REFERENCE:

Marley NC Steel Cooling Tower Specification

Options:
Stainless Steel Tower
Extended Lube Line (Not available on models with outlet attenuators)
Flow Control Valves
Basin Equalizers
Ladder and Guardrail
Ladder Safety Cage
Plenum Walkway
Interior Mechanical Equipment Access Platform (NC8402 thru NC8422 only)
Vibration Switch
High Wind Load/Seismic Design (Not available on models with attenuators)

1.0 Base:

1.1 Provide an induced draft, crossflow type, factory assembled, film fill, industrial duty, stainless steel cooling tower situated as shown on the plans. The limiting overall dimensions of the tower shall be 18.17 ft wide, 25.775 ft long, and 11.94 ft high. Total operating power of all fans shall not exceed 90 BHp, consisting of 3 @ 30 Hp motor(s). Tower shall be similar and equal in all respects to Marley Model NC8403SLN3.

1.2 The cooling tower shall be designed for quiet operation, and shall produce an overall level of sound not higher than _____ dB(A) measured at _____ ft from the location: _____. Sound levels shall be independently verified by a CTI-licensed sound test agency to ensure validity and reliability of the manufacturers published values. Measurement and analysis of the sound levels shall be conducted by a certified Professional Engineer in Acoustical Engineering. Sound pressure levels shall be measured and recorded in the acoustic near-field and far-field locations using ANSI S1.4 Type 1 precision instrumentation and in full conformance with CTI ATC-128 test code published by the Cooling Technology Institute (CTI). All low sound options shall be CTI certified for thermal performance.

2.0 Thermal Performance:

2.1 The tower shall be capable of cooling 3360 gpm of water from 96 °F to 86 °F at a design entering air wet-bulb temperature of 80 °F, and its thermal rating shall be Certified by the Cooling Technology Institute.

2.2 The tower shall be capable of a minimum 50.799 gpm/Hp efficiency per ASHRAE Standard 90.1.

2.3 CTI Certification notwithstanding, the cooling tower manufacturer shall guarantee that the tower supplied will meet the specified performance conditions when the tower is installed according to plan. If, because of a suspected thermal performance deficiency, the owner chooses to conduct an on-site thermal performance test under the supervision of a qualified, disinterested third party in accordance with CTI or ASME standards during the first year of operation; and if the tower fails to perform within the limits of test tolerance; then the cooling tower manufacturer will pay for the cost of the test and will make such corrections as are appropriate and agreeable to the owner to compensate for the performance deficiency.

3.0 Warranty:

3.1 The entire tower, including structure, casing, basins, decking, fan(s), motor(s), and all mechanical drive components (including belts, if used) shall be warranted against failure due to defects in materials and workmanship for a period of five (5) years from the date of shipment to the job. Towers not covered by a warranty of this scope will not be accepted.

4.0 Design Loading:

4.1 The tower structure, anchorage and all its components shall be designed by licensed structural engineers, employed by the tower manufacturer, per the international building code to withstand a wind load of _____ psf, as well as a _____ seismic load. The fan deck and hot-water basin covers shall be designed for 50 psf live load or a 200 lb concentrated load. Guardrails, where specified, shall be capable of withstanding a 200 lb concentrated live load in any direction, and shall be designed in accordance with OSHA guidelines.

4.2 The tower shall be structurally capable of being supported at the four outer corners of the tower cell. Alternatively, the tower manufacturer shall provide supporting steel to adapt tower to be supported at four outer corners.

5.0 Construction:

5.1 Except where otherwise specified, all components of the cooling tower shall be fabricated of series 301L stainless steel. The tower shall be capable of withstanding water having a chloride content (NaCl) up to 750 ppm; a sulfate content (SO4) up to 1200 ppm; a calcium content (CaCO3) up to 800 ppm; and silica (SiO2) up to 150 ppm. The circulating water shall contain no oil, grease, fatty acids, or organic solvents.

Fiberglass casing, polyurethane barriers, and thermosetting hybrids and the components they are adhered to shall be considered non-recyclable and not allowed.

5.2 The specifications, as written, are intended to indicate those materials that will be capable of withstanding the above water quality in continuing service, as well as the loads described in paragraph 4.1. They are to be regarded as minimum requirements. Where component materials peculiar to individual tower designs are not specified, the manufacturers shall take the above water quality and load carrying capabilities into account in the selection of their materials of manufacture.

6.0 Mechanical Equipment:

6.1 Fan(s) shall be propeller-type, incorporating aluminum alloy blades attached to galvanized hubs with U-bolts. Blades shall be individually adjustable. Maximum fan tip speed shall be 13,000 ft/min. Fan(s) shall be driven through a right angle, industrial duty, oil lubricated, geared speed reducer that requires no oil changes for the first five (5) years of operation. All gearbox bearings shall be rated at an L10A service life of 100,000 hours or greater and the gear sets shall have AGMA Quality Class of 9 or greater. The gearbox shall include any modifications to enable operation down to 10% of full speed.

An external oil level dipstick shall be located adjacent to the motor at the fan deck surface and shall be accessible from a portable maintenance ladder.

