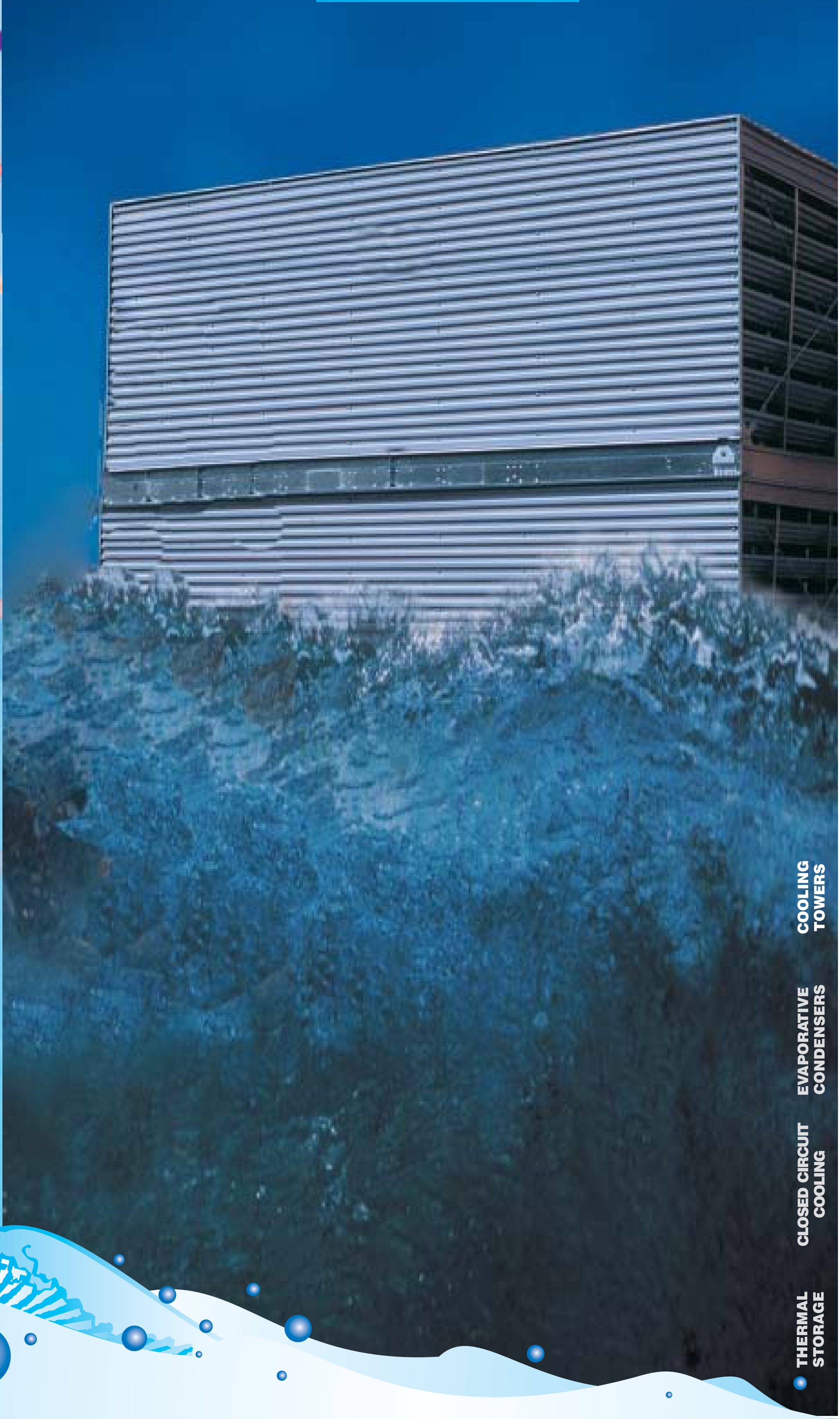
COOLING TOWERS

OMRAN TAHVIEH



SERIES 3000

COOLING TOWERS

COOLING TOWERS

EVAPORATIVE CONDENSERS

CLOSED CIRCUIT COOLING

THERMAL STORAGE

Series 3000 Cooling Towers

PROVEN TOTAL PERFORMANCE

Series 3000 Cooling Towers meet the demands of today's industrial cooling, air conditioning, and refrigeration systems. Constructed with energy efficient components, these cooling towers deliver independently verified, fully rated thermal performance over a wide range of flow and temperature requirements. Years of operating experience and extensive research and development have resulted in standard design features that satisfy today's environmental concerns, minimize installation costs, maximize year-round operating reliability, and simplify maintenance requirements. Innovative performance-enhancing options and alternate corrosion-resistant materials of construction allow each unit to be customized to meet specific project requirements.

SERIES 3000 COOLING TOWERS

- Proven total performance
- Low energy consumption
- Long service life
- Low installed cost
- Reliable year-round operation
- Easy maintenance
- Three-year wrranty on mechanical equipment

JE PREMIER SERIES CONSTRUCTION

Where the ultimate in corrosion protection and long life is desire , Series 3000 Cooling Towers, provided with JE PREMIER SERIES Construction, have all the benefits of the standard Series 3000, plus:

- Stainless steel components provide the ultimate in corrosion protection:
  - structural frame
  - welded cold water basin
  - mechanical equipment support
  - fan deck and cylinder
  - hot water basin and distribution covers
  - louver supports
- Three-year warranty on the entire unit

Proven Advantages

Low energy consumption

With increased environmental concerns and utility deregulation, low energy consumption is an important social issue as well as a significant economic consideration. Series 3000 Cooling Towers feature energy-efficient components that minimize power requirements. High efficiency Wet Deck Surface with integral eliminators provides maximum air/water contact time and low air pressure drop. Additionally, axial flow fans allow the fan horsepower to be approximately half that required by comparably sized centrifugal fan units. In addition, alternative low-horsepower models can be selected to further reduce fan power consumption.

The Power Train fan drive system, featured as standard on most Series 3000 Cooling Towers, allows fan energy consumption to be further reduced with The exclusive ENERGY-MISER fan System option.The ENERGY-MISER Fan System employs two Independent motors sized to provide energy savings superior to conventional two-speed motors and afford stand-by protection in the event of a motor failure (see page 9 for details).

Long Service Life

Frame construction enables standard casing panels and air inlet louvers, which are critical links for long service life, to be constructed of corrosion-resistant, fiberglass reinforced polyester (FRP).

For applications where abnrmally corrosive conditions exist, or extended equipment life is desire Series 3000 Cooling Towers are available in a wide range of constuction alternatives. Galvanized, BALTIBOND corrosion Protection System, or Type 304 Stainless Steel are available to meet the corrosion resistance, unit operating life, and budgetary requirements of any project (see page 8 for construction alternatives).

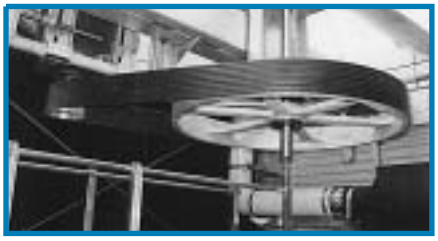
Low Installed Cost

All models mount directly to two parallel I-beams and ship complete with motors and drives factory-installed and aligned. Models 3728A through 31056A and 31132A through 31301A ship in two sections to minimize rigging requirements.

The modular concept of the Series 3000 Cooling Tower enable unit to be easily multiplexed for larger installations, to provide a cost-effective alternative to field-erected products by eliminating the time and expense associated with site erection.

The optional EASY CONNECT Piping Arrangement with BALANCE CLEAN Chamber further reduces field maintenance and installation costs by eliminating overhead piping and piping support requirements.

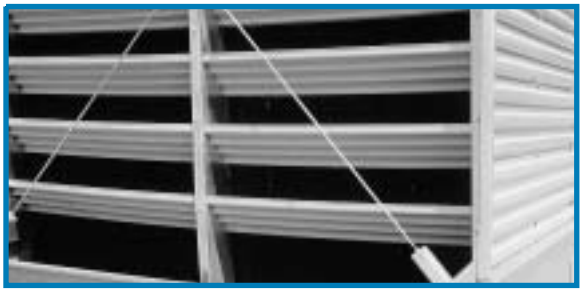
Reliable Year-Round Operation



Series 3000 Cooling Towers provide reliable, trouble-free operation in all climates. The exclusive Beltdrive Power Train fan drive system is the result of many years experience with cooling tower drive systems .

Backed by a three-year fan drive and motor warranty , the Beltdrive Power Train utilizes special corrosion resistant materials of construction and state-of-the-art technology to ensure ease of maintenance and reliable year-round perfo rmance.

Separate air inlet louvers, a standard feature on all Series 3000 Cooling Towers, provide a critical function for reliable year -round cooling tower operation. In addition to ensuring uniform air distribution through Wet Deck Surface, separate air inlet louvers reduce the potential for excessive scale build-up and damaging ice formations at the air/water interface.



Easy Maintenance

To obtain optimum performance and maximum service life, it is important that cooling towers be designed to simplify routine cleaning and maintenance requirements. Crossflow cooling towers provide a spacious plenum with easy access for visual inspections and maintenance. Oversized access doors in both end walls provide easy access to the unit interior to adjust the make-up float valve, clean the cold water basin and strainer, and service the fan drive system. The wet deck surface is elevated above a sloped cold water basin to facilitate flushing of dirt and debris from this critical area.

The water distribution system consists of gravity distribution basins with large orifice nozzles, which greatly reduce clogging and assure constant performance between maintenance intervals. When nozzle cleaning is required, each nozzle can be cleaned in place, or easily removed. Steel distribution system covers are supplied as standard on all Series 3000 Cooling Towers. This feature eliminates exposure of the water to airborne debris which reduces dirt accumulation in the distribution basins. The distribution basin covers are designed for a maximum concentrated live load of 200 pounds.

This innovative option allows all routine maintenance of the water distribution system to be performed from the unit interior eliminating the need to use the cooling tower fan deck as a working surface to perform routine maintenance. If access to the top of the unit is desired, the purchaser/end-user is cautioned to use appropriate means, complying with applicable safety standards of governmental authorities.

