ITA COUNTERFLOW COOLING TOWER

User Manual

Marley

Manual 93-1110B

Contents

△ **Note**

This manual contains vital information for the proper installation and operation of your cooling tower. Carefully read the manual before installation or operation of the tower and follow all instructions. Save this manual for future reference.

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning the life of the product.

△ **Warning**

Indicates presence of a hazard which can cause severe personal injury, death or substantial property damage if ignored.

△ **Caution**

Indicates presence of a hazard which will or can cause personal injury or property damage if ignored.

△ **Note**

Indicates special instructions on installation, operation or maintenance which are important but not related to personal injury hazards.

Installation

The Marley ITA Series cooling tower purchased for this installation represents the current state of the art in counterflow, induced draft cooling tower design. Thermally and operationally, it is the most efficient cooling tower of its class.

This manual—as well as those offered separately on the motor, fan, Geareducer®, coupling, driveshaft, float valve, etc.—are intended to assure that the tower serves you properly for the maximum possible time. Since product warrantability may well depend upon your actions, please read these manuals thoroughly prior to operation.

If you have questions about the operation and/or maintenance of this tower, and you can't find the answers in this manual, please contact your Marley sales representative. When writing for information, or when ordering parts, please include tower serial number shown on the nameplate.

Safety First

The location and orientation of the cooling tower can affect the safety of those responsible for installing, operating or maintaining the tower. However, since Marley does not determine the location or orientation of the tower, we can not be responsible for addressing those safety issues that are affected by the tower's location or orientation.

△ Warning

The following safety issues should be considered by those responsible for designing the tower installation.

—access to and from the mechanical equipment access door.

—access to inlet louvers and basin access door.

—potential access problems due to obstructions surrounding the tower.

—the need for ladders (either portable or permanent) to gain access to the access doors.

—lockout of mechanical equipment.

—the possible need for safety cages around ladders.

These are only some of the safety issues that may arise in the design process. Marley strongly recommends that you consult a safety engineer to be sure that all safety considerations have been addressed.

Installation

Tower Location

Space available around the tower should be as generous as possible to promote ease of maintenance—and to permit freedom of airflow into and through the tower. If you have questions about the adequacy of the available space and the intended configuration of the tower, please contact your Marley sales representative for guidance.

Prepare a stable, *level* support foundation for the tower, utilizing weight, wind load, and dimensional information appearing on appropriate Marley submittal drawings. *Supports must be level to insure proper operation of the tower.*

△ Warning

The cooling tower must be located at such distance and direction to avoid the possibility of contaminated tower discharge air being drawn into building fresh air intake ducts. The purchaser should obtain the services of a Licensed Professional Engineer or Registered Architect to certify that the location of the tower is in compliance with applicable air pollution, fire, and clean air codes.

Tower Shipment

ITA towers ship by truck on flat bed trailers, which lets you receive, hoist, and install the tower in one continuous operation. Each tower cell consists of a bottom section with two louver sections and a top section. Single cell towers ship on one truck. Multicell towers may require more than one truck. Responsibility for the condition of the tower upon its arrival belongs to the trucker—as does the coordination of multiple shipments, if required.

Receiving Tower

Prior to unloading the tower from the delivering carrier, inspect the shipment for evidence of damage in transit. If damage is apparent, note the freight bill accordingly. This will support your future recovery claim.

△ Note

To save time and effort later, it is suggested that you inspect the top of the fill (top area of the bottom section) at this time. If any debris has accumulated in shipment, remove it.

Installation

Find and remove the installation instruction drawings and manuals, located in a container shipped in the cold water basin. The drawings and manuals will be valuable for future reference.

Hoisting Tower

Top and bottom sections of the tower are equipped with heavy duty hoisting clips (4 per section). Lower section end panels contain 13⁄16″ diameter hoist holes for use with shackles. Top and bottom section hoisting instructions labels are located near hoisting clips. Remove tower from the carrier and hoist into place in accordance with the instructions on these labels.

If hoisting and installation are to take place simultaneously, hoist the bottom section first. This is the section including the cold water basin, louvers, and fill.

Tower Installation

△ **Note**

These installation instructions are intended to help you prepare before your tower arrives. If discrepancies exist between these instructions and those shipped with the tower, the instructions shipped with the tower will govern.

