fittings.
- D. Motor: Single speed, VFD inverter duty rated, totally enclosed, weatherproof, factory epoxy-sealed type, air over (TEAO) type with special moisture protection, mounted on welded stainless steel frame in fan deck.
 - 1. Refer to Section 23 05 13.
 - 2. Cooling tower manufacturer shall provide VFD fan motor drive with manual bypass, all in NEMA type 4X enclosure.
- E. Belt Drive, designed for a minimum strength of 150% over the motor nameplate power.
- F. Fan Cylinder shall be one-piece welded stainless steel fan assembly.
- G. Fan Guard shall be one-piece welded steel rod and wire guard Stainless Steel material.
- H. Access, provide large access doors at both ends of tower to eliminators and air plenum.
- I. Provide safety railings and ladder from grade to fan deck, aluminum construction.
- J. Distribution Basin shall be open, gravity type distribution basin utilizing weirs and plastic metering orifices, with flow control balancing valves at each hot deck inlet.
- K. Fill shall be vertical sheets of polyvinyl chloride plastic hung from stainless steel supports.
- L. Drift Eliminators shall be two or three-pass polyvinyl chloride plastic, to limit drift loss to 0.7% of total water circulated.

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- M. Collection Basin shall be self-cleaning stainless steel with depressed center section, designed to support tower, with cleanout and drain fitting, 8 gage, ¼" stainless steel mesh strainer, bottom outlet or side outlet sump, with separate overflow connection.
- N. Overflow shall be stainless steel pipe and fittings.
- O. Float Valves shall be brass or bronze make-up valve with plastic or copper float (electronic not acceptable).
- P. Hardware shall be stainless steel nuts, bolts, and washers shall.
- Q. Finish for Stainless Steel components non-required.
- R. Optional Component: If required provide fan cylinder extension (in stainless steel) to elevate fan discharge, prevent moist air recirculation and to mitigate noise.

2.4 ACCESSORIES

- A. Temperature Controller shall be located in mechanical room with sensor in conditioned water return to control fans (one per tower).
- B. Time Delay Relay shall limit fan motor starts to not more than six per hour (not required if VFD fan drive is used).
- C. Provide Capacity Control for stable operation down to 10% of rated cooling at specified wet bulb temperature.
- D. Control Panel shall be in NEMA type 4X enclosure and containing:
 - 1. Unfused disconnect switch
 - 2. Interlocks and relays
 - 3. Pilot lights and push buttons
- E. Provide water meter for make-up water.
- F. Provide backflow preventer for make-up water line.
- G. Provide vibration switch, one per each tower.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install one tower per water-cooled chiller.
 - 1. Do not use dual cell, common sump towers.
 - 2. Design condenser water piping system so that any tower can be isolated and can serve any chiller.
 - 3. Install cooling towers in accordance with manufacturer's instructions.
 - 4. Cooling tower I-beam structural supports shall be aluminum.
- B. Provide 8 ft masonry screen walls, louvered walls or corrosion resistant fence around perimeter of tower compound with a minimum clearance of 10' from tower to screen walls or fence.
 - 1. Elevate tower to maintain maximum positive suction head on condenser water pump.
- C. For vibration isolation, refer to Section 23 05 48.
- D. Provide a 115 V duplex receptacle in the cooling tower compound.
 - 1. Connect condenser water piping with flanged connections to tower.
 - 2. Pitch condenser water supply to tower and condenser water suction away from tower.
 - 3. Refer to Section 23 21 13.
- E. Provide hose bib on make-up water supply in tower.
 - 1. Connect make-up water piping with brass flanged or union connections to tower.
 - 2. Refer to Section 23 21 13.
- F. Provide full flow-makeup water bypass with valve to fill sump.
 - 1. Connect bleed to floor drain.

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- G. Division 16 wiring for motors in wet locations (Cooling Towers) shall be installed in water tight conduit with both ends sealed and shall be terminated inside the sealed motor terminal boxes with silicone filled wire nuts.
 - H. Provide concrete pad for the tower compound floor under tower, with rock between tower and fence.
 - 1. Architect shall specify the rock depth and type.
 - I. Provide one water treatment system per cooling tower; refer to Section 23 25 00.
- 3.2 FIELD QUALITY CONTROL
- A. Performance of field inspection and testing is per provisions of Section 01 40 00.
 - B. Test under actual operating conditions in accordance with CTI ATC 105 and verify specified performance.
- 3.3 MANUFACTURER'S FIELD SERVICES
- A. Prepare and start systems under provisions of Section 01 60 00.
 - B. Inspect tower after installation and submit report prior to start-up, verifying installation is in accordance with specifications and manufacturer's recommendations.
 - 1. If tower fails to meet field performance, then it shall be up-sized at no cost to Owner.
 - C. Supervise rigging, hoisting, and installation.
 - D. Provide startup and instructions to Owners operating personnel and Owner's satisfaction.
 - E. DO NOT operate the cooling tower until initiation of water treatment system.
 - F. Contractors' startup shall be scheduled and documented in accordance with the commissioning requirements.
 - 1. Refer to Section 01 91 00, Commissioning, for further details
- 3.4 SCHEDULE
- A. Provide equipment schedule on the drawings to include the following data:
 - 1. Manufacturer
 - 2. Model Number
 - 3. Cooling Capacity
 - 4. Water Flow Rate
 - 5. Entering Water Temperature
 - 6. Leaving Water Temperature
 - 7. Entering Air WB Temperature
 - 8. External Static Pressure
 - 9. Number of fans, Motors
 - 10. Motor size, speed, horsepower, volts, phase, and frequency
 - 11. VFD manufacturer, size, type, and operating range
- 3.5 FUNCTIONAL PERFORMANCE TESTING
- A. System Functional Performance Testing is part of the Commissioning Process.
 - 1. The Contractor shall perform the Functional Performance Testing and the Commissioning Authority shall witness and document the test.
 - 2. Refer to Section 01 91 00, Commissioning, for functional performance tests and commissioning requirements.
 - B. Systems Readiness Checklists shall be completed and submitted for each piece of equipment included in this section.
 - C. Include the functional performance testing of HVAC pumps as part of the Chilled Water System Functional Performance testing.

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3.6 DEMONSTRATION AND TRAINING

- A. Training of the Owner's operation and maintenance personnel is required in cooperation with the Owner's Representative.
 - 1. Provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems.
 - 2. Schedule the instruction in coordination with the Owner's Representative after submission and approval of formal training plans.
 - 3. Refer to Section 01 91 00, Commissioning, for further contractor training requirements.
- B. Provide demonstration and training for all equipment covered by this section and installed in this project.

END OF SECTION