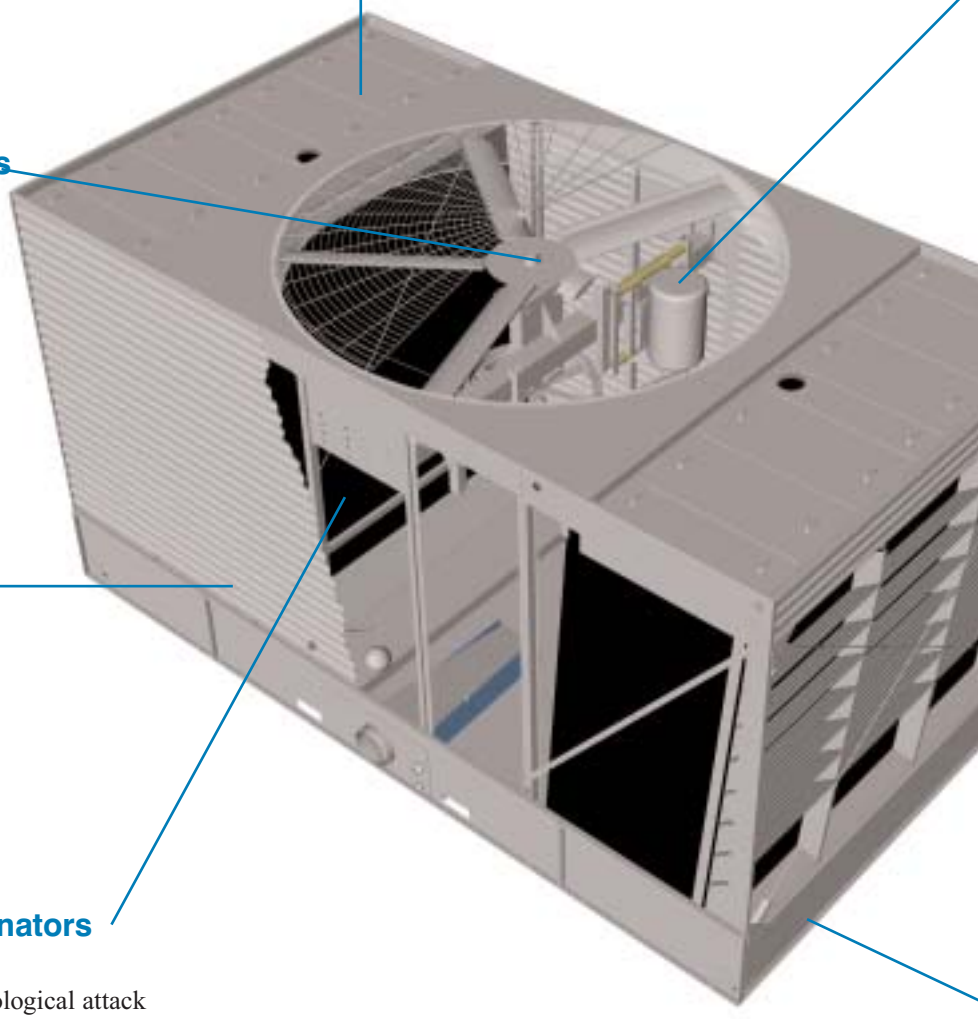
Construction Details

Heavy Duty Construction

- Heavy gauge steel frame
- Alternate materials of construction available

Water Distribution System

- Sturdy steel covers in easy to remove sections
- Low pump head gravity distribution basins
- Large orifice, non-clog nozzles



Low HP Axial Flow Fans

- Quiet operation
- Corrosion resistant aluminum
- Optional low sound fans available

FRP Casing Panels

- Corrosion resistant
- Maintenance free
- UV resistant finish

Wet Deck Surface with Integral Drift Eliminators

- Polyvinyl chloride (PVC)
- Impervious to rot, decay or biological attack
- Elevated above the cold water basin for easy maintenance

Oversized Access Door

- Inward swinging doors on each end wall with easy latch handles

Beltdrive Power Train

- Premium quality , solid backed, multi-groove belt
- Corrosion resistant cast aluminum sheaves
- Heavy duty bearings (280,000 hour
- Three - year motor and drive warranty

FRP Air Inlet Louvers

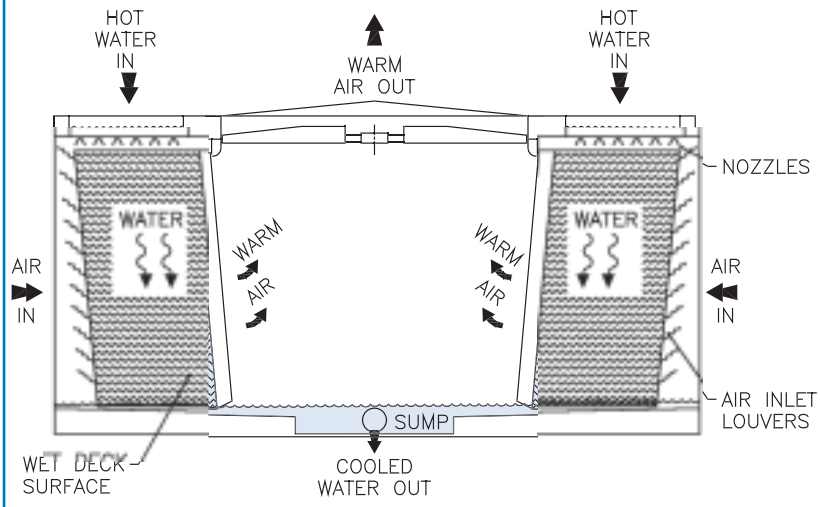
- Corrosion resistant
- UV resistant finish
- Prevent water splash-out
- Maintenance free
- Minimize scaling potential on face of wet deck

Cold Water Basin

- Sloped cold water basin below wet deck sections for easy cleaning
- Suction strainer with anti-vortex hood
- Adjustable water make-up assembly
- Lifting ears for easy installation

Principle of Operation

Water from the system heat source enters the Series 3000 Cooling Tower through two inlet connections located on the top of the unit. The water circulates through the hot water basins, where non-clog diffuser nozzles distribute the water uniformly over the wet deck surface. Simultaneously, air is drawn through air inlet louvers and across the wet deck surface, causing a small portion of the water to evaporate. Evaporation removes the heat from the remaining water. The cooled water then flows into the cold water basin and returns to the heat source.



Construction Alternatives

Standard Corrosion Resistant Constrruction

All steel panels and structural elements of the Series 3000 Cooling Tower are constructed of heavy gauge hot-dip galvanized steel.

A zinc-rich primer is applied to the cut edges of all hot-dip galvanized components prior to assembly. Casing panels and air inlet louvers, which are critical links in the life expectancy of a cooling tower, are constructed of UV-resistant, fiberglass reinforced polyester (FRP).
This standard construction will provide reliable corrosion protection and long life for most industrial cooling, air conditioning, and refrigeration applications.

Optional Corrosion Protection System

The Corrosion Protection System is an advancement in materials engineering developed by OMRAN specifically for increased protection from adverse operating conditions. The manufacturing process fuse bonds a special hybrid polymer to all hot-dipped galvanized steel components of the cooling tower , extending the life of the base material.

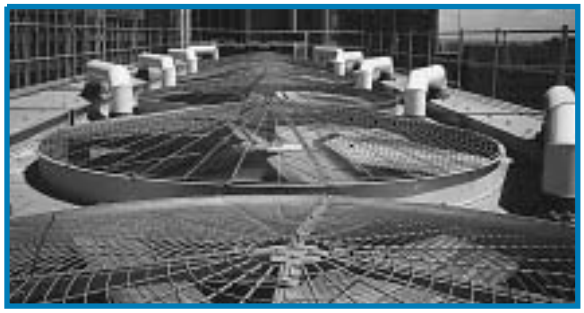
Optional Stainless Steel Cold Water Basin

A welded, Type 304 stainless steel basin is available to increase leak protection and corrosion protection of this critical component. All seams between panels inside the cold water basin are welded. The basin is leak tested at the factory and is provided with a three-year leakproof guarantee. The steel panels and structural members above the cold water basin can be constructed of the standard hot-dipped galvanized steel or the optional Corrosion Protection System.

Optional JE PREMIER SERIES Construction

Series 3000 Cooling Towers provided with JE PREMIER SERIES Construction are designed for applications exposed to extremely corrosive conditions or where the ultimate in corrosion protection and long life are desired. All steel panels and structural elements, including the structural frames, louver supports, cold water basin, hot water basins and covers, fan deck, fan cylinder, and mechanical equipment supports are constructed of Type 304 Stainless Steel. All seams between panels inside the cold water basin are welded. The basin is leak tested at the factory and is provided with a three-year leakproof guarantee. Casing panels and air inlet louvers are constructed of corrosion and UV resistant fiberglass reinforced polyester (FRP).

Custom Features and Options



Low Sound Operation

As society becomes increasingly concerned over the quality of its environment, sound is an important consideration in the selection and location of sound generating equipment. The mechanical equipment on Series 3000 Cooling Towers is carefully selected to produce optimum cooling tower thermal performance with minimal sound levels. The low sound levels generated by Series 3000 Cooling Towers make them suitable for installation in most environments.

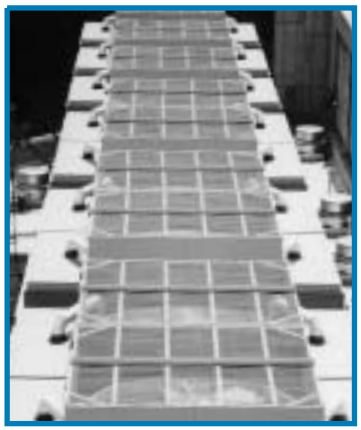
For very sound sensitive installations, Series 3000 Cooling Towers are available with a low-sound fan option which significantly reduces the sound levels generated from the tower with minimal impact on ther mal performance.

For extremely sound sensitive installations, factory designed, tested and rated sound attenuation is available for both the air inlet and discharge of Series 3000 Cooling Towers. Consult your local OMRAN Sales Representative for selection and application information on this unique optional feature.

ENERGY - MISER Fan System

Reduced operating costs can be achieved during off-peak operation by taking advantage of ENERGY-MISER Fan System option. ENERGY-MISER Fan System is an energy-saving, capacity control alternative to two-speed motors. It consists of two standard, single-speed fan motors and drive assemblies. One drive assembly is sized for full speed and load, and the other is sized approximately 2/3 speed and consumes only 1/3 the design horsepower. This configuration allows the system to be operated like a two-speed motor, but with the reserve capacity of a standby motor in the event of a failure. Controls and wiring are the same as those required for a two-speed, two-winding motor. Significant energy savings are achieved when operating at low speed during periods of reduced load and/or low wet bulb temperatures.

ENERGY-MISER Fan System



Series 3000 Cooling Towers with discharge sound attenuation.

