

SECTION 23 65 00 - PACKAGED STEEL COOLING TOWERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

- A. The Conditions of the Contract and applicable requirements of Division 1, "General Requirements", and Section 23 01 00, "Mechanical General Provisions", govern this Section.

1.2 DESCRIPTION OF WORK:

- A. Scope: Extent of cooling tower work required by this Section is indicated on drawings and schedules, by requirements of this Section, and Section 23 01 00 "Mechanical General Provisions."
- B. Types: Types of cooling towers specified in this Section include the following:
 - 1. Induced-mechanical-draft.
 - a. Crossflow.
 - b. Counterflow.
 - 2. Provide the following models or approved equal.
 - a. Evapco AT-Line.
 - b. Marely NC Series.
 - c. BAC Series 3000.
- C. Arrangement: Consult the drawings for cooling tower arrangements. Tower dimensions and arrangements shall fit the space available.
- D. Related Sections: Refer to other sections of Division 23 for the following:
 - 1. Testing, adjusting, and balancing.
 - 2. Electronic variable speed drives.
 - 3. Vibration isolation.
 - 4. HVAC piping systems.
 - 5. HVAC Piping valves and accessories.
 - 6. Condensing water filter system.
 - 7. HVAC Sequence of Operation.
- E. Division 16: Refer to Division 26 sections for the following work:
 - 1. Power wiring and disconnects from the power source and VSD to connections on the tower.
- F. Other Divisions: Refer to other divisions of the specification for the following work:
 - 1. Structural steel supports.

1.3 QUALITY ASSURANCE

- A. Factory Fabricated Towers: Design, fabricate and test factory fabricated towers in conformance with CTI Tower Code, including:
 - 1. ATC-105 Standard Specifications for Thermal Testing of Wet/Dry Cooling Towers
 - 2. STD-111 Standard Specifications for Gear speed Reducers for Application on Industrial Water-Cooling Towers
 - 3. STD-131 Standard Specifications for Fiberglass-Reinforced Plastic Panels for Application on Industrial Water-Cooling Towers
 - 4. STD-201 Certification Standard for Water-Cooling Towers
- B. Wind Load: Design and certify towers for a wind load of 30 pounds per square foot.
- C. Seismic Design: Design to withstand seismic forces corresponding to Zone 1 designation of the Building Officials and Code Administrators International (BOCA) "Basic Building Code."

- D. Certifications: The cooling tower's performance shall be certified by the cooling Tower Institute (CTI) in accordance with CTI Certification Standard STD-201 or, a field acceptance test shall be conducted in accordance with CTI Acceptance Test Code ATC-105, by the CTI or other qualified independent third part testing agency. Submit certifications of tower conformance to CTI design and testing standards and American National Standard Institute (ANSI) A58.1, "Minimum Design Loads for Buildings and Other Structures."
- E. Codes: Provide tower components conforming to the following:
 - 1. Underwriters Laboratories, Inc. (UL) and National Electrical Manufacturers Association (NEMA): Provide motors, electrical wiring, conduit, lighting, and electrical devices listed and labelled to conform to UL and NEMA.
 - 2. Occupational Safety and Health Administration (OSHA): Construct stairways and ladders in conformance with OSHA requirements.

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data, including rated capacities, pressure drop, fan performance data; weights (shipping, installed, and operating), installation and start-up instructions, and rating curves with selected points clearly indicated.
- B. Contractor's Certification: Submittals shall include a certification, signed by an officer representing the Contractor and stipulating that the submittal prepared by the manufacturer has been reviewed, and checked on an item by item basis.
 - 1. Equipment and products not in strict conformance with contract documents shall be separately submitted, clearly flagged and proposed under the change provision of the contract.
- C. Shop Drawings: Submit shop drawings indicating dimensions, weight loadings, required clearances and certification of conformance with referenced standards.
- D. Maintenance Data: Submit maintenance data and parts lists for each cooling tower, control, and accessory. Include this data, product data, shop drawings, and wiring diagrams.
- E. Controls: Submit shop drawing on:
 - 1. Make-up water level control and wiring diagrams.
 - 2. Bleed control.
- F. Additional information as required in Section 23 01 00.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Handle cooling towers and components carefully to prevent damage, breaking, denting, and scoring. Do not install damaged cooling towers or components, replace with new.
- B. Store cooling towers and components in a clean place. Protect from dirt, construction debris, and physical damage.
- C. Comply with manufacturer's rigging and installation instructions for unloading cooling towers and moving them to the final location.

