

/ Marley Class 160 Crossflow Cooling Tower /

Product Specifications



SPX

COOLING TECHNOLOGIES

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Class 160 Cooling Tower



Marley Class 160 towers are field erected, general purpose crossflow wood cooling towers, designed to serve all normal cooling water systems. They evolve from the crossflow concept of towers pioneered by Marley in 1938, and incorporate over 65 years of design advancements that our customers have found valuable. Class 160 cooling towers represent the current state of the art in this cooling tower category.

This publication not only relates the language to use in describing an appropriate Class 160 cooling tower—but also defines why certain items and features are important enough to specify with the intention of insisting upon compliance by all bidders. The left hand column of pages 4 through 18 provides appropriate text for the various specification paragraphs, whereas the right hand column comments on the meaning of the subject matter and explains its value.

Pages 4 through 11 indicate those paragraphs which will result in the purchase of a cooling tower which will not only accomplish the specified thermal performance, but which will include normal operation and maintenance-enhancing accessories and features. It will also incorporate those standard materials which testing and experience has proven to provide best results in normal operating conditions.

Pages 12 through 18 provide some paragraphs intended to add those features, components, and materials that will customize the tower to meet the user's requirements.

Space does not permit definition and explanation of all of the possible options that can be applied to the Class 160. SPX Cooling Technologies realizes that you, the purchaser, must be happy with the tower's characteristics, and we are prepared to provide—or provide for—any reasonable enhancement that you are willing to define and purchase.

Class 160 Cooling Tower

Specifications

1.0 Base:

1.1 Furnish and install an induced-draft, crossflow-type, field-erected, wood-framed, PVC fill, industrial-duty cooling tower of _____ cell(s), as shown on Plans. The limiting overall dimensions of the tower shall be _____ wide, _____ long, and _____ high to the top of the fan cylinder. Total operating horsepower of all fans shall not exceed _____ hp, consisting of _____ @ _____ hp motor(s). Tower shall be similar and equal in all respects to Marley Model _____.

Specification Value

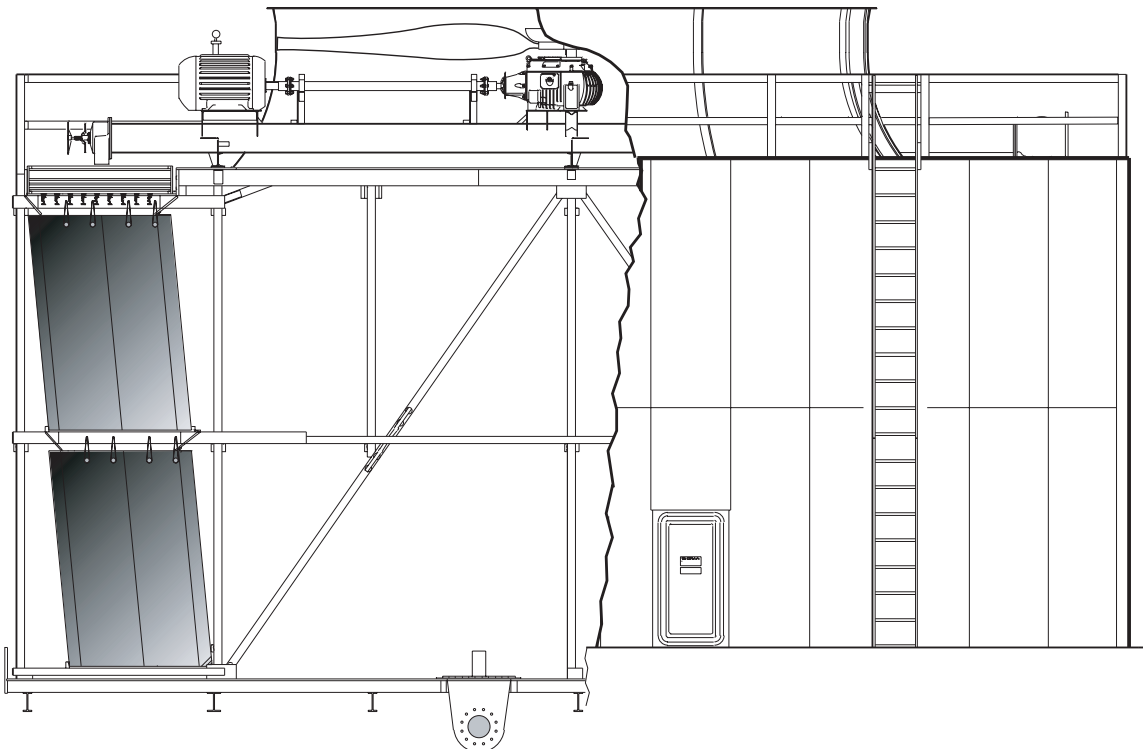
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Your specification base establishes the type, configuration, base material, and physical limitations of the cooling tower to be quoted. During the planning and layout stages of your project, you will have focused your attention on a cooling tower selection that fits your space allotment, and whose power usage is acceptable. Limitations on physical size and total operating horsepower avoid the introduction of unforeseen operational and site-related influences. Specifying the number of cells, and the maximum fan hp/cell will work to your advantage.