Basinless Unit Construction

The basinless unit construction option enables Series 3000 Cooling Towers to be directly applied to projects utilizing new or existing concrete cold water basins. This custom feature, available exclusively on OMRAN Series 3000 CoolingTowers, reduces maintenance costs by eliminating the redundant integral basin from traditional units. It simplifies piping and pumping requirements of multi-cell installations, enhances stringent equipment wind and seismic requirements and provides a cost-effective solution for many field-erected cooling tower replacement projects.

Basinless Series 3000 Cooling Tower on a concrete basin.

Velocity Recovery Stacks

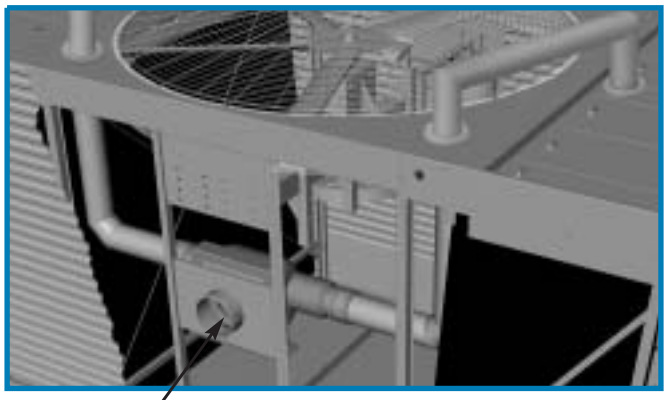
Velocity recovery stacks, previously used primarily on large field-erected cooling tower applications, are available on Series 3000 Cooling Towers, for incremental thermal performance increases.

This accessory can be used to gain extra capacity in tight layoyts,while maintaining the same footprint and unit horsepower. The velocity recovery stack height is five feet and can be constructed of either hot-dip galvanized steel, the Corrosion Protection System, or Type 304 stainless steel. Field assembly is required.

Your local OMRAN Representative can provide additional application assistance.

EASY CONNECT Piping Arrangement with BALANCE CLEAN Chamber

This exclusive OMRAN option simplifies water inlet piping and reduces routine maintenance on Series 3000 Cooling Towers. A single water inlet connection, located on the side or bottom of each unit, eliminates the need for overhead piping and piping supports. The BALANCE CLEAN Chamber features an integral strainer which prevents large debris from being carried to the hot water distribution basins. The BALANCE CLEAN Chamber automatically balances flow within each cell, eliminating the need for flow balancing valves. The unique design of the water distribution system enables all routine maintenance to be performed from the unit interior thereby eliminating the need to use the cooling tower fan deck as a working surface to perform routine maintenance of the water distribution system.



Optional EASY CONNECT Piping Arrangement with BALANCE CLEAN Chamber

Optional Accessories

Vibration Cutout Switch

A factory-mounted vibration cutout switch is available to effectively protect against equipment failure due to excessive vibration of the mechanical equipment system. OMRAN can provide either a mechanical or solid-state electronic vibration cut-out switch to ensure reliable protection and troublefree operation in the moist cooling tower environment.
Additional contacts can be provided to either switch to activate an alarm or initiate equipment shutdown.

Ladder, Safety Cage, Gate and Handrails

If the installation owner desires access to the cooling tower fan deck using ladders, OMRAN equipment can be provided with ladders extending from the top of the unit to the base, as well as safety cages, safety gates and handrail packages to meet requirements.
All access to the top of the equipment must be made in accordance with applicable governmental occupational safety standards.

Internal Walkway and Service Platforms, and External Service Platforms

A galvanized steel internal walkway located between the two access doors of the cooling tower provides a permanent working surface for easy access to the strainer, outlet, and make-up water assembly. For access options to the motor and drive assemblies on two-piece units, an internal ladder and upper service platform with handrail is available.

For external service, louver face platforms, access door platforms and fan deck extensions are other options that can be added to the cooling tower either when the unit is purchased or as an aftermarket item. Safety gates are available for all handrail openings supplied by OMRAN .

External platform
at louver face

Internal walkway

Internal ladder and service platform

Basin Heaters

Cooling towers exposed to below freezing ambient temperatures require protection to prevent freezing of the water in the cold water basin when the unit is idle. Factory-installed heaters, which maintain +40°F water temperature at 0°F, are a simple and inexpensive way of providing such protection.

Heater Sizing Data

Model Numbers	Standard Heaters 1		HARD Heaters 2	
	No. of Heaters	kW per Heater	No. of Heaters	kW per Heater
3240A thru 3379A	2	6	2	9
3412A thru 3527A	2	8	2	12
3473A thru 3672A	2	10	2	14
3728A thru 31056A	2	12	2	15
3583A thru 3725A	2	14	2	18
31132A thru 31301A	2	14	2	20

1 Standard heaters sized for 0º F ambient.
2 HARD heaters sized for -20 ºF ambient .

Electric Water Level Control Package

The electric water level control replaces the standard mechanical makeup valve when a more accurate water level control is required. This package consists of a conductance-actuated level control mounted in the basin and a slow-closing solenoid in the make-up water line. For water supply pressure greater than 40 psig, a surge suppressor may be required (by others).

Extended Lubrication Lines

Extended lubrication lines with standard grease fittings are available for lubrication of the fan shaft bearings. Fittings are located inside the plenum area next to the access door.

Air Inlet and Basin Debris Screens

Hot-dip galvanized wire mesh screens can be factory-installed over the inlet louvers to prevent debris from entering the tower.

As an alternative to air inlet screens, HDG wire mesh screens are factory-installed over exposed portions of cold water basin to keep out airborne debris.

Basin Sweeper Piping

Basin sweeper piping provides an effective method of eliminating debris which may collect in the cold water basin of the tower. A complete piping system including nozzles is provided in the tower basin for connection to side stream filtration equipment (by others).

Side Outlet Depressed Sump

Available for field installation below the base of tower to facilitate job site piping. The outlet connection is designed to mate with ASME Class 150 flat face flanges.

High Temperature Wet Deck

Optional high temperature wet deck material is available for entering water temperatures up to 135°F.

Engineering Data

Do not use for construction. Refer to factory certified dimensions. This brochure includes data current at time of publication which should be reconfirmed at the time of purchase.

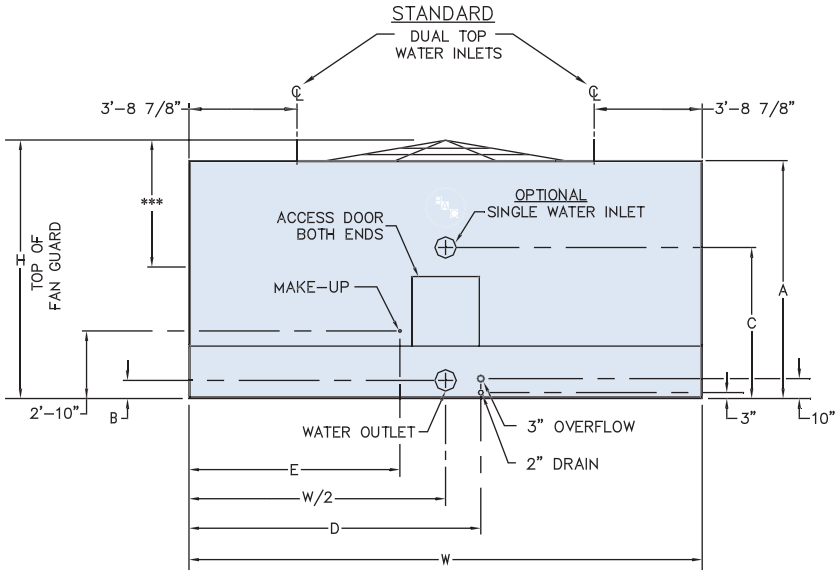
Single Cell Unit

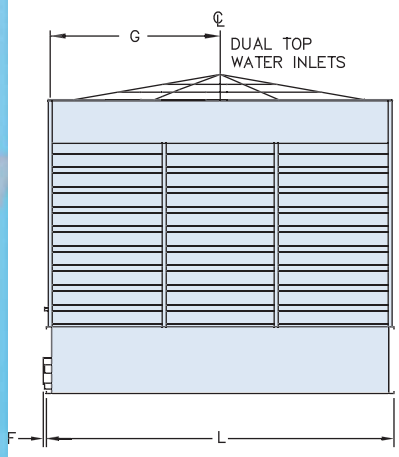
MODEL NUMBER	NOMINAL TONS (1)	MOTOR HP	FAN CFM	WEIGHTS (lbs)			DIMENSIONS			
				OPER. (2)	SHIPPING	HEAVIEST SECTION	L	W	H	A
3240A	240	10	62790	14770	6790	6790	8'-5 3/4"	18'-0 1/2"	9'-3 5/8"	8'-7 3/4"
3272A	272	15	71340	14900	6920	6920				
3299A	299	20	78110	14960	6980	6980				
3333A	333	20	85720	15750	7260	7260	8'-5 3/4"	18'-0 1/2"	10'-7 5/8"	9'-11 3/4"
3358A	358	25	91960	15780	7290	7290				
3379A	379	30	97400	15830	7340	7340				
3412A	412	25	103700	18580	8420	8420	9'-9 1/4"	20'-0 1/2"	10'-9 1/8"	9'-11 3/4"
3436A	436	30	109830	18630	8470	8470				
3455A	455	25	112250	19480	8740	8740	9'-9 1/4"	20'-0 1/2"	12'-1 1/8"	11'-3 3/4"
3482A	482	30	118880	19530	8790	8790				
3527A	527	40	130160	19690	8950	8950				
3473A	473	25	118870	23090	10190	10190	11'-9 3/4"	21'-6 1/2"	10'-10 1/8"	9'-11 3/4"
3501A	501	30	125900	23140	10240	10240				
3552A	552	30	136170	25690	10800	10800	11'-9 3/4"	21'-6 1/2"	12'-2 1/8"	11'-3 3/4"
3604A	604	40	149090	25850	10960	10960				
3648A	648	50	159950	25860	10970	10970				
3672A	672	60	166020	27060	12180	12180				
3728A	728	40	178860	32060	13770	8720	11'-9 3/4"	21'-6 1/2"	16'-4 7/8"	15'-5 1/2"
3781A	781	50	191890	32070	13780	8730				
3828A	828	60	203230	32290	13990	8940				
3872A	872	50	206630	35030	14500	8800	11'-9 3/4"	21'-6 1/2"	19'-0 7/8"	18'-1 1/2"
3923A	923	60	218840	35250	14710	9010				
3970A	970	75	230080	36530	16000	10300				
3985A	985	60	229950	40240	15560	9460	11'-9 3/4"	21'-6 1/2"	21'-8 7/8"	20'-9 1/2"
31056A	1056	75	246700	40330	15650	9550				
3583A	583	25	143950	30300	12070	12070	13'-11 1/8"	24'-0 1/2'	12'-3 1/8"	11'-3 3/4"
3618A	618	30	152460	30350	12120	12120				
3676A	676	40	166920	30510	12280	12280				
3725A	725	50	179080	30520	12290	12290				
31132A	1132	75	267880	41290	16610	10230	13'-11 1/8"	24'-0 1/2"	19'-2 7/8"	18'-1 1/2"
31213A	1213	75	282010	44300	17550	10720	13'-11 1/8"	24'-0 1/2"	21'-10 7/8"	20'-9 1/2"
31301A	1301	100	302580	46590	19840	13010				

Notes: 1. A nominal ton is defined as 3 GPM of water cooled from 95°F to 85°F with a 78° F entering wet bulb.
2. Operating weight is for tower with the water level in the cold water basin at overflow. If a lower operating weight is needed to meet design requirements, your local OMRAN sales representative can provide additional assistance.
3. 31301A is supplied with gear drive as standard.
4. Models 3240A–3672A and 3583A–3725A, when shipped with a gear drive, will have increased unit height by 10 1/2".
5. Refer to page 15 for dimensional reference drawings.