1. Place bottom section on your prepared supports, aligning anchor bolt holes with those in your supporting steel. ***Make sure that the orientation of the bottom section agrees with your intended piping arrangement.*** Attach section to supporting steel with four 5⁄8″ diameter bolts.
2. Apply strip sealer and gun caulk around top peripheral bearing surface of bottom section according to drawing instructions.
3. Clean any dirt or debris from underside of top section casing and remove shipping cover from top section inlet flange connection. Place top section on top peripheral bearing surface of bottom section, aligning mating holes as it is set in place. ***Make sure that the orientation of the top section agrees with your intended piping and access arrangement. Sections are 180° reversible with respect***

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to each other. Attach top section to bottom section with ⅜″ bolts provided—according to manual instructions.

△ **Note**

If tower purchased is one cell only, ignore steps 4 through 8.

4. Remove the temporary cover plate from the flume opening in the cell just installed.
5. Remove the temporary cover plate from the flume opening of the 2nd cell and set the bottom section of the 2nd cell in place. Align anchor bolt holes and flume openings.
6. Install flume according to drawing instructions shipped with tower.

△ **Note**

It is important that the cells be properly aligned and anchored before the flume is installed. Otherwise, undue stress may be applied to the flume during the attempt to install attachment bolts. Temporary cover plates may be removed and flumes installed after all towers are set in place and anchored.

7. Repeat step 3 for 2nd top section.
8. Repeat steps 4 through 7 for any remaining cells.
9. Install louver section per manual instructions. Louver section containing removable assembly should be located on cold water basin depressed area face.
10. Attach your cold water supply piping to the cold water basin suction connection in accordance with drawing instructions.

△ **Note**

Do not support your pipe from the tower or outlet connection—support it externally.

Normally one of the following three outflow arrangements is provided:

Side suction connection: This is a factory installed, galvanized pipe nipple extending horizontally from the side of the cold water basin, usually on Face A. It is both beveled for welding—and grooved for a mechanical coupling. If a weld connection is used, it is recommended that the weld area be protected against corrosion. Cold galvanizing is suggested, applied according to the manufacturer's instructions.

Bottom outlet connection: This is a factory-installed circular opening in

the cold water basin floor of one or more cells. Outlet and bolt circle dimensions conform to 125# ANSI B16.1 flat flange specifications. Option may be equipped with trash screen and mud sill.

Depressed sump connection: Steel sumps are attached upside down in the basin to prevent damage in shipment. They must be inserted into the square opening prepared in the floor of the cold water basin of one or more cells—sealed against leakage, and attached by galvanized bolts, according to the installation drawing included. Outlet and bolt circle dimensions in the vertical face of the sump conform to 125# ANSI B16.1 flat flange specifications.

11. Attach makeup water supply piping to appropriately sized float valve connection located in cold water basin side wall (normally on Face D.) If you wish to conduct overflow and drain water to a remote discharge point, make those connections at this time also.
12. Attach your warm water return piping (riser) to the inlet connection(s) of the tower. ***Do not support your pipe from the tower—support it externally***. Inlet connection consists of a 150#, schedule 80, "Van Stone" flange which rotates to facilitate ease of flange alignment.

△ Note

On multicell towers, incoming water flow to each cell may become unbalanced, particularly at reduced flow rates. Significant imbalance during freezing weather may lead to unacceptable levels of icing. You can address this problem by installing regulator valves in your riser piping to each cell.

13. Wire motor in accordance with wiring diagram.

△ Warning

For maintenance/safety purposes, provide a lockout type disconnect switch located such that it is visible from the mechanical equipment region of the tower.

In addition to this disconnect switch, the motor should be wired to main power supply through short circuit protection, and a magnetic starter with overload protection.

Operation

Tower Start-Up

△ **Warning**

Among other sources, outbreaks of Legionnaires' Disease have reportedly been traced to cooling towers. Maintenance and water treatment procedures that prevent amplification and dissemination of Legionella and other airborne bacteria should be formulated and implemented BEFORE systems are operated and continued regularly thereafter to avoid the risk of sickness or death.

Water System

1. New installations should be cleaned and treated with biocides by a water treatment expert before startup.
2. Remove any and all accumulated debris from tower. Pay particular attention to inside areas of cold water basin, top of fill, and top of drift eliminators. Make sure that cold water suction screens are clear and properly installed.
3. Fill the water system to an approximate depth of 7″ in the depressed section of the cold water basin. This is the recommended operating water level. Adjust the float valve so that it is ¾ open at that level. Float valve setting will need to be readjusted during tower operation with heat load to maintain this recommended operating water level. Continue filling the system until the water reaches a level approximately ⅛″ below the lip of the overflow.

△ **Note**

If tower is equipped with a standard side-suction connection, vent accumulated air from the top of the suction hood by removing one or both tap screws provided at that location. Replace these tap screws when venting is complete.