Crossflow towers are noted for the accessibility and maintainability of all operating components. The spacious interior provides easy access to fill, drift eliminators, all basin accessories—and is one of two primary accessways to the fan, Geared reducer, and other mechanical components.

At the fan deck level, the hot water distribution basins are easily inspected and cleaned—while the tower is operating, if you wish. The mechanical equipment can also be readily accessed from this level.

Except for the cold water basin, no counterflow tower component requiring routine maintenance is as easily accessed. The confined areas that typify counterflow designs can make difficult work for maintenance personnel!



Class 160 Cooling Tower

Specifications

2.0 Thermal Performance:

2.1 The tower shall be capable of cooling _____ GPM of water from ____ °F(°C) to ____ °F(°C) at a design entering air wet-bulb temperature of ____ °F(°C). The cooling tower manufacturer shall guarantee that the tower supplied will meet the specified performance conditions when the tower is installed according to plans. If, because of a suspected thermal performance deficiency, the owner chooses to conduct an on-site thermal performance test in the presence of the manufacturer, and under the supervision of a qualified, disinterested third party in accordance with CTI (Cooling Technology Institute) ATC-105 standards during the first full year of operation; and if the tower fails to perform within the limits of test tolerance; then the cooling tower manufacturer shall make alterations as it deems necessary to overcome indicated deficiency. Should alterations prove to be inadequate, the owner, at the cooling tower manufacturer's option, shall be compensated by either (or a combination of both) of the following: (a) Installation of additional cooling tower capacity; (b) A refund of a percentage of the contract price proportional to the deficiency as established.

Specification Value

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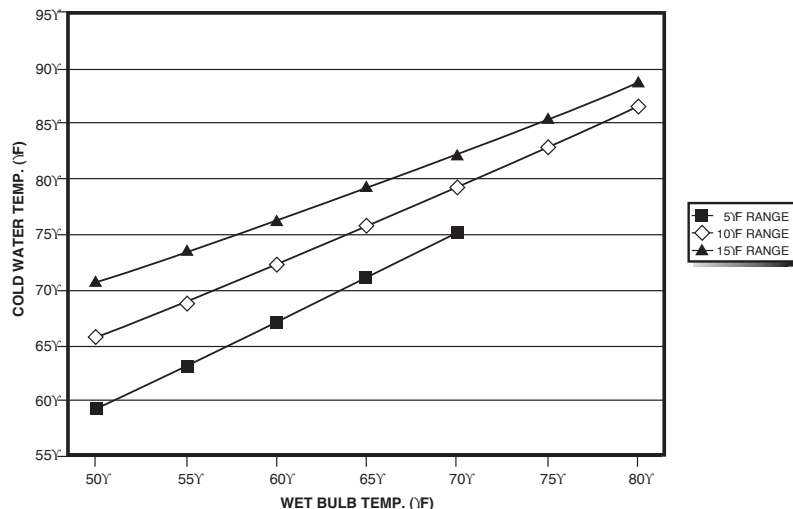
Your reason for purchasing a cooling tower is to obtain a continuing flow of cooled water as defined in the paragraph at left. If the tower that you purchase is incapable of performing as specified, then you will not have received full value for your investment.

Bear in mind that the size—and cost—of a cooling tower varies directly with its true thermal capability. This paragraph is intended to protect you against either intentional or inadvertent undersizing of the tower by the manufacturer. Judging the level of performance of a cooling tower on critical processes is never easy, and the potential risk of a non-performing cooling tower usually causes the requirement for a mandatory acceptance test to be very desirable.

Your contract with the successful bidder should establish the acceptable remedies for inadequate performance, which might include:

- The addition of one or more cells of tower, as necessary, to bring it to the specified level of performance. This is usually limited to the scope of work as defined in the specs, which means that you (the owner) will have to pay for the additional basin, wiring, starters, piping, etc.
- The reimbursement of a portion of the total contract price equal to the percentage deficiency in performance.

Under no circumstances should you allow the manufacturer to repitch the fans to increase motor brake horsepower above that shown in the proposal. That imposes operating costs that will continue for the life of the tower—and imposes no penalty on the manufacturer.