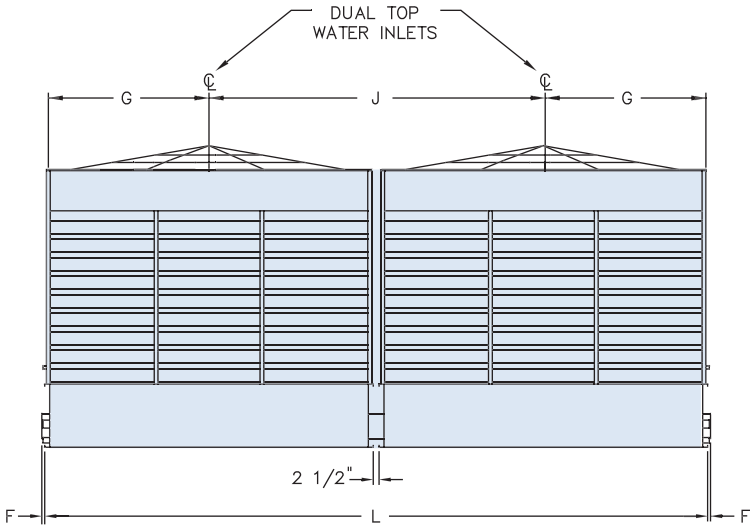
Double Cell Unit

MODEL NUMBER	NOMINAL TONS (1)	MOTOR HP	FAN CFM	WEIGHTS (lbs)			DIMENSIONS			
				OPER. (2)	SHIPPING	HEAVIEST SECTION	L	W	H	A
3240A-2	480	(2) 10	125580	29540	13580	6790	17'-2"	18'-0 1/2"	9'-3 5/8"	8'-7 3/4"
3272A-2	544	(2) 15	142680	29800	13840	6920				
3299A-2	598	(2) 20	156220	29920	13960	6980				
3333A-2	666	(2) 20	171440	31500	14520	7260	17'-2"	18'-0 1/2"	10'-7 5/8"	9'-11 3/4"
3358A-2	716	(2) 25	183920	31560	14580	7290				
3379A-2	758	(2) 30	194800	31660	14680	7340				
3412A-2	824	(2) 25	207400	37160	16840	8420	19'-9"	20'-0 1/2"	10'-9 1/8"	9'-11 3/4"
3436A-2	872	(2) 30	219660	37260	16940	8470				
3455A-2	910	(2) 25	224500	38960	17480	8740	19'-9"	20'-0 1/2"	12'-1 1/8"	11'-3 3/4"
3482A-2	964	(2) 30	237760	39060	17580	8790				
3527A-2	1054	(2) 40	260320	39380	17900	8950				
3473A-2	946	(2) 25	237740	46180	20380	10190	23'-10"	21'-6 1/2"	10'-10 1/8"	9'-11 3/4"
3501A-2	1002	(2) 30	251800	46280	20480	10240				
3552A-2	1104	(2) 30	272340	51380	21600	10800	23'-10"	21'-6 1/2"	12'-2 1/8"	11'-3 3/4"
3604A-2	1208	(2) 40	298180	51700	21920	10960				
3648A-2	1296	(2) 50	319900	51720	21940	10970				
3672A-2	1344	(2) 60	332040	54120	24360	12180				
3728A-2	1456	(2) 40	357720	64120	27540	8720	23'-10"	21'-6 1/2"	16'-4 7/8"	15'-5 1/2"
3781A-2	1562	(2) 50	383780	64140	27560	8730				
3828A-2	1656	(2) 60	406460	64580	27980	8940				
3872A-2	1744	(2) 50	413260	70060	29000	8800	23'-10"	21'-6 1/2"	19'-0 7/8"	18'-1 1/2"
3923A-2	1846	(2) 60	437680	70500	29420	9010				
3970A-2	1940	(2) 75	460160	73060	32000	10300				
3985A-2	1970	(2) 60	459900	80480	31120	9460	23'-10"	21'-6 1/2"	21'-8 7/8"	20'-9 1/2"
31056A-2	2112	(2) 75	493400	80660	31300	9550				
3583A-2	1166	(2) 25	287900	60600	24140	12070	28'-0 3/4"	24'-0 1/2'	12'-3 1/8"	11'-3 3/4"
3618A-2	1236	(2) 30	304920	60700	24240	12120				
3676A-2	1352	(2) 40	333840	61020	24560	12280				
3725A-2	1450	(2) 50	358160	61040	24580	12290				
31132A-2	2264	(2) 75	535760	82580	33220	10230	28'-0 3/4"	24'-0 1/2"	19'-2 7/8"	18'-1 1/2"
31213A-2	2426	(2) 75	564020	88600	35100	10720	28'-0 3/4"	24'-0 1/2"	21'-10 7/8"	20'-9 1/2"
31301A-2	2602	(2) 100	605160	93180	39680	13010				





Single Cell Unit



Double Cell Unit

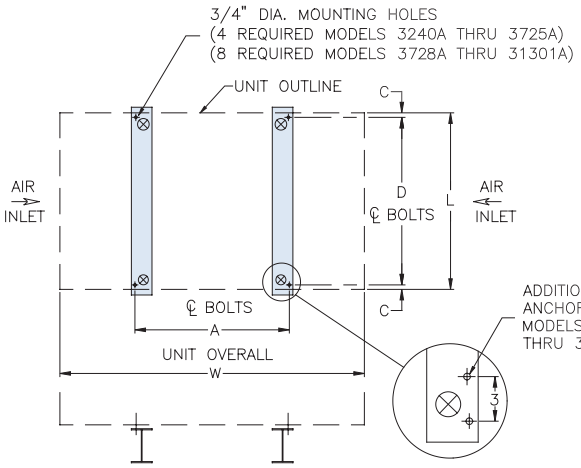
*** 3728A THRU 31056A AND 31132A THRU 31301A SHIP IN TWO SECTIONS PER CELL. THE TOP SECTION IS THE HEAVIEST AND TALLEST.
TOP SECTION HEIGHTS ARE:
3728A THRU 3970A: 10 - 3 1/8
31132A: 10 - 5 1/8
3985A THRU 31056A: 11 « - 7 1/8
31213A THRU 31301A: 11 « - 9 1/8

Support Details

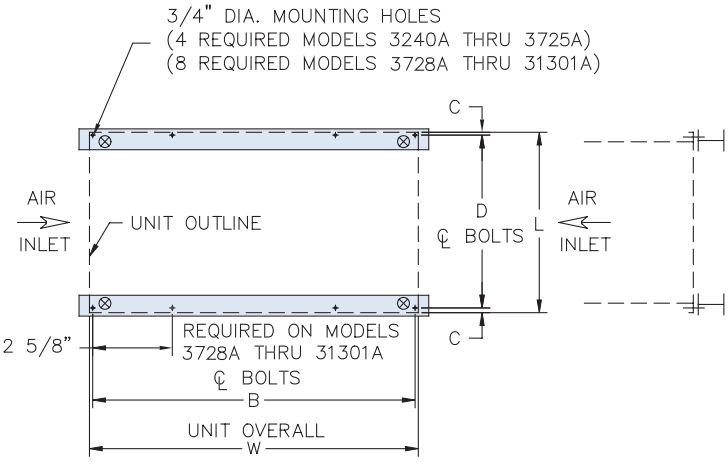
The recommended support arrangement for the Series 3000 Cooling Tower consists of parallel I-beams positioned as shown in the drawings. Besides providing adequate support, the steel also serves to raise the unit above any solid foundation to assure access to the bottom of the tower. Series 3000 Cooling Towers may also be supported on columns at the anchor bolt locations shown in Plan A or Plan C. To support a Series 3000 Cooling Tower on columns, or in an alternate steel support arangement, consult your OMRAN Representative. A minimum bearing surface of twelve inches square must be provided under each of the concentrated load points (See Note 7).