4. Start your pump(s). Observe system operation. Since the water system external to the tower will have been filled only to the level achieved in the cold water basin, a certain amount of "pump-down" of the basin water level will occur before water completes the circuit and begins to fall from the fill. The amount of initial pump-down may be insufficient to cause the float valve to open. However, you can check its operation by pressing down on the operating lever to which the stem of the float valve is attached.

Operation

5. Continue pump operation for about 15 minutes, after which it is recommended that the water system be drained, flushed, and refilled.
6. While operating the condensing water pump(s) and prior to operating the cooling tower fan, execute one of the two alternative biocidal treatment programs described in the following:
   - Resume treatment with the biocide which had been used prior to shutdown. Utilize the services of the water treatment supplier. Maintain the maximum recommended biocide residual (for the specific biocide) for a sufficient period of time (residual and time will vary with the biocide) to bring the system under good biological control

     or
   - Treat the system with sodium hypochlorite to a level of 4 to 5 mg/L (ppm) free chlorine residual at a pH of 7.0 to 7.6. The chlorine residual must be held at 4 to 5 mg/L (ppm) for six hours, measurable with standard commercial water test kits.

   If the cooling tower has been in operation and then shut down for a duration of time and not drained, perform one of the two previous biocidal treatment programs directly to the cooling water storage vessel (cooling tower sump, drain down tank, etc.) without circulating stagnant water over the cooling tower fill or operating the cooling tower fan.

   After biocidal pretreatment has been successfully completed, cooling water may be circulated over the tower fill with the fan off.

   When biocidal treatment has been maintained at a satisfactory level for at least six hours, the fan may be turned on and the system returned to service. Resume the standard water treatment program, including biocidal treatment.

Mechanical Equipment

△ **Warning**

Always shut off electrical power to the tower fan motor prior to performing any maintenance on the tower. Any electrical switches should be locked out and tagged out to prevent others from turning the power back on.

△ **Note**

Always access interior of top section of tower through the mechanical equipment door located on the end of each cell. Lowering the interior access platform provides additional space for inspection or

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Operation

maintenance of mechanical equipment, eliminators and spray system. Platform must be returned to its vertical storage position before operating tower.

1. Check oil level in accordance with the Geareducer Manual. Although the Geareducer was filled to the proper level at the factory, tipping during shipment and hoisting may have caused some loss of oil. If oil is required, fill Geareducer to the proper level. Refer to the Geareducer Manual for the correct oil to use, see **Note** on page 18. Check oil level at view port or dipstick (located Face D, if so equipped) to confirm that the proper level is indicated.
2. Spin the fan manually to assure that all fan blades properly clear the inside of the fan cylinder. Observe the action of the coupling to be sure that the motor and Geareducer are properly aligned. If necessary, correct the alignment in accordance with the included manual. When satisfactory, raise interior access platform and secure in operating position (vertical) and close access door.
3. Momentarily energize ("bump") the motor and observe rotation of the fan. The fan should rotate in a clockwise direction when viewed from above. If rotation is backwards, shut off the fan and reverse two of the three primary leads supplying power to the motor.

△ Caution

If tower is equipped with a two-speed motor, check for proper rotation at both speeds. Check also to see that starter is equipped with a 20 second time delay which prevents direct switching from high speed to low speed. This delay will allow the fan to slow down, and will prevent abnormal stress from being applied to the mechanical equipment and the electrical circuit components.

4. Run the motor and observe the operation of the mechanical equipment. Operation should be stable, and there should be no evidence of oil leakage.

△ Note

If the water supply system is not being operated—or if there is no heat load on the system—motor amps read at this time may indicate an apparent overload of as much as 10–15%. This is because of the increased density of unheated air flowing through the fan. Determination of an accurate motor load should await the application of the design heat load.

Operation

Tower Operation

General

The cold water temperature obtained from an operating cooling tower will vary with the following influences:

1. **Heat load:** With the fan in full operation, if the heat load increases, the cold water temperature will rise. If the heat load decreases, the cold water temperature will fall.