Typical cooling tower performance curve

Class 160 Cooling Tower

Specifications

3.0 Construction:

- 3.1 The tower shall be capable of withstanding water having a pH of 6.5 to 8.0; a chloride content (NaCl) up to 750 ppm; a sulfate content (SO₄) up to 1200 ppm; a sodium bicarbonate content (NaHCO₃) up to 200 ppm; a calcium content (CaCO₃) up to 800 ppm; silica (SiO₂) up to 150 ppm; and design hot water temperatures up to 120°F. The circulating water will contain no oil, grease, fatty acids, or organic solvents.
- 3.2 The structural framework of the tower shall be Douglas Fir, designed in accordance with CTI STD-114. Nylon shear plates shall be utilized to transmit loads at critical joints, and all fasteners shall be in accordance with CTI STD-119. Basic design criteria shall be 30 psf wind load and 5%g seismic load.
- 3.3 All wood components shall be treated after fabrication with chromated copper arsenate (CCA) by the full-cell process to a chemical retention of 0.4 lbs/ft³.
- 3.4 Structural columns and diagonals shall be 4"x4". Framing girts may be 2"x4", except for those supporting the hot water basins and fill. Those girts shall be 2"x6" minimum, located both sides of the support columns.
- 3.5 Multicell towers shall include treated Douglas Fir plywood partitions between cells in the plenum area. Partitions shall extend the full height of the tower from the base of fill to the underneath side of the fan deck.
- 3.6 Column lines shall be on no greater than 4'-0" longitudinal centers, and the base of all perimeter columns shall be firmly anchored to galvanized steel base plates. Framing joints shall be made with 1/2" diameter or larger galvanized machine bolts and shear plates, where required.

Specification Value

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The limiting water quality values indicated are those which are acceptable for the normal materials of construction specified. **If water of more aggressive quality is anticipated please change hardware material requirement to 300 Series stainless steel, as indicated below and following.**



Cooling Technology Institute standards take into account the hot, humid environment in which a cooling tower normally operates. This environment can render the limits of customary construction standards inadequate for cooling tower design.

The importance of shear plates is discussed at length in *Marley Difference, "Item S-3"*. Ask your Marley sales representative for a copy.

See notes on page 16 regarding the use and availability of redwood.

Specification of minimum member sizes assures that all offerings will conform to an industrial level of construction.

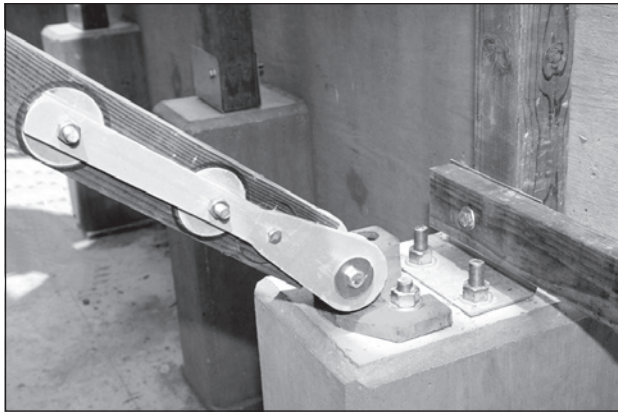
Multicell towers **must** have plenum partitions between cells. Otherwise, air will be induced downward through an inoperative fan, bypassing the fill entirely. Without these partitions, part-load or off-season operation of the tower would be completely unsatisfactory.

If preferred—or to protect against aggressive water conditions—please change "galvanized" in paragraph 3.6 to "Series 300 SS".

Class 160 Cooling Tower

Specifications

Specification Value



Diagonal and Column Anchorage



Diagonal Connector

4.0 Fan Deck and Fan Cylinder:

4.1 The fan deck shall act as a working platform for maintenance personnel. It shall be fabricated of no less than 1" thick, 7 ply, exterior grade, treated Douglas Fir plywood, and shall be designed for a uniform live load of 60 psf or a concentrated load of 600 pounds.

4.2 Fan cylinders shall be molded FRP. They shall be anchored to the fan deck structure to provide a consistently stable operating shroud for the fan.



The indicated design values for framing and decking not only give you assurance that the tower can withstand long term operation in a hostile environment—but that it will accept many years of inspection and maintenance traffic by your operating personnel.

Fiberglass-reinforced polyester fan cylinders provide the close tip clearances and smooth airflow contour necessary for good fan performance. The inert, noncorroding nature of FRP assures that these characteristics will persist.

Class 160 Cooling Tower

Specifications

5.0 Mechanical Equipment:

5.1 Fan(s) shall be propeller-type, incorporating high strength, inert composite material. Blades shall be individually adjustable and replaceable. Fan(s) shall be driven through a rightangle, industrial-duty, oil-lubricated, geared speed reducer. Speed reducers employing pulleys and belts will not be accepted.

5.2 Motor(s) shall be ____ hp maximum, TEFC, 1.15 service factor, and specially insulated for cooling tower duty. Speed and electrical characteristics shall be 1800 (1800/900) RPM, single winding, ____ phase, ____ hertz, ____ volts.

5.3 Motor shall be located outside the fan cylinder at the fan deck, and shall be connected to the speed reducer by a tubular stainless steel, dynamically balanced driveshaft equipped with neoprene flexible coupling elements.

5.4 A galvanized oil gauge and drain line shall extend from the gear reducer to the vicinity of the motor, and shall be equipped with a dip stick for oil level measurement.

5.5 The complete mechanical equipment assembly for each cell shall be supported by a rigid, unitized support that resists misalignment between the motor and the gear reducer. Support shall be heavy-wall tubular steel, to which heavy plate platforms for the motor and gear reducer have been welded and the assembly shall be hot-dip galvanized after fabrication. The support assembly shall also provide an inlet connection for incoming hot water, and shall serve as a crossover pipe to deliver water to both sides of the tower.