MODEL NUMBER	WEIGHTS (LBS.) SHIPPING (1)	OPER. (1&2)	WT.AT ⊕	DIMENSIONS L1	L2	W	A	B	C	D	E
3240A	6790	14770	3693	8'-5 3/4"	17'-2"	18'-0 1/2"	9'-4"	16'-4 1/2"	1 1/8"	8'-3 1/2"	4 3/4"
3272A	6920	14900	3725								
3299A	6980	14960	3740								
3333A	7260	15750	3938	8'-5 3/4"	17'-2"	18'-0 1/2"	9'-4"	16'-4 1/2"	1 1/8"	8'-3 1/2"	4 3/4"
3358A	7290	15780	3945								
3379A	7340	15830	3958								
3412A	8420	18580	4645	9'-9 1/4"	19'-9"	20'-0 1/2"	11'-4"	18'-4 1/2"	1 1/8"	9'-7"	4 3/4"
3436A	8470	18630	4658								
3455A	8740	19480	4870	9'-9 1/4"	19'-9"	20'-0 1/2"	11'-4"	18'-4 1/2"	1 1/8"	9'-7"	4 3/4"
3482A	8790	19530	4883								
3527A	8950	19690	4923								
3473A	10190	23090	5773	11'-9 3/4"	23'-10"	21'-6 1/2"	12'-10"	19'-10 1/2"	1 1/8"	11'-7 1/2"	4 3/4"
3501A	10240	23140	5785								
3552A	10800	25690	6423	11'-9 3/4"	23'-10"	21'-6 1/2"	12'-10"	19'-10 1/2"	1 1/8"	11'-7 1/2"	4 3/4"
3604A	10960	25850	6463								
3648A	10970	25860	6465								
3672A	12180	27060	6765								
3728A	13770	32060	8015	11'-9 3/4"	23'-10"	21'-6 1/2"	12'-10"	19'-10 1/2"	1 1/8"	11'-7 1/2"	4 3/4"
3781A	13780	32070	8018								
3828A	13990	32290	8073								
3872A	14500	35030	8758	11'-9 3/4"	23'-10"	21'-6 1/2"	12'-10"	19'-10 1/2"	1 1/8"	11'-7 1/2"	4 3/4"
3923A	14710	35250	8813								
3970A	16000	36530	9133								
3985A	15560	40240	9258	11'-9 3/4"	23'-10"	21'-6 1/2"	12'-10"	19'-10 1/2"	1 1/8"	11'-7 1/2"	4 3/4"
31056A	15650	40330	9298								
3583A	12070	30300	7575	13'-11 1/8"	28'-0 3/4"	24'-0 1/2"	15'-4"	22'-4 1/2"	1 7/16"	13'-8 1/4"	5 3/8"
3618A	12120	30350	7588								
3676A	12280	30510	7628								
3725A	12290	30520	7630								
31132A	16610	41290	10323	13'-11 1/8"	28'-0 3/4"	24'-0 1/2"	15'-4"	22'-4 1/2"	1 7/16"	13'-8 1/4"	5 3/8"
31213A	17550	44300	11075	13'-11 1/8"	28'-0 3/4"	24'-0 1/2"	15'-4"	22'-4 1/2"	1 7/16"	13'-8 1/4"	5 3/8"
31301A	19840	46590	11648								

Single Cell Units

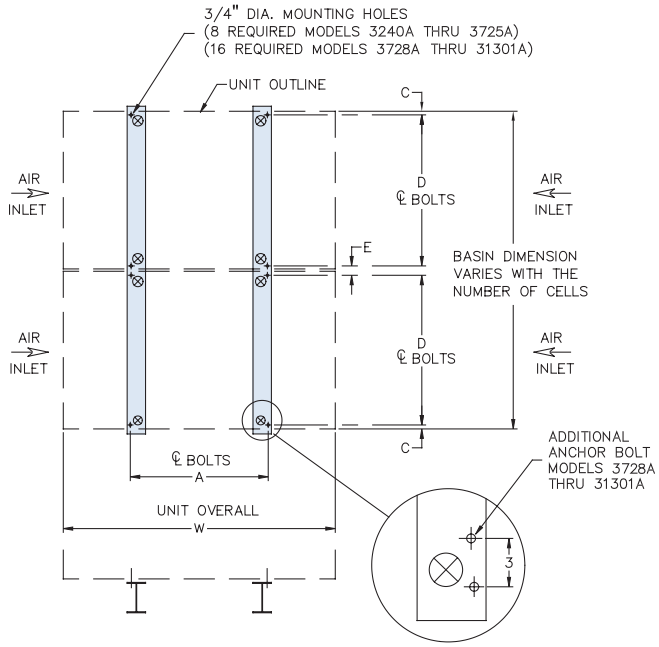


Plan A



Plan B

Double Cell Units



Plan C

Note:
1. Shipping and operating weight are for a single cell. To obtain weights for multi-cell units, multiply by number of cells.
2. Operating weight and weight loading are for a single cell tower with water at overflow level in the cold water basin.
3. Support beams and anchor bolts to be selected and installed by others.
4. All support steel must be level at the top.
5. Beams must be selected in accordance with accepted structural practice. Maximum deflection of beam under unit to be 1/360 of span, not to exceed 1/2 inch.
6. All single and double cell units can be furnished with optional vibration isolation rail packages, when required, to be used between the tower and supporting steel. The OMRAN standard vibration isolation rail package is designed for support Plan A for single cell units and support Plan C for double cell units. Plan B rails are available upon request. When determining the length of the supporting steel, allow for the length of the vibration rails as they are sometimes longer than the cooling tower dimensions shown.
7. If point vibration isolation is used with multi-cell towers, the isolators must be located under the support steel, not between the support steel and the cooling towers.

Series 3000 Rigging and Assembly Instructions

Introduction

Series 3000 Cooling Towers should be rigged and assembled as outlined in this bulletin. These procedures should be thoroughly reviewed prior to the actual rigging and assembly of the equipment to acquaint all personnel with procedures to be followed and to assure that all necessary equipment will be available.

Be sure to have a copy of the certified drawing available for reference. If you do not have a copy of this drawing, or if you need additional information about this unit, contact the local OMRAN Representative whose name and telephone number are on a label adjacent to the access door. The model number and serial number of the unit are also located in this area.

SHIPPING

Series 3000 units are factory assembled to assure uniform quality and minimum field assembly. Models 3240A through 3672A, and 3583A through 3725A ship in one section per cell. All other Series 3000 models ship in two sections per cell (upper and lower) due to shipping height restrictions.

CHECK UNIT BEFORE RIGGING

When the unit is delivered to the jobsite, it should be checked thoroughly to ensure all required items have been received and are free of any shipping damage prior to signing the bill of lading. The following parts should be inspected:

- Sheaves and Belts
- Bearings
- Bearing Supports
- Fan Motor(s)
- Fan(s) and Fan Shaft(s)
- Float Valve Assembly(s)
- Water Distribution System
- Wet Deck Surface
- Cold Water Basin Strainer(s)
- Interior Surfaces
- Exterior Surfaces
- Optional EASY CONNECT Piping Arrangement and BALANCE CLEAN Chamber
- Miscellaneous Items:
  All bolts, nuts, washers, and sealer tape required to assemble sections or component parts are furnished by OMRAN. and shipped with the unit. A checklist inside the envelope attached to the side of the unit marked "For Rigger" indicates what miscellaneous parts are included with the shipment and where they are packed.

UNIT WEIGHTS

Before rigging any unit, the weight of each section should be verified from the unit certified drawing. Some accessories add additional weight as shown on the respective accessory drawings.

WARNING: Before an actual lift is undertaken, ensure that no water, snow, ice, or debris has collected in the basin or elsewhere in the unit. Such accumulations will add substantially to the equipment's lifting weight.

WARNING: For safety, in the event of extended lifts or where hazards exist, the lifting devices should be used in conjunction with safety slings placed under the unit.

ANCHORING

Three-quarter inch (3/4") diameter holes are provided in the bottom flange of the cold water basin section for bolting the unit to the support beams. Refer to the suggested support location drawing included in the submittal for the location of the mounting holes. **The unit must be level for proper operation.** Anchorage bolts must be provided by others.

Additional anchorage plates are supplied to meet Seismic Zone 4 and/or additional wind loading requirements.

PIPING

Refer to the recommended piping drawing included in the submittal package for details on inlet piping arrangement and support.

Safety Adequate precautions appropriate for the installation and location of these products should be taken to safeguard the public from possible injury and the equipment and premises from damage.

WARNING When the fan speed of any unit is to be changed from the factory set speed, including the use of a variable speed device, steps must be taken to avoid operating at or near the fan's "critical speed" which could result in fan failure and possible injury or damage. Consult with your local OMRAN. Representative on any such applications.

WARNING Operation, maintenance and repair of this equipment should be undertaken only by personnel qualified to do so. Proper care, procedures and tools must be used in handling, lifting, installing, operating, maintaining and repairing this equipment to prevent personal injury and/or property damage.

Warranties Please refer to the Limitation of Warranties applicable to and in effect at the time of the sale/purchase of these products.

Freeze Protection **These products must be protected by mechanical and operational methods against damage and/or reduced effectiveness due to possible freeze-up.** Please refer to the Series 3000 catalog, Operation and Maintenance Manual or contact the local OMRAN. Representative for recommended protection alternatives.

Location **All evaporative cooling equipment must be located to ensure an adequate supply of fresh air to the fans.** When units are located adjacent to walls or in enclosures, care must be taken to ensure that the warm, saturated, discharge air is not deflected and short-circuited back to the air intakes.

Also, each unit should be located and positioned to **prevent the introduction of discharge air into the ventilation systems** of the building on which the unit is located and of adjacent buildings.

For detailed recommendations on Series 3000 Cooling Tower layout, please consult your local OMRAN Representative.

Refer to **Table 1** and **Figures 1 & 2** for the recommended size of the spreader bar (dimension "W") and the recommended minimum vertical dimension "H" from the lifting device at the base of each unit or section to the spreader bar. The lifting device can be moved to the alternative lifting device location shown in **Figure 2** for final positioning of multi-cell units. Bolt holes have been provided to accommodate the lifting devices at this alternative location. For units shipped in two sections and all multi-cells, refer to the appropriate section of this bulletin for further details.

Note: Models 3728A through 31056A, and 31132A through 31301A must be rigged one section at a time.

Table 1 - Rigging Dimensions

	Model Number	Dimensions (for each cell)		
		Section	H	Min. W
Figure 1	3240A to 3379A	1 piece	15'	8'6" min.
	3412A to 3527A	1 piece	17'	10'
	3473A to 3501A 3552A 3604A 3648A 3672A	1 piece	18'	12'
	3583A 3618A 3676A 3725A	1 piece	20'	14'
Figure 2	3728A to 3828A	upper lower	18' 18'	12' 12'
	3872A to 3970A	upper lower	18' 18'	12' 12'
	3985A to 31056A	upper lower	18' 18'	12' 12'
	31132A	upper lower	20' 20'	14' 14'
	31213A to 31301A	upper lower	20' 20'	14' 14'

Note: H dimension represents distance from the lifting device at the base of the tower section to spreader bar attach points.
W1 dimension represents minimum distance between spreader bar attach points.