   Note that the number of degrees ("range") through which the tower cools the water is established by the system heat load and the amount of water being circulated, in accordance with the following formula:

   $$\text{Range (°F)} = \frac{\text{Heat Load (Btu/hr)}}{\text{GPM x 500}}$$

   The cooling tower establishes *only* the cold water temperature attainable under any operating circumstance.
2. **Air wet-bulb temperature:** Cold water temperature will also vary with the wet-bulb temperature of the air entering the louvered faces of the tower. Reduced wet-bulb temperatures will result in colder water temperatures. However, the cold water temperature will not vary to the same extent as the wet-bulb. For example, a 20°F reduction in wet-bulb may result in only a 15°F reduction in cold water temperature.
3. **Water flow rate:** Increasing the water flow rate (GPM) will cause a slight elevation in cold water temperature, while reducing the water flow rate will cause the cold water temperature to decrease slightly. However, at a given heat load (see formula above), GPM reductions *also* cause an increase in the incoming hot water temperature. Use care to prevent the hot water from exceeding 125°F, in order to prevent damage to the tower components.
4. **Air flow rate:** Reducing air flow through the tower causes the cold water temperature to rise. ***This is the approved method by which to control leaving water temperature***.

   If your tower is equipped with a single-speed motor, the motor may be shut off when the water temperature becomes too cold. This will cause the water temperature to rise. When the water temperature then becomes too warm for your process, the motor can be restarted.

Operation

△ **Note**

When operating in this mode, care must be taken not to exceed a total acceleration time of 30 seconds per hour.

From a dead stop, determine the number of seconds it takes the fan to arrive at full speed. Divide this number into 30 to determine the allowable number of starts per hour. Considering the normal fan and motor sizes utilized on ITA towers, anticipate that approximately 4 to 5 starts per hour are allowable.

If your tower is equipped with a two-speed motor, you will enjoy greater opportunity for temperature control. When the water temperature becomes too cold, switching the fan to half-speed will cause the cold water temperature to rise—stabilizing at a temperature some 5-15 degrees higher (depending upon a combination of all operating factors). With a further reduction in water temperature, the fan may be cycled alternately from half-speed to off—subject to the same constraint of *30 seconds of allowable acceleration time per hour* as outlined above.

If your tower consists of two or more cells, cycling of motors may be shared between cells, increasing your steps of operation accordingly.

For greater insight on cold water temperature control, please read *Marley Technical Report H-001-A* "Cooling Tower Energy and its Management" available, from your Marley sales representative.

Wintertime Operation

During operation in subfreezing weather, the opportunity exists for ice to form in the colder regions of the tower. Your primary concern is to prevent the formation of destructive ice on the cooling tower fill. Your understanding of cold weather operation will be enhanced if you read *Marley Technical Report H-003* "Operating Cooling Towers in Freezing Weather", augmented by the following guidelines:

1. Do not allow the tower's leaving water temperature to drop below a minimum allowable level—about 35°F—established as follows:

   During the coldest days of the first winter of operation, observe whether any ice is forming on the louver face, particularly near the bottom part of the louver face. If hard ice is present on the louvers, *you must increase the allowable cold water temperature*. If the coldest possible water is beneficial to your process, ice of a mushy consistency can be tolerated —but routine periodic observation is advisable.

If the minimum allowable cold water temperature is established at or near maximum heat load, it should be safe for all operating conditions. However, if established at reduced load, *increased heat loads may reintroduce the potential for icing*.

Having established the minimum allowable cold water temperature, maintaining that temperature can be accomplished by fan manipulation, as outlined in **Tower Operation: Item 4** on page 11. However, in towers of more than one cell, the limiting temperature established applies to the water temperature of the cell or cells operating at the highest fan speed —not necessarily the net cold water temperature produced by the entire tower.

2. As cold air enters the louvers, it causes the falling water to be drawn inward toward the center of the tower. Thus, under fan operation, the louvers and lower periphery of the tower structure remain partly dry, seeing only random splashing from within the tower—plus normal atmospheric moisture from the entering air. Such lightly wetted areas are most subject to freezing.

   Although ice is unlikely to cause structural damage, it may build up sufficiently to restrict the free flow of air through the louvers. This will have the effect of reducing the tower's thermal performance efficiency. When excessive ice forms on the louvers, stop the fan for a few minutes. With the fan off, the action of the spray system will cause a slight downward movement of air through the fill. This warmed air will exit through the louvers and deice them.

Intermittent Wintertime Operation

If periods of shutdown (nights, weekends, etc.) occur during freezing weather, measures must be taken to prevent the water in the cold water basin—and all exposed pipework—from freezing. Several methods are used to combat this, including automatic basin heater systems available from Marley.

△ **Note**

Unless some means of freeze prevention is incorporated into your system, the tower basin and exposed pipework should be drained at the beginning of each wintertime shutdown period.

It is recommended that you discuss your freeze prevention options with your local Marley sales representative.