5.6 The mechanical equipment assembly shall be warranted for no less than five (5) years. This warranty shall cover the fan(s), speed reducers, driveshafts and couplings, and the unitized supports.

Specification Value

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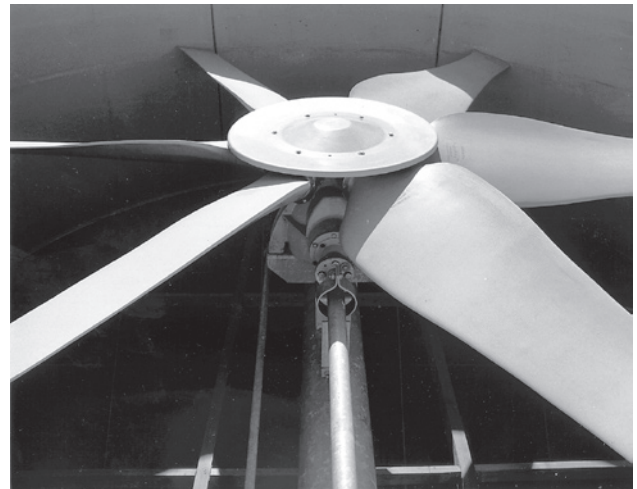
Unless otherwise specified, motor speed will be 1800 RPM in 60 Hertz areas and 1500 RPM in 50 Hertz areas. If you prefer the operating flexibility of two-speed operation, please specify the RPM to be 1800/900 (1500/750 in 50 Hertz regions).

The driveshaft turns at the motor speed and is, therefore, most sensitive to operational imbalance. Stainless steel manufacture assures that the driveshaft will not become unbalanced as a result of corrosion.

The extended oil line to an external dip stick provides a convenient means of checking the level of oil in the Geareducer. As indicated on page 15, a sight glass is also available in lieu of the dip stick.

Fans of the size used on large cooling towers are applied at speeds and horsepowers

that generate considerable torque—and structural tubular steel resists this torque very effectively. The Marley torque-tube assures that all of the mechanical equipment



remains aligned, and that the rotating fan is properly positioned within the fan cylinder. Hot-dip galvanizing **after** fabrication assures that **all** steel surfaces will be heavily coated with zinc for long-term protection against corrosion.

Even in aggressive water conditions, the heavy construction of the unitized support normally precludes the need for stainless steel.

The value of a 5 year mechanical equipment warranty speaks for itself. Except for the motor, all of the mechanical equipment on a Marley tower is **made** by SPX Cooling Technologies. Cooling tower vendors who purchase commercial fans, gear boxes, driveshafts, etc. may require that you deal directly with those commercial suppliers for warranty satisfaction.

Class 160 Cooling Tower

Specifications

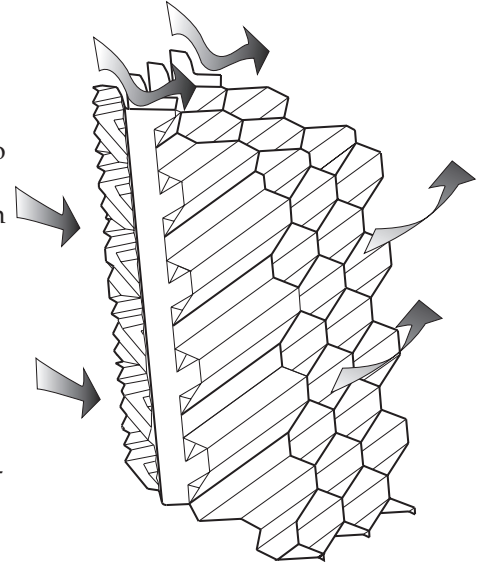
6.0 Fill, Louvers and Drift Eliminators:

- 6.1 Fill shall be film-type, 15 mil thick, thermoformed PVC, with louvers and drift eliminators formed as part of each fill sheet. Fill shall be suspended from stainless steel structural tubing supported from the upper 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 splashout.
- 6.2 Drift eliminators shall be PVC, triple-pass, and shall limit drift losses to no more than 0.010% of the design GPM flow rate.