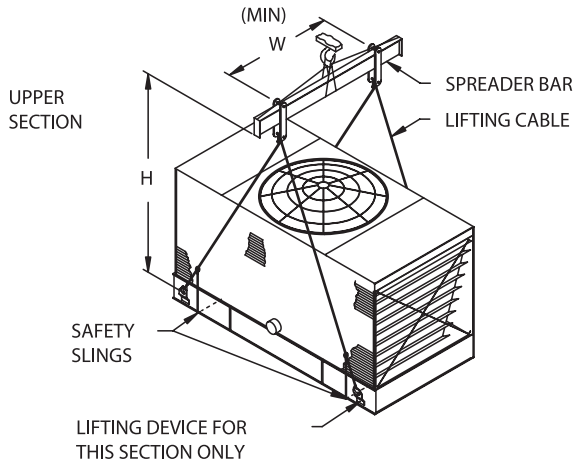


FIGURE 1 – Series 3000 Models 3240A through 3672A or 3680A and 3583A through 3725A

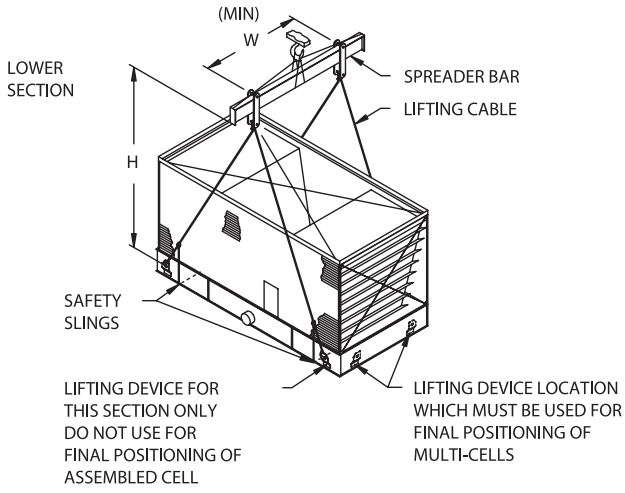


FIGURE 2 – Series 3000 Two-Section Units

Section Assembly

Position the bottom section on the unit support and bolt in place. Factory installed sealer tape is furnished on the mating flange of the bottom section to ensure a watertight seal between the top and bottom section. Remove the protective paper strip from the sealer tape. Using drift pins in the bolt holes provided, guide the top section onto the bottom section. Match marks must line up as shown in **Figure 3.** Bolt in place as illustrated in **Figure 3 (Detail A)** using a sealing washer under each nut to prevent water leakage.

Note: On multi-cell installations, it is suggested that for cells subsequent to the first, have the top and bottom sections assembled on the support foundation adjacent to the final mounting locations. This will allow space for securing the top and bottom sections of each cell. Move the subsequent cell(s) to their final position using the lifting devices at the base of the cell(s). Refer to the section "Assembly of Multiple-Cell Units" for details. All multi-cell units have the cell number and "face" identified on each section as well as match marks to show how the cells should be mated.

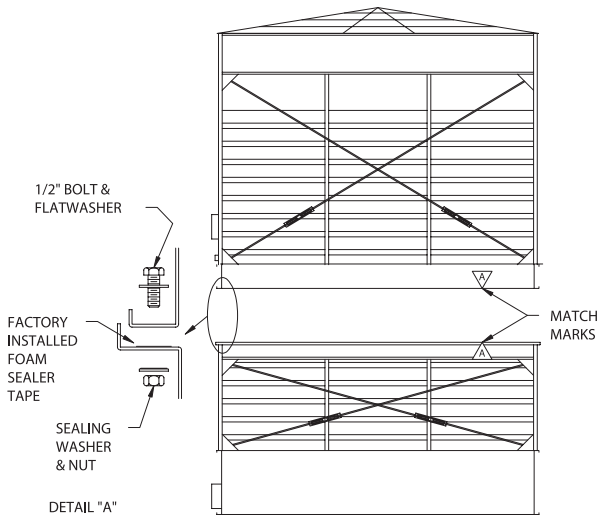


FIGURE 3 – Upper and Lower Assembly

Assembly of Multi-Cell Towers

Refer to the unit certified print for the proper orientation of each cell. The cell number and 'face' are stenciled on the outer basin wall. Multiple cell cooling tower installations may employ cold water basin connectors to equalize the water level in the basin of each cell. **Figure 4**details the connector for Series 3000 Cooling Towers. When used, basin connectors must be assembled as the cells are being positioned on the tower supports. Follow directions below for details on their installation. For two-section cells, first attach the unit bottom section of the first cell to the foundation. Then fasten the unit's top section to the secured bottom section. Each subsequent cell should be assembled just adjacent to its final location, and then positioned next to the previous cell. Relocate the lifting devices at the base of each subsequent cell to slide the cells together. This can be seen in **Figure 2.**Use the basin connector assembly procedure outlined below to join the basin connection for multi-cell units.

1. Position Cell #1 on the unit support and bolt into place.
2. Wipe down the surface adjacent to the opening of Cell #1 to remove any dirt or moisture that may have accumulated during shipment.
3. Wipe down the flanges on both ends of the basin connector. On one end apply a layer of 1/8" x 1" butyl tape around the face of the flange over the centerline of the holes. Do not overlap or stretch too thinly at the corners. When it is necessary to splice the sealer, be sure to press the two ends together so as to form a smooth continuous strip. Apply a **second** layer of sealer tape over the first layer following the same procedure. Refer to **Figure 4 Detail A.**
4. Using drift pins to align the bolt holes, place the basin connector over the opening in the tower basin of Cell #1 and fasten in place. Insert the 3/8" self-tapping screws or bolts from the basin connector into the basin wall as illustrated in **Figure 5.**

   Note: Basin connectors furnished with units constructed with stainless steel basins are assembled with stainless steel bolts, washers and nuts in lieu of self tapping screws.
5. Apply sealer to the other end of the basin connector as described in Step 3.
6. Position Cell #2 on the tower supports. Wipe down the surface adjacent to the opening to remove any dirt or moisture.
7. Using drift pins to assure alignment, draw Cell #2 tight against the basin connector. The Series 3000 Unit lifting devices must be moved to the alternative lifting device location as referred to in the Rigging section of this bulletin to assist in this step. **(Figure2)**
8. As illustrated in **Figure 5,**insert 3/8" self-tapping screws in each hole from the basin connector into the basin wall and tighten.

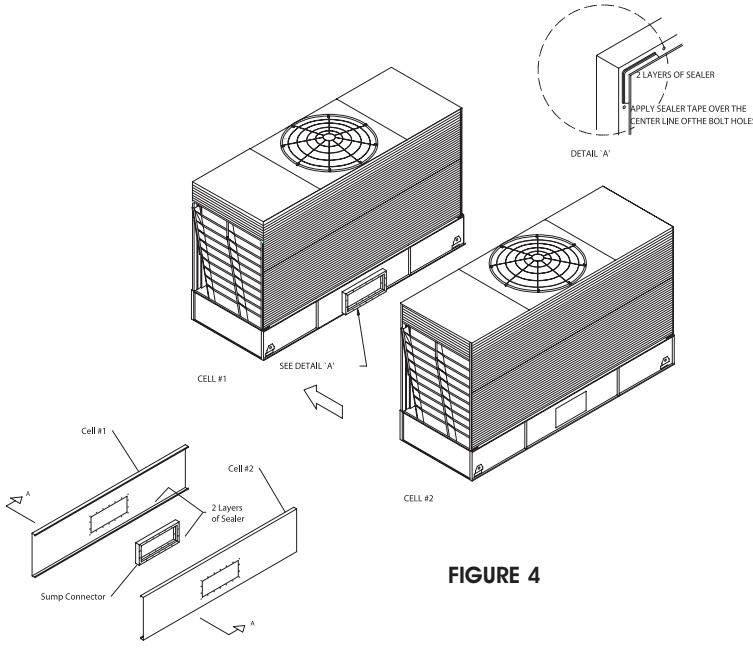


FIGURE 4

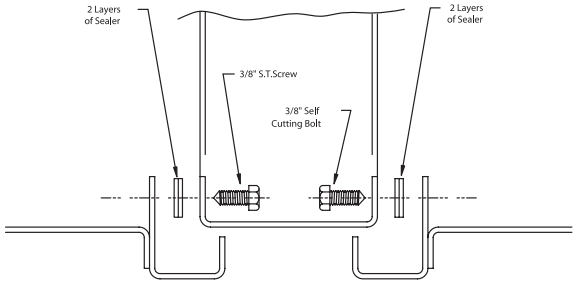


FIGURE 5

Positive Closure Plate Option

The optional Positive Closure Plate and gasket can be furnished on multiple cell units to allow individual cells to be isolated for cleaning and routine maintenance. This plate ships loose inside the unit cold water basin.

To install the Positive Closure Plate and gasket, follow steps 1 through 7 from the instructions above. Complete the installation of your specific type of tower using the instructions listed below.

Thread 3/8" self-cutting bolts from the basin connector into the cell with the Positive Closure Plate, as shown in **Figure 6.**Position the neoprene gasket and Positive Closure Plate over the bolts and fasten in place with the 3/8" flat washers and wing nuts provided.

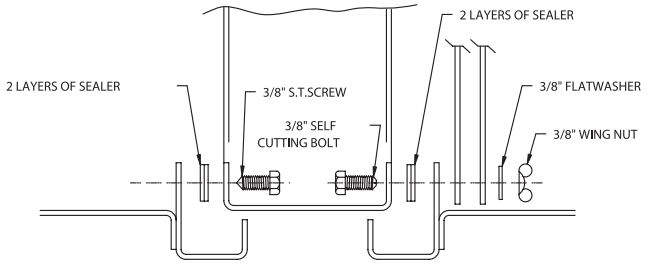


FIGURE 6

Installation Of Fan Guard

Due to height limitations on truck shipments, the fan guard may ship unmounted. Models 3240A through 3379A have a one-piece fan guard. The fan guards on Models 3583A, 3618A, 3676A, 3725A and models 31132A through 31301A have a four-piece fan guard. The fan guard supports should be joined as illustrated in **Figure 7, Detail A** before securing to the fan cylinder as illustrated in **Figure 7, Detail B.** The fan guards should be joined together and to the fan guard support as illustrated in **Figure 7, Detail C** before securing to the fan cylinder as illustrated in **Figure 7, Detail D.**

All other models are shipped in two halves. These halves should be bolted together using fan guard clamps, 3/8" bolts and lock nuts supplied with unit. Then attach the guard to the fan cylinder as illustrated in **Figure 7, Detail D**. **Fan guards must be securely in place before the Series 3000 Cooling Tower is placed in operation.**

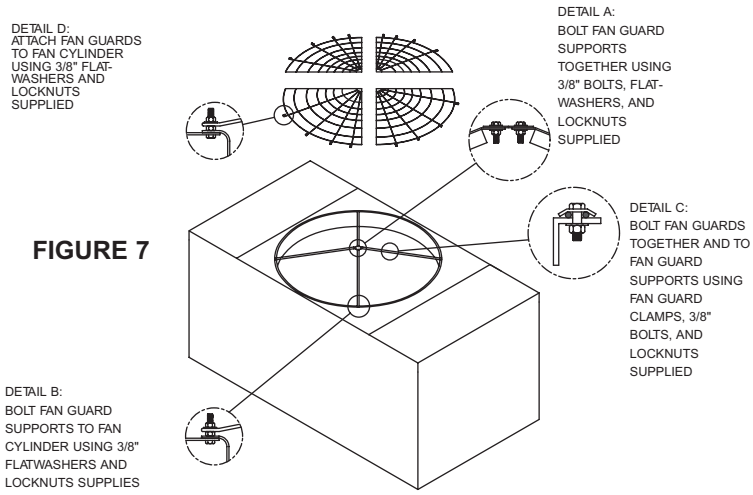


FIGURE 7

Installation of the Optional Side Outlet Depressed Sump Box

The optional side outlet depressed sump box option allows a Series 3000 Cooling Tower water outlet connection to be piped from underneath the unit in four possible directions, 90° apart. The connection is a bolt circle to fit a 150-pound ASA flat flange with a full-face gasket.

