

TM Series Cooling Tower Specification

1.0 Cooling Tower

1.1 General: Furnish and install _____ factory-assembled, induced draft, counterflow cooling tower(s) with vertical air discharge conforming in all aspects to the specifications, schedules and as shown on the plans. Overall dimensions shall not exceed approximately _____ ft (mm) long x _____ ft (mm) wide x _____ ft (mm) high. The total connected fan horsepower shall not exceed _____ HP (kW). The cooling tower(s) shall be Delta Cooling Towers Model _____.

1.2 Thermal Capacity: The cooling tower(s) shall be warranted by the manufacturer to cool _____ USGPM (l/s) of water from _____ °F(°C) to _____ °F(°C) at _____ °F(°C) entering wet bulb temperature. Additionally, the thermal performance shall be certified by the Cooling Technology Institute in accordance with CTI Certification Standard STD-201. Lacking such certification, a field acceptance test shall be conducted within the warranty period in accordance with CTI Acceptance Test Code ATC-105, by the Cooling Technology Institute or other qualified independent third party testing agency. Manufacturer's performance guarantees or performance bonds without CTI Certification or independent field thermal performance test shall not be accepted. The cooling tower shall comply with the horsepower per cooling ton energy efficiency requirements of ASHRAE Standard 90.1.

1.3 Corrosion Proof Construction: Unless otherwise noted in this specification, all panels and structural members shall be constructed of Seamless, Unitarily Molded, High Density Polyethylene.

1. Shell shall be seamless, double-wall, non-corroding, hi-impact high-density polyethylene (HDPE) of leak proof design. Conical transition of shell to motor/fan assembly with separate polyethylene velocity recovery stacks. The shell shall exceed .300" average thickness. The structural shell shall be capable of withstanding inlet water temperatures up to 175°F on a continual basis. The tower shell shall withstand impact of 160 in-lbs per ASTM D2794 without fracture or penetration of the HDPE.
2. Shall withstand 6000 hours of ultraviolet radiation equivalent to 120,000 hours of noontime sun exposure without loss of functional properties;
3. Shall withstand 200 thermal shock cycles between - 25°F and +180°F (-32°C and 82°C) and without deterioration;
4. Shall withstand 6000 hours of exposure to 60 psi (42184.2 kg/m²) water jet without signs of wear or erosion.
5. Cooling tower structural HDPE shell & sump shall be supplied with a warrantee against corrosion for 20 years.

1.4 Wind and Seismic Forces: When supported as recommended, the unit shall be suitable for applications requiring equipment anchorage to resist wind loads ranging from 100mph to 150mph. Wind loading and anchoring calculations to be completed in accordance with the appropriate revisions of the International Building Code (IBC) and the American Society of Civil Engineers “Minimum Design Loads for Buildings and other Structures” (ASCE 7-05). Seismic forces appropriate for the location shall also be considered. Minimum Seismic Loads are to be as required for Seismic Zone 4 assuming an Importance factor of 1.0, and soil profile SD, and rigid mounting to the supporting structure per the 1994 Uniform Building Code. All calculations shall be reviewed and certified by a third party Professional Engineer.

2.0 Construction Details

2.1 Cold Water Basin: The cold water basin shall be seamless, double-wall, non-corroding, hi-impact HDPE. Basin shall include a depressed section with drain/clean-out connection. The basin area under the fill shall be sloped a minimum of 3% toward the depressed section to facilitate cleaning. Standard basin accessories shall include a corrosion resistant make-up valve with a large diameter plastic float for easy adjustment of operating water level.

2.2 Water Outlet: The water outlet connection shall be designed to accept an ASME Class 150 flat face flange. The outlet shall be provided with strainers having perforated openings sized smaller than the water nozzles and an anti-vortexing device to prevent air entrainment.

2.3 Water Distribution System: The distribution system shall be furnished with a single water inlet. Totally enclosed, non-corroding, polyvinyl chloride (PVC) pipe with large orifice non-clog spray nozzle distribution system. Threaded nozzle orifices shall be interchangeable allowing substitution of larger diameter orifice for increased flow conditions without increasing inlet pressure.

3.0 Mechanical Equipment

3.1 Fan(s): Fan(s) shall be axial flow with FRP blades selected to provide optimum cooling tower thermal performance with minimal sound levels. Air shall discharge through a fan cylinder designed for streamlined air entry and minimum tip clearance for maximum fan efficiency. The top of the fan cylinder shall be equipped with a removable fan guard.

3.2 Fan Drive: The fan(s) shall be direct-driven for optimum efficiency, eliminating any belt drive or gearbox efficiency losses.

3.3 Fan Motor: Fan motor(s) shall be NEMA Premium Efficiency, 900rpm, 3-Phase, totally enclosed air over (TEAO), reversible, squirrel cage, ball bearing type designed

specifically for cooling tower service. The motor shall be furnished with special moisture protection on winding, shafts, and bearings, utilize class F insulation, and carry a 1.15 Service Factor, and be appropriately labeled for “severe duty.” The fan motor shall carry a minimum 5 year warranty.

4.0 Fill and Drift Eliminators

4.1 Fill and Drift Eliminators: The fill and drift eliminators shall be formed from self-extinguishing (per ASTM- 568) polyvinyl chloride (PVC) having a flame spread rating of less than 20 per ASTM E84 and shall be impervious to rot, decay, fungus and biological attack. The fill shall be suitable for entering water temperatures up to and including 140°F (60°C). The fill shall be manufactured, tested and rated by the cooling tower manufacturer and shall be elevated above the cold water basin to facilitate cleaning.