Specification Value

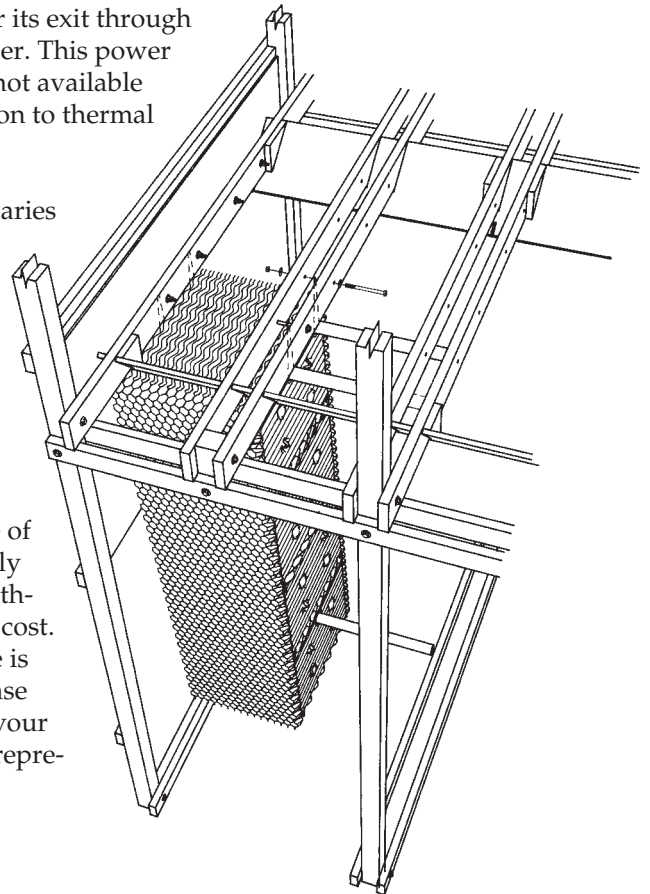
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Louvers integral with the fill keep the flowing water within the confines of the fill. The separate external louvers used by others permit water to escape the fill and form ice or produce an unsightly situation adjacent to the tower. If you plan to use your tower in the wintertime, particularly for free cooling, integral louvers will put your operating concerns to rest.



Vertical blade-type eliminators, as well as misdirected cellular types, cause much of the fan power to be wasted in turning the horizontal flow of air vertical for its exit through the fan cylinder. This power is, of course, not available for contribution to thermal performance.

Drift rate varies with design water loading and air rate, as well as drift eliminator depth and number of directional changes. The indicated rate of 0.010% is easily achievable without premium cost. If a lower rate is required, please discuss with your Marley sales representative.



Class 160 Cooling Tower

Specifications

7.0 Hot Water Distribution System:

7.1 The mechanical equipment support/crossover pipe shall deliver water to two open hot water basins per cell at the fan deck elevation. Water shall exit these basins to the fill by gravity through metering orifice-type polypropylene nozzles situated in the basin floor. Nozzles shall be easily removable and replaceable.

7.2 Heavy-duty, industrial grade flow-control valves shall be provided at the inlet to each basin. These valves shall permit both flow balancing and maintenance shut-off to selected cells, or portions of cells. Valves shall have machined cast iron bodies, with stainless steel operating stems, and heavy-duty locking handles.

8.0 Casing:

8.1 Tower endwalls shall be cased with ribbed FRP panels, lapped and sealed to prevent leakage. Tower corners shall be finished with FRP corner rolls.

9.0 Access and Safety:

9.1 Single cell towers shall include a 33" wide by 61" high molded FRP access door in one endwall casing for access to the interior of the tower. Casing access door shall be hinged and equipped with a latch operable from both inside and outside the tower. Multicell towers shall have an access door in both endwalls, and shall include a lift-out door in each transverse partition to give free access through the tower.

Specification Value

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Gravity-flow distribution basins are a feature of crossflow type towers. These basins are out where they can be easily inspected—even maintained—while the tower is in operation. Spray systems of counterflow towers, sandwiched between the top of the fill and the drift eliminators, are extremely awkward to access and maintain.

Marley flow-control valves remain serviceable for the life of the tower, and provide a continuing means of flow-regulation between hot water basins—and between cells of multicell towers as well. Towers without valves do not provide this valuable operating flexibility.



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The access doors on other towers may be unreasonably small. Specifying the size of the door will cause those bidders to take exception, alerting you to a potential maintenance headache.

Class 160 Cooling Tower

Specifications

9.2 The top of the tower shall be equipped with a sturdy 42" high wood guardrail system; top rails, intermediate rails, and toeboards; conforming to OSHA standards. Posts shall be 4"x4", on no greater than 8'-0" centers. Guardrails shall be 2"x4". Single 2"x4" top rail will be acceptable up to 6'-0" span. Above 6'-0" span, an additional 2"x4" cap strip shall be included.

9.3 Each endwall of the tower shall be equipped with a 20" wide aluminum vertical ladder, through-bolted to the endwall structure. Ladder shall rise from the cold water basin level to the top of the fan deck guardrail, and shall be designed and installed in conformance with OSHA standards.

10.0 Cold Water Basin:

10.1 The cold water collection basin shall be of poured-in-place concrete, provided under scope of work done by others. The concrete basin design shall be based upon certified loads and dimensions provided by the cooling tower manufacturer.

11.0 Scope of Work:

11.1 The cooling tower manufacturer shall be responsible for the design, fabrication, and delivery of materials to the project site, and for the erection of the tower over supports provided by others. Unless otherwise specified, all external piping, pumps, controls, and electrical wiring will be outside the cooling tower manufacturer's scope of work.