To install the side outlet depressed sump box, follow steps below.

1. Wipe the edges around the opening in the cold water basin to remove any dirt or moisture that may have accumulated during shipment. Apply a layer of 1/8" x 1" butyl sealer tape around the opening in the basin over the centerline of the holes. Do not stretch the sealer too thinly or overlap at the corners. When it is necessary to splice the sealer, be sure to press the two ends together to form a continuous strip. Apply a second layer of sealer tape over the first layer following the same procedure. Refer to **Figure 8.**
2. Insert the basin box assembly into the opening in the cold water basin and attach it to the basin with 3/8" x 1" bolt and nuts, flat washers, and lock washers as shown in **Figure 8, Detail A.**
3. Place the suction strainer over the opening.

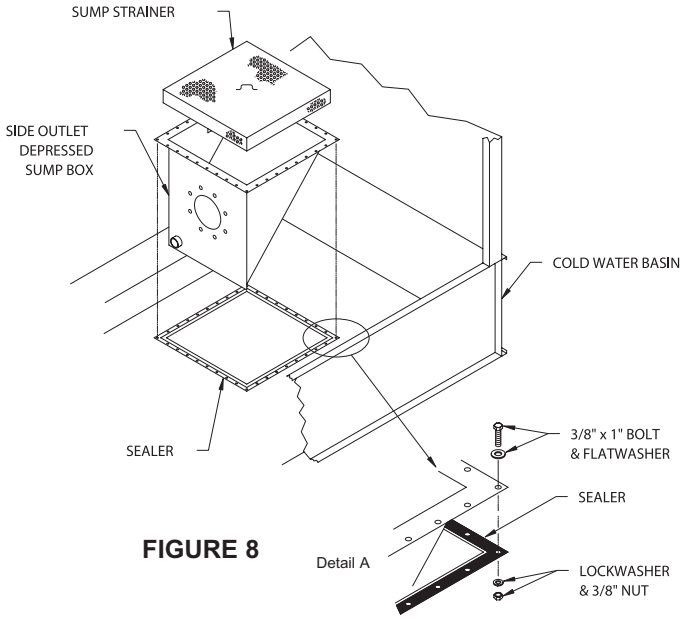


FIGURE 8

Optional Accessories and Equipment

All optional accessories such as ladders, safety cages, platforms, and deck grating between cells should be installed as shown on the appropriate reference drawing in the submittal package from Baltimore Aircoil Company. The handrail package reference drawing is included with the unit in the envelope attached to the side of the unit marked "For Rigger."

Series 3000 Crossflow Cooling Tower

Operating and Maintenance Instructions

OMRAN TAHVIEH Company Crossflow Cooling Towers have been designed to give long, trouble-free service when properly installed, operated, and maintained. **To obtain optimum performance and maximum service life, it is important that a program of regular inspection and maintenance be developed and carried out.** This bulletin is published as a guide to establishing such a program.

Included in this bulletin are the recommended maintenance services for start-up, operation, and shutdown and the approximate frequency for each. **Note that the recommendations on frequency of service are minimums and where operating conditions are severe, the services should be performed more often.** For each required service, follow the procedures outlined under the ŇMaintenance ProceduresÓsection of this bulletin. The Series 3000 Cooling Tower is illustrated on page 23 with the major points of inspection and service identified. A copy of the unit certified drawing should also be available for reference. If you need additional information about the operation or maintenance of this equipment that is not covered in this bulletin, contact the local OMRAN . Representative. Their name and telephone number are on a label adjacent to the access door. The model and serial number of the unit are also located in this area.

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General Maintenance Information

The services required to maintain a cooling tower are primarily a function of the quality of the air and water in the locality of the installation:

AIR:
The most harmful atmospheric conditions are those with unusual quantities of industrial smoke, chemical fumes, salt or heavy dust. Such airborne impurities are carried into the cooling tower and absorbed by the recirculating water to form a corrosive solution.

WATER:
The most harmful conditions develop as water evaporates from the cooling tower, leaving behind the dissolved solids originally contained in the make-up water. These dissolved solids may be either alkaline or acidic and, as they are concentrated in the circulating water, can produce scaling or accelerated corrosion.

The extent of impurities in the air and water determines the frequency of most maintenance services and also governs the extent of water treatment which can vary from a simple continuous bleed and biological control to a sophisticated treatment system. (See "Water Treatment and Biological Control.")

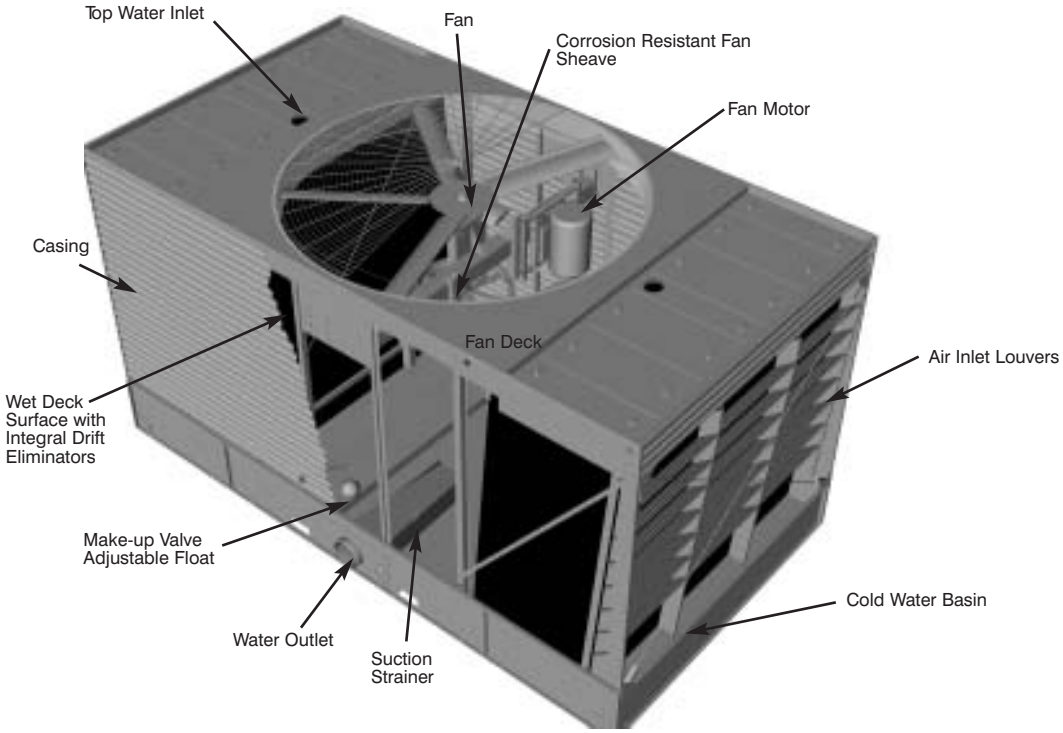


Figure 1 – Cutaway view of Series 3000 Cooling Tower

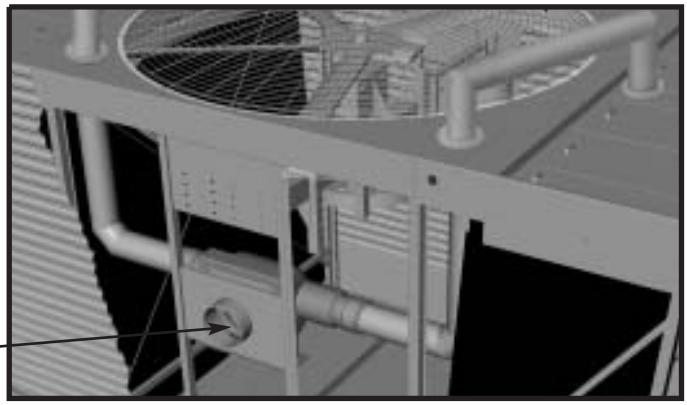


Figure 2 – Series 3000 BALANCE CLEAN Chamber

Operation and Maintenance

Described below are the recommended services for start-up, operation, and shutdown and the approximate frequency for each.

TABLE 1: Recommended Maintenance Services for Series 3000 Cooling Tower

Type of Service	Monthly	Quarterly	Start-Up	Shutdown	Annually	Ref. Page
Inspect General Condition of Tower	X		X			4
Inspect and Clean as Necessary:						
A) Cold Water and Hot Water Basins	X		X	X		5
Flush Cold Water Basin to Remove Silt		X				6
B) Optional BALANCE CLEAN Chamber Inlet Strainer	X		X	X		5
C) Air Inlet Louvers	X		X	X		4
Check and Adjust Water Level in:						
Cold Water Basin/ Hot Water Basin	X		X			5
Check Operation of Make-Up Valve	X		X			6
Check Bleed Rate and Adjust	X		X			0
BELTIDRIVE Power Train:						
A) Check Condition of Belt	X		X			8 &
B) Readjust Tension on Belt		X				8
C) Drive Alignment					8 X &	7
Lubricate Fan Shaft Bearings		X	X	X		7
Lubricate Motor Base Adjusting Screw		X	X	X		7
Clean Outside of Fan Motor		X	X	X		6
Inspect Protective Finish					X	8

NOTES:
1. Recommended service intervals are for typical installations. Severe environment conditions may dictate more frequent servicing.
2. When operating in ambient temperatures below freezing, the cooling tower should be inspected more frequently (see Winter Operation, page 30).
3. Tension on new belts must be readjusted after first 24 hours of operation and quarterly thereafter.