6.2 Single-speed motor(s) shall be 30 Hp maximum, NEMA Premium Efficiency, TEFC, 1.15 service factor, inverter duty, variable torque, and specially insulated for cooling tower duty (Class F). Speed and electrical characteristics shall be 1800 rpm, single-winding, 3-phase, 60 Hz, ____ volts. Motor shall operate in the shaft-horizontal position for geardrive towers and shaft-down position for belt drive towers. Nameplate horsepower shall not be exceeded at design operation.

6.3 The motor to gearbox close coupling shall be a tire-type, single piece, flexible element design to accommodate frequent speed changes that are inherent with VFD applications.

6.4 The complete mechanical equipment assembly for each cell shall be supported by two horizontal steel beams that resist misalignment between the motor and the gear reducer/ belt drive system.

A vibration limit switch in a NEMA 4X housing shall be installed on the mechanical equipment support and wired to the shutdown circuit of the fan motor starter or VFD. The purpose of this switch will be to interrupt control power voltage to a safety circuit in the event of excessive vibration causing the starter or VFD equipment to de-energize the motor. It shall be adjustable for sensitivity, and include a means to reset the switch.

7.0 Fill, Louvers & Drift Eliminators:

7.1 Fill shall be film type, thermoformed of PVC, with louvers and eliminators formed as part of each fill sheet. Fill shall be suspended from stainless steel structural tubing supported from the tower structure, and shall be elevated above the floor of the cold-water basin to facilitate cleaning. Air inlet faces of the tower shall be free of water splash out.

7.2 Drift eliminators shall be PVC, triple-pass, and shall limit drift losses to 0.005% or less of the design water flow rate.

8.0 Hot Water Distribution System:

8.1 Two open stainless steel basins (one above each bank of fill) shall receive hot water piped to each cell of the

tower. These basin components shall be installed and sealed at the factory and assembled with bolted connections. Tap screws shall not be allowed due to their potential to develop leaks. The basins shall be equipped with removable, stainless steel covers capable of withstanding the loads described in paragraph 4.1. The water distribution system shall be accessible and maintainable during tower fan and water operation.

Heavy-duty flow-regulator valves shall be provided at the hot-water inlet connections. These valves shall be disc-type, with cast iron bodies and stainless steel operating stems. There shall be a locking handle to maintain the valve setting in any position. Valves shall be right-angle configuration, precluding the need for inlet elbows.

8.3 The water distribution system shall be accessible and maintainable while tower is operating.

10.1 A large galvanized, rectangular access door shall be located on both cased faces for entry into the cold-water basin. Doors shall provide convenient access to the fan plenum area to facilitate inspection and allow maintenance to the fan drive system. The access doors shall be at least 30" wide by 48" high.

9.0 Casing, Fan Deck and Fan Cylinder:

9.1 The casing and fan deck shall be stainless steel, and shall be capable of withstanding the loads described in paragraph 4.1. The top of the fan shall be equipped with a conical, non-sagging, removable fan guard, fabricated of welded 5/16" and 7 gauge rods, and hot dip galvanized after fabrication. Fan cylinders 5'-0" in height and over shall not be required to have a fan guard.

10.0 Access:

10.1 A large stainless steel, rectangular access door shall be located on both cased faces for entry into the cold-water basin. Doors shall provide convenient access to the fan plenum area to facilitate inspection and allow maintenance to the fan drive system. The access doors shall be at least 30" wide by 48" high.

The top of the tower shall be equipped with a guardrail complete with kneerail and toeboard, designed according to OSHA guidelines and factory welded into subassemblies for ease of field installation. Posts, toprails and kneerails shall be 1.5" square tubing. The guardrail assembly shall be hot dipped galvanized after welding and capable of withstanding a 200 pound concentrated live load in any direction. Posts shall be spaced on centers of 8'-0" or less. A 1'-6" wide aluminum ladder with 3" I-beam side rails and 1.25" diameter rungs shall be permanently attached to the endwall casing of the tower, rising from the base of the tower to the top of the guardrail.

A heavy gauge aluminum safety cage, welded into subassemblies for ease of field installation, shall surround the ladder, extending from a point approximately 7'-0" above the foot of the ladder to the top of the guardrail. Maximum weight of welded subassemblies shall not exceed 20 lb for ease of installation.

Provide a factory-installed, walkway extending from one cased-face access door to the other cased face. A steel framework shall support the walkway and the top of the walkway shall be at or above the cold-water basin overflow level. The walkway and framework to be equivalent material as the tower basin and have a minimum width of 36".

A factory-installed, elevated platform convenient for the care and maintenance of the tower's mechanical equipment shall be provided. The walkway and framework to be equivalent material as the tower basin.

11.0 Cold Water Collection Basin:

11.1 The collection basin shall be welded 301L stainless steel construction. Only low-carbon stainless steel alloys will be accepted in order to minimize the risk of intergranular corrosion in the weld zones. The basin shall include the number and type of suction connections required to accommodate the outflow piping system shown on the plans. Suction connections shall be equipped with stainless steel debris screens. An overflow and drain connection shall be provided in each cell of the cooling tower. The basin floor shall slope toward the drain to allow complete flush out of debris and silt that may accumulate. Towers of more than one cell shall include a method for flow and equalization between cells. The basin shall be accessible and maintainable while water is circulating. All steel items that project into the basin shall also be made of stainless steel.

A hole and bolt circle shall be provided in the depressed section of the basin for equalizer piping between cells. A full-face, .25" thick, 50 durometer gasket shall be provided at each equalizer location.