Specification Value

Good maintenance practice requires periodic access to the top of the tower to inspect the distribution basins, as well as the structural integrity of the fan deck, fan cylinder, and fan—especially the fan blade securing hardware. **And there are no induced-draft cooling tower designs that are immune to this need!**

For the comfort and safety of your operating personnel, the Class 160 includes a ladder and guardrail of the quality and design indicated—and we strongly recommend that you **require it of all bidders!** Portable ladders and other “make-do” access means are inappropriate for equipment of this size and complexity.

See photo, page 10.



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This basic specification assumes that the tower will be erected over a concrete basin at grade level. If the tower is to be installed on an elevated supporting platform, the plywood cold water collection basin indicated on page 16 should be included in the specifications.

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Please be clear in your specifications and inquiry documents regarding the full scope of work expected. That will help assure that your bid comparisons will be made on as equal a basis as possible—and will help to avoid any misunderstandings during the execution and implementation of the contract.



Options

Specifications

Control Options

Control System:

Para. 5.7: Add the following paragraph in the Mechanical Equipment section: Each cell of the cooling tower shall be equipped with a UL listed control system in a NEMA 3R or 4X outdoor enclosure capable of controlling single-speed or two-speed motors as required, and designed specifically for cooling tower applications. The panel shall include a main fused disconnect with an external operating handle, lockable in the off position for safety. Across-the-line magnetic starters or solid state soft-start starters as required shall be controlled with a thermostatic or solid state temperature controller. Door mounted selector switches shall be provided to enable automatic or manual control and wired for 120VAC control. Control circuit to be wired out to terminal blocks for field connection to a remote vibration switch and for access to extra 120VAC 50VA control power, overload trip alarms and remote temperature control devices. The temperature controller shall be adjustable for the required cold water temperature. If a thermostatic controller is used it shall be mounted on the side of the tower with the temperature sensing bulb installed in the cold water basin using a suspension mounting bracket. If a solid state temperature controller is used the controller will be door mounted on the control panel. The temperature controller will display two temperatures, one for outgoing water and the other for set point. Water temperature input shall be obtained using a three-wire RTD with dry well in the outlet water piping and wired back to the solid state temperature controller in the control panel.

Specification Value

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If it is your opinion that the control system for the cooling tower should be part of the tower manufacturer's responsibility, we are in wholehearted agreement with you. Who better to determine the most efficient mode and manner of a tower's operation—and to apply a system most compatible with it—than the designer and manufacturer of the cooling tower?

Options

Specifications

Basin Heaters:

Para. 10.2: Add the following paragraph in the Cold Water Basin section: Provide a system of electric immersion heaters and controls for each cell of the tower to prevent freezing of water in the collection basin during periods of shutdown. The system shall consist of one or more stainless steel electric immersion heaters installed in a galvanized steel heat shield provided in the floor of the basin. A NEMA 4 enclosure shall house a magnetic contactor to energize heaters; a transformer to provide 24 volt control circuit power; and a solid state circuit board for temperature and low water cutoff. A control probe shall be located in the basin to monitor water level and temperature. The system shall be capable of maintaining 40°F water temperature at an ambient air temperature of ___ °F. Wiring of the heaters and controls shall be the responsibility of the purchaser.

Variable Speed Drive:

Para. 5.7: Add the following paragraphs in the Mechanical Equipment Section: A complete UL listed Variable Speed Drive system in a NEMA 12 indoor or NEMA 3R outdoor enclosure shall be provided. The VFD shall use PWM technology with IGBT switching and integrated by-pass design. The panel shall include a main disconnect with short circuit protection and external operating handle, lockable in the off position for safety. The system shall include a solid state, PID temperature controller to adjust frequency output of the drive in response to the tower cold water temperature. The temperature of the cold water and set point shall be displayed on the door of the control panel. The by-pass circuit shall include a complete magnetic bypass that isolates the VFD when in the bypass mode. Transfer to the bypass mode shall be automatic in the event of VFD failure or for trip faults. The bypass contactor shall be cycled on and off while operating in bypass, to maintain the set-point temperature of the cold water.



Specification Value

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The basin heater components described at left represent our recommendation for a reliable automatic system for the prevention of basin freezing. They are shipped separately for installation at the jobsite.

If aggressive operating conditions are anticipated, change “galvanized” in paragraph 10.2 to “Series 300 SS”.

The ambient air temperature that you fill in should be the lowest 1% level of winter temperature prevalent at site.

Ask for Marley drawing 92-3627.

Marley VFD drive systems are designed to combine absolute temperature control with ideal energy management. The cooling tower user selects a cold water temperature and the drive system will vary the fan speed to maintain that temperature. Precise temperature control is accomplished with far less stress to the mechanical equipment components. The improved energy management provides fast payback. Indeed, many utilities offer generous rebates for users having installed VFD drives.

Options

Specifications

The drive design shall be operated as a stand-alone system or controlled with a building automation system. The BAS can be the normal source of control and the integrated temperature controller may be used as a backup to the building automation system.

Operator controls shall be mounted on the front of the enclosure and shall consist of start and stop control, bypass/VFD selector switch, Auto/Manual selector switch, manual speed control, and solid state temperature controller. An emergency bypass selector switch internal to the panel allowing the cooling tower fan motor to be run at full speed shall be furnished.