PART 2 - PRODUCTS

2.1 COOLING TOWER GENERAL REQUIREMENTS

- A. Manufacturer: Provide cooling towers which are the product of a manufacturer regularly engaged in the production of cooling towers, who publishes descriptions and catalog capacities of the proposed equipment, who maintains facilities capable of testing towers in accordance with CTI testing requirements and can demonstrate that the proposed cooling tower product has been in satisfactory service for not less than three years prior to the date of Invitation For Bids of this Contract.
- B. Structural Supports: Modify design details of tower supports, structural framing, vibration isolators and concrete basins to suit cooling tower proposed.

1. Any modifications to the cooling tower supports, stub columns, additional structural steel of vibration isolators required to suit the particular tower shall be furnished without additional cost.
2. Vibration isolation modifications shall conform to the requirements of Section 23 05 48, "Vibration Isolation."
- C. Galvanizing: Where the term "galvanizing" is used in reference to cooling towers, it shall mean either hot-dip galvanizing or electro-deposited zinc coating at a rate not less than 2 ounces per square foot of surface, performed after the material has been fabricated.
 1. The use of zinc pigment paint in lieu of galvanizing will not be permitted.
- D. Steel Surfaces: Wire brush, clean and factory treat steel surfaces with a bonded coating, not less than 20 mils thick, guaranteed by the manufacturer to withstand the following tests.
 1. A spray coating 1/16-thick shall permit no corrosion on low carbon steel when exposed to a 20 percent salt spray at 95 degrees F. for 400 consecutive hours.
 2. The coating shall withstand a minimum 4,000 cycles in an accelerated weathering test without checking, alligating or perceptible loss of its protective quality.
 3. Provide surface coating with a fire hazard rating not to exceed 25 plus or minus 10, and the coating, during combustion, shall not drip, sag, or run. Rating shall be determined by American Society for Testing and Materials (ASTM) E 84 (NFPA 255), "Standard Test Method for Surface Burning Characteristics of Building Materials."
 4. Provide Type 316 stainless steel, where stainless steel is specified or is not noted.

2.2 INDUCED-DRAFT COOLING TOWERS

- A. General: Provide factory-assembled induced-draft counterflow or crossflow cooling towers of quantity, capacity, and sizes indicated on the drawings. Towers shall be designed for multiple or dual side air entry and with vertical air discharge.
- B. Cold Water Basin and Accessories: The entire cold water basin shall be constructed of heavy gauge Type 304 stainless steel. Each cell shall include a side outlet depressed or sloped sump, overflow, drain, stainless steel anti-vortexing hood and removable screen, and brass make-up valve with float assembly. Outlet connection shall be designed to mate with 125 lb. Pipe flange or grooved for mechanical coupling connection.
- C. Casing: The casing shall consist of stainless steel support structure and frame with a stainless steel mechanical support. Casing panels shall be constructed of heavy duty Fiberglass Reinforced Polyester (FRP). Fan deck shall be constructed of 304 stainless steel or FRP and designed as required to support weight of service personnel for maintaining tower. Casing shall be UV resistant to weathering.
- D. Louvers: The louvers shall be constructed of UV resistant FRP or PVC construction. Louvers shall be mounted in easily removable frames as required for access to the basin for maintenance. The louvers shall be designed to prevent splash out and block direct sunlight into the basin.
- E. Propeller Fans: Provide a fixed or adjustable pitch multi-blade heavy duty axial propeller fans statically balanced. Fans shall be constructed of aluminum alloy blades with cast aluminum hubs.
- F. Bearing and Drives: Provide the following bearings and drives installed by the manufacturer.
 1. Fan shaft bearings shall be heavy duty self-aligning ball bearings with moisture-proof seals. Bearings shall be designed for a minimum L-10 life of 75,000 hours.
 2. The fan drive shall be a multi-groove, solid back V-belt type with taper lock sheaves designed for 150% of the motor nameplate horsepower or geared reducer drive used in model provided.
 3. Belt material shall be neoprene reinforced with polyester cord and specifically designed for cooling tower service.
 4. Fan sheaves shall be aluminum alloy construction.
 5. Bearing lube lines shall be extended to the exterior of the unit for easy access.