Maintenance

Water Treatment and Blowdown

Maintaining Water Quality

The steel used in ITA towers has been galvanized with a heavy zinc coating averaging 2.0 mils in thickness. ITA Diamond Series towers are stainless steel. Other materials used (PVC fill, drift eliminators, louvers, and distribution piping, aluminum fans, cast iron Geareducer, etc.) are selected to offer maximum service life in a “normal” cooling tower environment, defined as follows:

- Circulating water with a pH between 6.5 and 8; a chloride content (as NaCl) below 500 ppm; a sulfate content (SO_4) below 250 ppm; total alkalinity (as $CaCO_3$) below 500 ppm; calcium hardness (as $CaCO_3$) above 50 ppm; a maximum inlet water temperature not to exceed 125°F; no significant contamination with unusual chemicals or foreign substances; and adequate water treatment to minimize scaling.
- Many systems may be successfully treated with Marley’s Ozone System. This removes the requirement for other chemical feed systems and provides significant water savings. For complete information, contact your local Marley sales representative.
- Chlorine (if used) shall be added intermittently, with a free residual not to exceed 1 ppm—maintained for short periods. Excessive chlorine levels may deteriorate sealants and other materials of construction.
- An atmosphere surrounding the tower no worse than “moderate industrial”, where rainfall and fog are no more than slightly acid, and they do not contain significant chlorides or hydrogen sulfide (H2S).

Since the structure of your cooling tower consists primarily of galvanized steel, your water treatment program must be compatible with zinc. In working with your water treatment supplier, it is important that you recognize the potential effects on zinc of the specific treatment program you choose.

Maintenance

Cooling Tower Cleaning

△ **Warning**

Any evaporative-type cooling tower must be thoroughly cleaned on a regular basis to minimize the growth of bacteria, including Legionella Pneumophila, to avoid the risk of sickness or death. Service personnel must wear proper personal protective equipment during decontamination. Do NOT attempt any service unless the fan motor is locked out.

Operators of evaporative cooling equipment, such as water cooling towers, should follow maintenance programs which will reduce to an absolute minimum the opportunity for bacteriological contamination. Public Health Service officials have recommended that “good housekeeping” procedures be followed, such as: regular inspections for concentrations of dirt, scale, and algae; periodic flushing and cleaning; and the following of a complete water treatment program including biocidal treatment. See **Tower Start Up: Water System** on page 8.

The visual inspection should take place at least once a week during the operating season. The periodic flushing and cleaning should be done before and after each cooling season, but in any event at least twice a year. The louvers, drift eliminators, and easily accessible fill surfaces should be flushed by use of a moderate-pressure water nozzle, being careful not to cause physical damage. A reliable water treatment program should be installed and maintained. Filtration devices may be employed to reduce the suspended solids concentrations, thus increasing the effectiveness of the water treatment program.

Blowdown

A cooling tower cools water by continuously causing a portion of it to evaporate. Although the water lost by evaporation is replenished by the makeup system, it exits the tower as pure water—leaving behind its burden of dissolved solids to concentrate in the remaining water. Given no means of control, this increasing concentration of contaminants can reach a very high level.

In order to achieve water quality which is acceptable to the cooling tower (as well as the remainder of your circulating water system), the selected water treatment company must work from a relatively constant level of

concentrations. This stabilization of contaminant concentrations is usually accomplished by *blowdown*, which is the constant discharge of a portion of the circulating water to waste. As a rule, acceptable levels on which to base a treatment schedule will be in the range of 2-4 concentrations. The following table gives *approximate* rates of blowdown (percent of total water flow rate constantly wasted) to achieve those concentrations at various cooling ranges.*

	Blowdown Rate	
Cooling Range (°F)	Two Concentrations	Four Concentrations
10	0.7%	0.17%
15	1.1%	0.30%
20	1.5%	0.43%

* "Range" = Difference between hot water temperature entering the tower & cold water temperature leaving the tower.

△ Note

When water treatment chemicals are added, they should not be introduced into the circulating water system via the cold water basin of the cooling tower. Water velocities are lowest at that point, which results in inadequate mixing.

Schedule of Tower Maintenance

Included with this instruction packet are separate Service Manuals on each major operating component of the tower, and it is recommended that you read them thoroughly. Where discrepancies may exist, the separate Service Manuals will take precedence.

The following is a recommended routine of scheduled maintenance:

△ Warning

Always shut off electrical power to the tower fan motor prior to performing any inspections that may involve physical contact with the mechanical or electrical equipment in or on the tower. Lock out and tag out any electrical switches to prevent others from turning the power back on. Service personnel must wear proper personal protective clothing and equipment.