To prevent heating problems in the cooling tower fan motor and to assure proper gear reducer lubrication the VFD system shall cycle the motor on/off when the minimum allowable motor speed is reached.

The cooling tower manufacturer shall supply VFD start-up and tower vibration testing to identify and lock out any vibration levels which may exceed CTI guidelines.

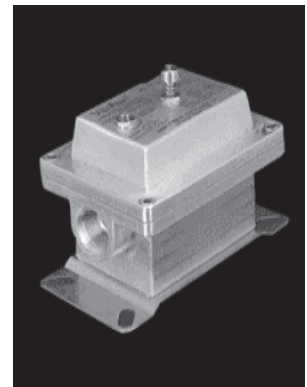
Vibration Limit Switch:

Para. 5.8: Add the following paragraph in the Mechanical Equipment section: A single-pole, double-throw vibration limit switch in the NEMA 4 housing shall be installed on the mechanical equipment support for wiring into the owner's control panel. The purpose of this switch will be to interrupt power to the motor in the event of excessive vibration. It shall be adjustable for sensitivity, and shall require manual reset.

Specification Value

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Unless specified otherwise, a Metrix switch will be provided. A double-pole, double-throw model is also available. If purchased in conjunction with the Control System, it is also factory-wired. The requirement for manual reset assures that the tower will be visited to determine the **cause** of excess vibration.



Options

Specifications

Convenience and Safety Options

Stairway:

Para. 9.3: Replace this paragraph with the following: A 30" wide, column supported, 45° stairway with 8" rise and run of treated Douglas Fir shall be provided at the tower endwall rising from grade (roof) to the fan deck elevation. Stair columns shall be 4"x4". Guardrails shall be 2"x4". The upper guardrail shall have an eased edge for the protection of operating personnel. Stairway foundation shall be by others, designed in accordance with drawings provided by the cooling tower manufacturer. The stairway shall conform to OSHA standards.

Plenum Walkway:

Para. 9.1: Add the following to the end of this paragraph: Provide a 30" wide walkway extending from one endwall access door to the other through the length of the tower. Walkway shall be constructed of treated Douglas Fir, and the top of the walkway shall be above the cold water basin overflow level. If the cold water basin is deeper than 4'-0", the walkway shall be equipped with guardrails.

Ladder Extension:

Para. 9.4: Add the following paragraph in the Access and Safety section: Provide a ladder extension for connection to the bottom of the ladder attached to the tower casing. This extension shall be long enough to rise from the roof (grade) level to the base of the tower. Anchorage and lateral bracing of the ladder extension shall be by others.



Specification Value

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Although they are not necessary for routine operation and maintenance, stairways do provide a safe and comfortable means of access to the top of the tower that is often overlooked in the initial cooling tower purchase. They are designed in straight-run or double-back configurations to accommodate your site requirements.

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This option permits freedom of movement for inspection or maintenance within the tower without the need for wading boots or tower drainage. It also helps prevent maintenance personnel from damaging submerged accessories in the cold water basin (such as screens, probes, basin heaters, etc.).

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Many towers are installed such that the base of the tower is 2'-0" or more above the roof or grade level. This makes it difficult to get up to the foot of the attached ladder. The ladder extension alleviates this problem. Marley ladder extensions are available in standard 5'-0" and 11'-0" lengths, and will be field-cut to fit.

Options

Specifications

Ladder Safety Cage:

Para. 9.3: Add the following to the end of this paragraph: A heavy gauge galvanized steel safety cage shall surround the ladder, extending from a point approximately 7'-0" above the bottom of the ladder to the top of the guardrail surrounding the fan deck.

Oil Level Sight Glass:

Para. 5.4: Replace this paragraph with the following: A galvanized oil gauge and drain line shall extend from the gear reducer to the vicinity of the motor, and shall be equipped with a bronze-bodied oil level sight glass.

Specification Value

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To meet OSHA guidelines, towers whose fan decks are 20'-0" or more above roof or grade, and which are equipped with ladders, are required to have safety cages surrounding the ladders.

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The oil level sight glass is a convenience item that is preferred by many users. The same purpose is, of course, served by either the dip stick or the sight glass.



Options

Specifications

Miscellaneous Options

Wood Cold Water Basin:

Para. 10.1: Replace this paragraph with the following: Include a cold water collection basin constructed of pressure treated Douglas Fir plywood. Basin floor shall be 3/4" thick 5-ply, supported by 6" deep joists on 2'-0" centers. Basin sides shall be 1" thick, 7 ply. The basin floor shall lock into a dado groove in the sides to form a watertight seal. A depressed, side outlet sump of either FRP or hot-dip galvanized steel having a 1/4" thick faceplate drilled for a standard class 125 ASME flange connection will be included. An appropriately sized (4" diameter or larger) galvanized standpipe overflow shall be provided. The standpipe shall be removable for flush-out cleaning of the basin. A float-operated, mechanical makeup valve shall also be included, installed adjacent to the endwall access door.