(Alternate) 4.1 Fill and Drift Eliminators: The high temperature fill and drift eliminators shall be formed from polypropylene (PP) and shall be impervious to rot, decay, fungus and biological attack. The high temperature fill shall be suitable for entering water temperatures up to and including 175°F (79.4°C). The fill shall be manufactured, tested and rated by the cooling tower manufacturer and shall be elevated above the cold water basin to facilitate cleaning.

5.0 Air Inlet Louvers

5.1 Air Inlet Louvers: Air inlet louvers shall be separate from the fill and be removable to provide easy access for inspection of the air/water interface at the louver surface. Louvers shall prevent water splash-out during fan cycling and be constructed of maintenance free, corrosion resistant, UV protected, PVC

6.0 Access

6.1 Plenum Access: Access panel shall be provided for access into plenum section.

7.0 Accessories

7.1 Basin Heater(s): The cooling tower cold water basin shall be provided with electric heater(s) to prevent freezing in low ambient conditions. The heater(s) shall be selected to maintain 40°F (4.4°C) basin water temperatures at _____°F (°C) ambient. The heater(s) shall be _____V/____phase/___Hz electric and shall be provided with low water cutout and thermostat as part of the contactor panel supplied for the heater.

7.2 Basin Water Level Control: The cooling tower manufacturer shall provide an electric water level control (EWLC) system. The system shall consist of water level sensing and control units in quantities and locations as indicated on the drawings. Each water level sensing and control unit shall consist of the following: NEMA 4 enclosure

with gasketed access cover; solid state controls including all necessary relays and contacts to achieve the specified sequence of operation; stainless steel water level sensing electrodes with brass holder; Schedule 40 PVC standpipe assembly with vent holes, and all necessary stainless steel mounting hardware. Provide PVC union directly below the control enclosure to facilitate the removal and access of electrodes and control enclosure.

The number and position of water level sensing electrodes shall be provided to sense the following: high water level, low water level, high water alarm level, low water alarm, and heater safety cutout.

7.3 Vibration Cutout Switch: Provide mechanical local reset vibration switch. The mechanical vibration cut out switch will be guaranteed to trip at a point so as not to cause damage to the cooling tower. To ensure this, the trip point will be a frequency range of 0 to 3,600 RPM and a trip point of 0.2 to 2.0 g's.

(Alternate) 7.3 Vibration Cutout Switch: Provide electronic remote reset vibration switch with contact for BAS monitoring. Wiring shall be by the installing contractor. The electronic vibration cut out switch shall be set to trip at a point so as not to cause damage to the cooling tower. The trip point will be 0.45 in/sec (0.0114 m/sec).

8.0 Anti-Microbial Materials of Construction (Optional)

8.1 Tower Shell Materials: Tower Shell to have compounded additive in resin base material that creates anti-microbial properties throughout the cross-section of the shell material. Anti-microbial properties of the Shell material shall be tested in accordance with Efficacy Standard JIS Z 2801 and produce an anti-microbial activity value of greater than R=4 as displayed by the test results. The purpose of this option is to minimize Bio film growth in the tower and significantly reduce the possibility of Legionella growth within the tower.

8.2 Tower Fill Materials: Tower shall include Wet Decking (fill) with similar antimicrobial efficacy to the tower shell. The Wet Decking shall have an additive in the fill base material that inhibits the growth of microorganisms and resists the growth of biofilms. Anti-microbial properties of the Wet Decking shall be tested in accordance with Efficacy Standard JIS Z 2801 and produce an anti-microbial activity value of greater than R=4 as displayed by the test results. This fill selection is included with the antimicrobial shell upgrade detailed in item 8.1.

9.0 Equipment Controls (Optional)

9.1 Variable Frequency Drive(s): A variable frequency drive (VFD) shall be provided for each fan motor. In the case of a tower with multiple fans on a single cell, the VFD shall be sized to control all of the motors from each cell to a single speed. Each motor shall have individual overload protection within the VFD package. The VFD shall have a 3-contactor bypass, 3% input line reactor, a removable keypad, an RS232 terminal for PC connection, and a fused protection disconnect switch. VFD shall be provided in a NEMA

(1)(3R) enclosure. The VFD shall be compatible with a (ModBus) (LonWorks) (Johnson N2) Building Automation System. The supplier of the VFD shall be the manufacturer of the evaporative cooling equipment.

OR

9.1 Enclosed Controls: An enclosed control panel shall be provided for each cell of the evaporative cooling equipment. The panel shall include full voltage, non-reversing (FVNR) fan motor and pump motor (if applicable) starters in a common enclosure. The panel shall be provided with a main a circuit breaker disconnect and a separate circuit breaker for each motor or speed. Fuse protection will not be accepted. Starters above 25 A shall be NEMA rated. IEC starters will be accepted for motors below 25 A. Panel shall include a 120V/60Hz control power transformer, Hand-Off-Auto switches for each starter or contactor, and pilot lights for each component. Enclosed controls shall be provided in a NEMA (1) (3R) enclosure.

Optional enclosed control features: (A temperature sensor shall be provided with the enclosed controls.)(A temperature controller shall be provided with the enclosed controls.)(A vibration cutout switch input shall be provided.)

9.2 Safety Switch(es): A heavy-duty, non-fusible safety disconnect switch shall be provided by the manufacturer of the evaporative cooling equipment. Switch shall be single throw, 3-pole design, rated up to 600 VAC. Switch shall have triple padlocking capability, a visible double break rotary blade mechanism, a clearly visible On/Off handle, an interlocking mechanism to prevent door opening with handle in On position, and a clear line shield. Safety switch shall be provided in a NEMA (1) (3R) enclosure.