Maintenance

Weekly: Inspect for bacterial growth and general operation conditions. Bacterial growth should be reported to your water treatment expert for immediate attention.

Monthly (Weekly at start up): Observe, touch, and listen to the tower. Become accustomed to its normal appearance, sound, and level of vibration. Abnormal aspects relating to the rotating equipment should be considered reason to shut down the tower until the problem can be located and corrected. Observe operation of the motor, coupling, Geareducer and fan. Become familiar with the normal operating temperature of the motor, as well as the sight and sound of all components as a whole.

Inspect louvers, drift eliminators and basin trash screens and remove any debris or scale which may have accumulated. Replace any damaged or worn out components. Use of high-pressure water may damage the eliminator and louver material.

Open basin access door or remove access section of louvers and observe operation of the float valve. Depress the operating lever to make sure that the valve is operating freely. Inspect the suction screen for plugging. Remove any debris that may have accumulated. (If the louvers are always properly replaced, suction screen fouling should seldom occur.)

Check for any buildup of silt on the floor of the cold water basin. Mentally note the amount, if any, so future inspections will enable you to determine the rate at which it is forming.

Semi-Annually: Relubricate motor. Refer to manufacturer's instructions for additional instructions.

△ Warning

Open and lock out disconnect switch to make certain motor cannot be started.

1. Access motor through mechanical equipment access door and tower internal platform.
2. Remove grease fill and relief plugs at both shaft extension end and opposite end bearings and remove hardened grease.
3. Install grease fittings in grease fill openings and add grease until grease is forced out through relief openings.

4. Replace fill plugs. Secure internal platform and access door in operating position. Operate mechanical equipment 30 minutes to one hour to purge excess grease at grease relief opening.
5. Reinstall grease relief plugs.
6. Resume normal tower operation.

Check Geareducer oil level. Shut down the unit and allow 5 minutes for the oil level to stabilize. Add oil if required.

Check to see that all bolts are tight in the fan and mechanical equipment region, including the fan cylinder and fan guard. Use torque settings located on the fan nameplate.

Clean and disinfect cooling tower with biocides. Systems with biofouling, high general bacterial counts, or positive cultures of legionella may require additional cleaning. Refer to **"Cooling Tower Cleaning"** on page 15. Consult your water treatment expert as to prudent biological evaluation testing.

△ **Note**

Geareducer models used on ITA cooling towers are designed for 5-year oil change intervals. To maintain five-year change intervals, use only Marley Gearlube™ or approved alternate. If, after five years, turbine-type mineral oil is used, the oil must be changed semiannually. Refer to the Geareducer Manual for alternate 5-year oil recommendations and further instructions.

Annually: Inspect the tower thoroughly, making maximum use of instructions given in the separate service manuals. Check structural bolted connections and tighten as required. Make preventive maintenance repairs as necessary.

Every 5 Years: Change Geareducer oil. Refer to Geareducer Manual for further instructions.

Seasonal Shutdown Instructions

When the system is to be shut down for an extended period of time, it is recommended that the entire system (cooling tower, system piping, heat exchangers, etc.) be drained. Leave the basin drains open.

During shutdown, clean the tower and make any necessary repairs. Pay particular attention to mechanical equipment supports and coupling .

Maintenance

Following each year's shutdown and cleaning, inspect the tower's metal surfaces for evidence of the need to apply a protective coating. Do not misinterpret grime—and transient rust from the piping system—as a need to have the tower painted. If relatively bright metal can be exposed by cleaning, consider that the galvanizing has remained effective. Unless there is evidence of a generalized failure of the galvanizing, localized touch-up should be all that is required.

△ **Note**

To the extent that the galvanizing (zinc coating) still exists, paint will not adhere to it readily. Contact the manufacturer of the coating you intend to use for instructions.

Tower framework: Check structural bolted connections and tighten as required.

Fans: Check fan assembly bolting and tighten as required. Use torque settings located on the fan nameplate.

Electric motors: Clean and lubricate motor at close of each operating season. Refer to motor manufacturer's recommendations. Check motor anchor bolts and tighten as required.

△ **Warning**

Do not start motor before determining that there will be no interference with free rotation of the fan drive.

The motor should be operated for three hours at least once a month. This serves to dry out windings and relubricate bearing surfaces. Refer to Marley Electric Motor service manual.

At start of new operating season, make sure bearings are adequately lubricated before returning motor to service.

Prolonged Shutdown

If shutdown period is longer than seasonal, contact your Marley sales representative for additional information.