Redwood Components:

Hot Water Basin Covers:

Para. 7.3: Add the following paragraph in the Hot Water Distribution System section: The distribution basins shall include treated Douglas Fir plywood covers at least 3/4" thick. These covers shall be designed to withstand 60 psf live load, and shall be easily removable for maintenance.

Air Inlet Screens:

Para. 6.3: Add the following paragraph in the Fill, Louvers and Drift Eliminators section: The air inlet faces of the tower shall be covered by 1" mesh hot-dip galvanized welded wire screens. Screens shall be secured to removable treated Douglas Fir frames.

Specification Value

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Marley basins are used to permit the installation of towers on elevated platforms or foundations. The cross section drawing on page 4 shows the relationship of the optional basin, sump and overflow to a typical steel I-beam support platform.

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Most of the wood components in the tower are available of pressure treated redwood. However, redwood lacks the strength of Douglas Fir, which may require structural modifications of the tower. Please discuss the available redwood options with your Marley sales representative.

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These covers are designed to keep leaves and debris out of the circulating water system. They also serve to suppress algae formation by shielding the incoming hot water from direct sunlight.

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In wooded or windy areas, these screens help to keep leaves or blowing debris out of the cooling tower and circulating water system.

Options

Specifications

Miscellaneous Options

Low Noise Tower:

Para. 1.1: Add the following at the end of this paragraph: The cooling tower shall be quiet operating, and shall produce an overall level of sound no higher than ____ dBA at the critical location indicated on the Plans.

Specification Value

□ □ □

Sound produced by a Class 160 tower operating in an unobstructed environment will meet all but the most restrictive noise limitations – and will react favorably to natural attenuation. Where the tower has been sized to operate within an enclosure, the enclosure itself will have a damping effect on sound. Sound also declines with distance—by about 5 or 6 dBA each time the distance doubles. Where noise at a critical point is likely to exceed an acceptable limit, you have several options—listed below in ascending order of cost impact:

- Where only a slight reduction in noise will satisfy—and the source of concern is in a particular direction—merely turning the tower may be the answer. Less sound emanates from the cased face of the tower than does from the air intake face.
- In many cases, noise concerns are limited to nighttime, when ambient noise levels are lower and neighbors are trying to sleep. You can usually resolve these situations by using two-speed motors in either 1800/900 or 1800/1200 RPM configuration; and operating the fans at reduced speed *without cycling* “after hours”. (The natural nighttime reduction in wet-bulb temperature makes this a very feasible solution in most areas of the world, but the need to avoid cycling may cause the cold water temperature to vary significantly.)
 - Variable speed drives automatically minimize the tower's noise level during periods of reduced load and/or reduced ambient without sacrificing the system's ability to maintain a constant cold water temperature. This is a relatively inexpensive solution, and can pay for itself quickly in reduced energy costs.
 - Where noise is a concern at all times (for example, near a hospital), the best solution is to oversize the tower so it can operate continuously at reduced (1200 or 900 RPM) motor speed even at the highest design wet-bulb temperature. Typical sound reductions are 7 dBA at $\frac{2}{3}$ fan speed or 10 dBA at $\frac{1}{2}$ fan speed, but larger reductions are often possible.
 - Extreme cases may require inlet and discharge sound attenuator sections; however, the static pressure loss imposed by attenuators may necessitate an increase in tower size. This is the least desirable approach because of the significant cost impact—and because of the obstruction to normal maintenance procedures.

Your Marley sales representative can help you meet your sound requirements.

Options

Specifications

Watertight Partitions Between Cells:

Para. 3.5: Replace the last sentence in this paragraph with the following: Partitions shall be 3/4" x 5-ply, factory-fabricated, grooved and splined treated Douglas Fir plywood sheets, installed and sealed watertight to permit independent cell operation.

Fire Safety Options

Specification Value

□ □ □

In addition to the normal partition function of preventing air bypass (page 6), this option allows you to use each partitioned cell of your tower independently. This is valuable where a single multicell tower is serving several separate systems—or where winter operation may require less than full tower capability.

□ □ □

Occasionally, critical processes or local codes may require you to install a fire-protection sprinkler system on a wood tower—or pay higher insurance premiums—or both. Alternatives that could be acceptable to your insurance carrier, and which you may wish to evaluate, would be to make your Class 160 tower as fire resistant as possible. This can be done by any or all of the following measures:

- FRP casing having a flame spread rating of 25 or less. (Para. 8.1)
- Fan cylinders of fire-retardant FRP having a flame spread rating of 25 or less. (Para. 4.2)
- 1/4" thick fireproof fiber reinforced cement overlay over the fan deck—and will provide FRC overlaid distribution basin covers. (Para. 4.1 and page 16)
- 3/4" thick plywood partitions both sides of the column line between cells to achieve a fire rating of at least 30 minutes. (Para. 3.5 and this page.)

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7401 WEST 129 STREET | OVERLAND PARK, KANSAS 66213 UNITED STATES | 913 664 7400 | spxcooling@spx.com | spxcooling.com

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