- G. Motor: Provide a totally enclosed, air over (TEAO) type motor single-speed motor design for inverter duty. Motor shall be mounted on adjustable base for belt adjustment.
- H. Water Distribution System: Provide one of the following hot water distribution system:
 - 1. Gravity Type: Gravity type distribution system shall consist of 125 lb. Flange or grooved pipe inlet connection, pre-strainer assembly, stainless steel distribution basin, and replaceable nozzles installed in floor of hot water basin to ensure even distribution of water over the fill of gravity flow. Provide distribution basin covers constructed of high density polyethylene (HDPE) or Type 304 stainless steel.
 - 2. Spray Type: Spray type distribution system shall consist of steel pipe connection, schedule 40 PVC spray header and branches and removable ABS spray nozzles. The spray header and branches shall be easily removed for cleaning purposes.
- I. Fill: The cooling tower fill shall be PVC of crossfluted design. The fill shall be self-extinguishing for fire resistance with a flame spread rating of 15 or less per ASTM E84-81a. The fill shall be resistant to rot, decay, or biological attack.
- J. Eliminators: Provide drift eliminators constructed entirely of inert PVC. Maximum drift rate shall be less than 0.005% of the circulating water rate.
- K. Equalizer Connection: Each tower shall be supplied with a factory equalizer connection to balance the level of the basins for multiple cell or tower arrangement.
- L. Access and Safety:
 - 1. Access Doors: Provide hinged access door at both ends of the tower walls for access to eliminators and fan plenum section.
 - 2. Fan Guard: Provide a heavy gauge stainless steel wire fan guard for each fan cylinder.
 - 3. Ladders and Railings: Design in accordance with OSHA requirements. Construct of steel with safety cage as required. Ladders and railings shall be provided as required to access and maintain all cooling tower serviceable components, i.e., motor, fan drive, hot and cold water distribution systems, etc.
- M. Vibration Switch: Provide a factory-accessory, manual reset vibration switch with alarm contacts for each tower cell fan which shall de-energize fan motor if excessive vibration occurs due to fan imbalance. Alarm contacts shall be monitored by the BCAS. Vibration limit switch shall be in a cast iron waterproof NEMA enclosure.
- N. Bolting: Bolting connections shall be with stainless steel bolts, nuts, and washers. All joints shall be sealed watertight.
- O. Warranty: The mechanical equipment, with the exception of the motor itself, shall be warranted against failure caused by defects in materials and workmanship for a period of five (5) years from the date of tower shipment. The warranty shall cover the fans, speed reducers, couplings or belts, fan shaft and mechanical supports.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install cooling towers where indicated, in accordance with equipment manufacturer's written instructions and ensure that cooling towers comply with specification requirements and serve intended purposes.
- B. Access: Provide access and service space around and over cooling towers, but in no case less than that recommended by manufacturer.
- C. Placement: Install cooling towers on steel framing member provided under other section of the specifications. Level units to tolerance of 1/8-inch in 10 feet, in both directions.
- D. Piping Connections: Piping at cooling tower shall be supported externally to cooling tower so that no weight is born by cooling tower.
- E. Make-Up Water Piping: Provide flanged or union connections to cooling tower, with flexible pipe connections. Pitch lines so water will drain into sump. Connect to automatic fill valve with 3-valve bypass and backflow preventer.

- F. Drain Piping: Connect drain overflow and bleed lines to cooling tower full size of connection on cooling tower.
 - G. Electrical Wiring: Install electrical devices furnished by manufacturer.
- 3.2 ADJUSTING AND CLEANING
- A. Cleaning: Clean inside of cooling tower thoroughly before filling for start-up. Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint.
 - B. Start-Up: Comply with manufacturer's instructions for filling and start-up of operation, but not less than the following:
 - 1. Verify lubrication of rotating parts; lubricate as needed.
 - 2. Verify fan rotation direction.
 - 3. Verify that motor amperage is in accordance with manufacturer's data.
 - 4. Balance condenser water flow to each tower and to each inlet for multiple inlet towers.
 - 5. Adjust water level control for proper operating level.
 - 6. Adjust bleed valve for indicated percentage of circulated water volume.
 - 7. Balance equalizer lines between multiple towers.
 - 8. Adjust temperature controls and verify operation.
- 3.3 CLOSEOUT PROCEDURES
- A. General: Provide services of manufacturer's technical representative for two 2-hour sessions to instruct personnel in operation and maintenance of cooling towers. One session at or around startup and one session into first cooling season.
 - 1. Schedule training providing at least 7 days notice.
- 3.4 SPARE PARTS
- A. General: Furnish the following spare parts:
 - 1. One spare set of matched fan belts for each belt driven fan.
 - 2. Three spare spray nozzles for each tower cell.
 - 3. One spare gasket for each gasketed access and inspection opening.

END OF SECTION 23 65 00