Maintenance

Marley Services

Marley's interest in your ITA cooling tower *does not* end with the sale. Having conceived, designed, and manufactured the most reliable and longest lasting cooling tower of its class, we want to make sure that you gain the maximum possible benefit from its purchase.

Therefore, the following services are available which are intended to: assure the maximum possible service life under your operating conditions; tailor the operating characteristics to your specific needs; and maintain consistently optimum thermal performance capability. They are available by contacting your Marley sales representative.

Replacement parts: With the exception of the motor, *every component of your tower is designed and manufactured by The Marley Cooling Tower Company.* We do this because commercially available components have not proved capable of withstanding the harsh environment of a cooling tower—nor do they contribute their share to the thermal capability and operating characteristics intended.

A complete stock of *all* parts and components is maintained at one or more of the various Marley plants. In cases of emergency, they can normally be shipped within 24 hours—by air freight if necessary. However, you would obviously benefit from anticipating your need in advance, thus avoiding the cost of special handling.

Be sure to include your tower serial number (from the tower nameplate) when ordering parts.

Periodic maintenance: You may wish to contract with Marley for regularly scheduled visits—for the purpose of inspecting and reporting your tower's condition—to make recommendations intended to prevent emergencies—and to perform maintenance considered outside the norm.

This service is not intended to replace the important function performed by your maintenance staff. Their attention assures the tower's routine operating performance, and is invaluable. However, Marley recognizes that the unusual manner in which a cooling tower performs its function—as well as the unique forces which act upon it—may be considerations which occasionally require the services of an expert technician.

Additional Information

Increased load requirements: ITA towers are designed so that cells of either equal or unequal capacity can be added in the future. This allows you to compensate for the load increases that normally occur with the replacement or addition of production equipment—and still retain continuity with respect to your cooling tower system.

Tower rebuilding: Marley routinely rebuilds and upgrades cooling towers of *all* materials and manufacture. If your tower ever reaches the limit of its service life, we recommend that you investigate the cost of rebuilding before you routinely order a new replacement tower.

Each ITA tower includes a document package containing general orientation drawings and drawings required to accomplish field installation. ***These drawings contain important information relating to safe installation and operation of the cooling tower.*** Field installation is always required for fan guards, louver sections, piping inlets, and piping outlets. Some optional accessories such as ladders and safety cages may also require field installation. A separate installation drawing for each purchased option is included in the document package. If you have purchased an option and can't find the appropriate installation drawing, contact your local Marley sales representative before proceeding.

Marley also provides several sets of a separate packet of pertinent operating and maintenance manuals. The manuals vary somewhat depending on the tower model purchased.

In addition Marley publishes numerous technical reports including more detailed information on a variety of cooling tower operation and service topics. Your Marley office or representative will be happy to give you copies of these reports.

For complete parts and service assistance, contact the Marley sales or representative office in your area. If you need help locating the office nearest you, please phone 913 664 7400 or check the interent at marleycoolingtower.com.

Troubleshooting

Trouble	Cause	Remedy
Motor will not start	Power not available at motor terminals	1. Check power at starter. Correct any bad connections between the control apparatus and the motor. 2. Check starter contacts and control circuit. Reset overloads, close contacts, reset tripped switches or replace failed control switches. 3. If power is not on all leads at starter make sure overload and short circuit devices are in proper condition.
	Wrong connections	Check motor and control connections against wiring diagrams.
	Low voltage	Check nameplate voltage against power supply. Check voltage at motor terminals.
	Open circuit in motor winding	Check stator windings for open circuits.
	Motor or fan drive stuck	Disconnect motor from load and check motor and Geareducer for cause of problem.
	Rotor defective	Look for broken bars and rings.
Unusual motor noise	Motor running single-phase	Stop motor and attempt to start it. Motor will not start if single-phased. Check wiring, controls and motor.
	Motor leads connected incorrectly	Check motor connections against wiring diagram on motor.
	Bad bearings	Check lubrication. Replace bad bearings.
	Electrical unbalance	Check voltage and currents of all three lines. Correct if required.
	Air gap not uniform	Check and correct bracket fits or bearing.
	Rotor unbalance	Rebalance.
	Cooling fan hitting end bell guard	Reinstall or replace fan.
Fan noise	Blade rubbing inside of fan cylinder	Adjust cylinder to provide blade tip clearance.
	Loose bolts in blade clamps	Check and tighten if necessary. Check fan blade pitch. Refer to Fan Service Manual.
Scale or foreign substance in water system	Lack of or insufficient bleed-off	See “Water Treatment” section of this manual.
	Water treatment	Consult competent water treating specialist. See “Water Treatment” section of this manual.
Motor does not come up to speed	Voltage too low at motor terminals because of line drop	Check transformer and setting of taps. Use higher voltage on transformer terminals or reduce loads. Increase wire size or reduce inertia.
	Broken rotor bars	Look for cracks near the rings. A new rotor may be required. Have motor service center check motor.
Wrong rotation (Motor)	Wrong sequence of phases	Switch any two of the three motor leads.
Excessive water drift	Faulty drift elimination	1. See if all louvers and eliminators are in place and clean. 2. Check to see that nozzles are in place and clean of debris.
	Overpumping	Reduce water flow rate to tower to design conditions.
Cold water too warm (See “Tower Operation”)	Overpumping	Reduce water flow rate to tower to design conditions.
	Not enough air	Check motor current and voltage to be sure of correct contract horsepower. Clean louvers, fill and eliminators.

Troubleshooting

Trouble	Cause	Remedy
Unusual fan drive vibration	Loose bolts and cap screw	Tighten all bolts and cap screws on all mechanical equipment and supports.
	Worn coupling or misalignment	Make sure motor and Geareducer shafts are in proper alignment and “match marks” properly matched. Repair or replace worn couplings.
	Unbalanced fan	Be sure blades are properly positioned in correct sockets. (See match numbers.) Make certain all blades are as far from center of hub as safety devices permit. All blades must be pitched the same. See Fan Service Manual. Clean off deposit buildup on blades.
	Worn Geareducer bearings	Check fan and pinion shaft endplay. Replace bearings as necessary.
	Unbalanced motor	Disconnect load and operate motor. If motor still vibrates, rebalance rotor.
	Bent Geareducer shaft	Check fan and pinion shafts with dial indicator. Replace if necessary.
Motor runs hot	Motor overload, wrong voltage or unbalanced voltage	Check voltage and current of all three lines against nameplate values.
	Wrong motor RPM	Check nameplate against power supply. Check RPM of motor and gear ratio.
	Bearings overgreased	Remove grease reliefs. Run motor up to speed to purge excessive grease.
	Wrong lubricant in bearings	Change to proper lubricant. See motor manufacturer’s instructions.
	One phase open	Stop motor and attempt to start it. Motor will not start if single-phased. Check wiring, controls and motor.
	Poor ventilation	Clean motor and check ventilation openings. Allow ample ventilation around motor.
	Winding fault	Check with Ohmmeter.
	Bent motor shaft	Straighten or replace shaft.
	Insufficient grease	Remove plugs and regrease bearings.
	Too frequent starting	Limit cumulative starting time to a total of 30 seconds each hour.
	Deterioration of or foreign material in grease	Flush bearings and re-lubricate.
	Bearings damaged	Replace bearings.
	Incorrect fan blade pitch	Measure actual fan pitch and compare to that recommended. Correct, if necessary. See Fan Service Manual.
Geareducer noise	Geareducer bearings	If new, see if noise disappears after one week of operation. Drain, flush and refill Geareducer. See Geareducer Service Manual. If still noisy, replace bearings.
	Gears	Correct tooth engagement. Replace badly worn gears. Replace gears with imperfect tooth spacing or form.

Marley Cooling Tower

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SERVICE information

THE MARLEY COOLING TOWER COMPANY

Health Alert

Among other sources, outbreaks of Legionnaires' Disease have reportedly been traced to cooling towers. Maintenance procedures that prevent amplification and dissemination of Legionella and other airborne bacteria should be formulated and implemented BEFORE systems are operated and continued regularly thereafter to avoid the risk of sickness or death. The following is recommended:

- ❑ Do NOT attempt any service unless the fan motor is locked out.
- ❑ New cooling towers should be cleaned and treated with biocides by a water treatment expert before startup. See your Cooling Tower User Manual for more detailed instructions on biocidal treatment.
- ❑ At a minimum, cooling towers should be cleaned and disinfected with biocides twice a year. Systems with biofouling or positive cultures of legionella may require additional cleaning.
- ❑ Units should be inspected weekly for bacterial growth and general operating conditions. Bacterial growth should be reported to your water treatment expert for immediate attention.
- ❑ Drift eliminators should be inspected monthly. Any debris or scale should be cleaned off the eliminators when noted. Replace any damaged or worn out components.
- ❑ Workers cleaning units should use protective clothing and equipment during decontamination.
- ❑ Although using these practices will not guarantee that a system or individual component will not be contaminated by legionella, they should reduce the chance of colonization.

  For additional copies of the tower User Manual or other literature pertaining to this unit, please contact your Marley sales representative.