WARNING: Before performing any maintenance or inspection, make certain that all electrical power has been disconnected and locked in the off position

SAFETY PRECAUTIONS:

The operation, maintenance, repair of this equipment should be undertaken only by qualified personnel. All qualified personnel should be thoroughly familiar with the equipment, the associated system and controls, and the procedures set forth in this manual. Proper care, procedures, and tools must be used in handling, lifting, installing, operating, maintaining and repairing this equipment to prevent personal injury and/or property damage.

All electrical, mechanical, and rotating machinery constitute a potential hazard, particularly for those not familiar with the design, construction, and operation. Accordingly, adequate safeguards (including the use of protective enclosures where necessary) should be taken with this equipment both to safeguard the public (including minors) from injury and to prevent damage to the equipment, its associated system, and the premises.

The cooling towers are designed so that access to the top of the cooling tower is not required to perform routine maintenance. The top horizontal surface of the tower is not intended for use as a walking surface or working platform. If access to the top of the unit is desired, the purchaser/end-user is cautioned to use appropriate means, complying with applicable safety standards of governmental authorities. At no time should this equipment be operated without all fan screens, access panels, and access doors in place.

WARNING: When the fan speed of the cooling tower is changed from the factory set speed, including changes achieved by the use of a variable fan speed control device, steps must be taken to avoid operating at or near the fan's "critical speed" which could result in fan failure and possible injury or damage. Consult with your local OMRAN Representative on any such applications.

WARNING: For the protection of authorized service and maintenance personnel, each fan and pump motor associated with this equipment should be installed with a lockable disconnect switch located within sight of the cooling tower. No service work should be performed on or near the fans, motors, and drives or inside the unit without first ensuring the fan and pump motors have been disconnected and locked out.

WARNING: The recirculating water system may contain chemicals or biological contaminants, including Legionella, which could be harmful if inhaled or ingested. Accordingly, personnel who may be exposed directly to the discharge airstream and the associated drift, mists generated during operation of the water distribution system and/or fans, or mists produced by high pressure water jets or compressed air (should these be used to clean portions or components of the recirculating water system), should wear respiratory protection equipment approved for such use by local occupational safety and health authorities.

WARRANTIES: Please refer to the Limitation of Warranties applicable to and in effect at the time of sale/purchase of these products.

Freeze Protection: These products must be protected by mechanical and operational methods against damage and/or reduced effectiveness due to possible freeze-up. Please refer to the product catalog or contact the local OMRAN Representative for recommended protection alternatives.

Operation and Maintenance
(continued)

INITIAL AND SEASONAL START-UP:
Prior to initial start-up or after a shut down period, the cooling tower must be thoroughly inspected and cleaned:

1. Clean all debris, such as leaves and dirt, from inside the tower, and the air inlet louvers.

2. Remove the inlet strainer, clean and install on all Series 3000 Cooling Towers provided with the optional **BALANCE CLEAN** Chamber.

3. Drain the cold water basin (with basin strainers in place) and flush to remove accumulated dirt.

4. Remove the suction strainer, clean and reinstall.

5. Turn the fan(s) by hand to insure rotation without obstruction.

6. Start the fan motor(s) and check for proper fan rotation.

7. At seasonal start-up, adjust the belt tension on the Beltdrive Power Train fan drive system. Note, during initial start-up, the belt tension may not require adjusting since the drive has been properly tensioned at the factory prior to shipment.

8. Check float operated make-up valve to be sure it is operating freely.

9. Lubricate the fan shaft bearings prior to seasonal start-up. Note, this is not required at initial start-up since the fan bearings have been lubricated at the factory prior to shipment.

10. At start-up, when the cold water basin is completely drained, fill the cold water basin with fresh water to the overflow level. **For new installations, initiate the biocide water treatment program at this time (see Biological Control Section). At seasonal start-up, and following a shutdown period of more than 3 days, resume the biocide treatment program or administer a shock treatment of appropriate biocides prior to operating the cooling tower fans to eliminate accumulated biological contaminants (see Biological Control Section).**

11. Set the float on the make-up valve to shut off the valve when the float is approximately 1/2" below the overflow level.

12. Balance flow to the Series 3000 Cooling Tower(s) by adjusting the flow balancing valves (by others or optionally supplied by OMRAN). Adjustment to the balancing valves is not required if the unit is equipped with the optional EASY CONNECT Piping Arrangement with the BALANCE CLEAN Chamber. Multi-cell arrangements will require flow balancing between cells to obtain even water distribution.

13. Open the valve in the tower bleed line (by others) and adjust bleed to the recommended rate. (See" Water Treatment" page 31.)

14. Check the voltage and current of all three legs of the fan motor. **The current should not exceed the nameplate rating.** Note: Current should be measured during warm ambient conditions and with a heat load on the tower. After prolonged shutdowns, the motor insulation should be checked with a "megger" insulation tester prior to restarting the motor.

CAUTION: Rapid on-off cycling can cause the fan motor to overheat. It is recommended that the controls be set to allow a maximum of 6 on-off cycles per hour.

When using a **2-speed motor,** the starter should include a 15-second time delay when switching from high speed to low speed.

AFTER 24 HOURS:
After 24 hours of operating the Series 3000 Cooling Tower under thermal load, the following services should be performed:

1. Check the tower for any unusual noise or vibration.

2. Check the operating water level in the hot and cold water basins. Adjust balancing valves and make-up float valve if necessary.

3. Readjust the belt tension.

OPERATION:
During operation, the tower should be inspected, cleaned, and lubricated on a regular basis. The required services and recommended frequency for each are summarized in Table 1 on page 24 of this bulletin.

SEASONAL SHUTDOWN:
The following services should be performed whenever the cooling tower is to be shutdown for more than 3 days:

1. Drain the cold water basin and all piping that will be exposed to freezing temperatures.

2. Clean and flush the hot and cold water basin with the basin strainers in place. Leave the cold water basin drain open so rain and melting snow will drain from the tower (for Series 3000 Cooling Towers with the optional BALANCE CLEAN Chamber, clean and flush the inlet strainer).

3. Clean the basin strainers and reinstall.

4. Cover the fan discharge opening to keep out dirt and debris.

5. Lubricate the fan shaft bearings and motor base adjusting screw.

6. Close the shutoff valve in the make-up water line (by others) and drain all exposed make-up water piping.

7. Inspect the integrity of the corrosion protection system on the steel portion of the tower. (See Corrosion Protection, page 29) .

Maintenance Procedures

HOT WATER BASINS:

The system water enters the cooling tower through two hot water basins. The hot water basins and orifices must be kept clean. At design flow, the operating level should not be less than two inches or greater than five inches deep. Monthly, remove any dirt or debris which may clog the orifices. Seasonally clean and flush the hot water basin with fresh water.

COLD WATER BASIN AND SUCTION STRAINERS:
As the water circulating though the tower is cooled, it collects in the cold water basin and passes through the strainers into the system. The operating water level is controlled by the make-up valve and should be maintained at the operating water level shown in **Table 2.**

The operating water level in the cold water basin will vary with system thermal load (evaporation rate), the bleed rate employed and the make-up water supply pressure. Because the typical winter load is less than the summer load, the winter evaporation rate is frequently less than the summer evaporation rate. With this reduced evaporation rate in winter, the water level in the cold water basin will increase unless the float is re-adjusted. **The operating water level should be checked monthly and the float re-adjusted as necessary to maintain the recommended operating level.**

The water level in the cold water basin of units designed for remote sump operation is a function of the circulating water flow rate, water outlet connection size, quantity and location, and outlet piping size and configuration. Units designed for remote sump applications are not supplied with a water make-up assembly and the sump operating level is not adjustable during operation.

The cold water basin should be inspected regularly. Any trash or debris which may have accumulated in the basin or on the strainers should be removed and, if necessary, the float adjusted to maintain the design operating level.

Cold Water Basin Inspection
Figure 3

SERIES 3000 OPTIONAL BALANCE CLEAN CHAMBER:
The water to be cooled enters the tower through a single connection and passes through the BALANCE CLEAN Chamber. The device is equipped with an internal strainer. Located at the bottom of the BALANCE CLEAN Chamber is a capped clean-out connection. This can be used to periodically purge the BALANCE CLEAN Chamber of dirt and debris collected by the strainer. The strainer should be cleaned periodically as detailed in the Recommended Maintenance Schedule. This is accomplished by un-bolting and temporarily removing the chamber bottom plate and inspecting the strainer for dirt and debris.

Optional Balance Clean Chamber
Figure 4

Maintenance Procedures
(continued)

Quarterly, or more often if necessary, the entire cold water basin should be drained, cleaned, and flushed with fresh water to remove the silt and sediment which normally collects in the basin.

It is important to note that the same maintenance applies to stainless steel basins or basins protected by the Corrosion Protection System.

If not removed periodically, this sediment can become corrosive and cause deterioration of the protective finish of metallic basins. When flushing the basin, the strainers should be left in place to prevent the sediment from re-entering the tower system. After the basin has been flushed, the strainers should be removed, cleaned, and replaced before refilling the basin with fresh water.

WARNING: Openings and/or submerged obstructions may exist in the bottom of the cold water basin. Use caution when walking inside this equipment.

MAKE-UP VALVE:
A float operated mechanical water make-up assembly is furnished as standard equipment on the cooling tower (unless the unit has been ordered with the optional electric water level control package or for remote sump application). It is located within easy reach from the access door at the connection end of the unit on the Series 3000 Cooling Towers.

The standard make-up assembly consists of a bronze make-up valve connected to a float arm assembly and actuated by a large diameter polystyrene filled plastic float. The float is mounted on an all-thread rod which is held in place by wing nuts. The operating water level in the cold water basin can be adjusted by repositioning the float and all-thread rod using the wing nuts provided.

The make-up assembly should be inspected monthly and adjusted as necessary. The valve itself should be inspected annually for leakage and the valve seat replaced if necessary. The make-up water supply pressure should be maintained between 15 and 50 psig for proper operation of the valve.

To set the initial basin water level, adjust the wing nuts so that the make-up valve is completely closed when the water level in the cold water basin is 1/2" below the overflow connection. Under design thermal load and with average city water pressure (15 to 50 psig) at the valve, this setting should produce the operating water levels stated in **Table 2.** Note that if the thermal load is less than the design load at the time of unit start-up, the procedure may produce operating levels greater than that shown. **It may be necessary to re-adjust the float in order to attain the recommended operating level.** The unit basin should be closely monitored and water level adjusted as necessary during the first 24 hours of operation.

Model No.	Height of Water in the Cold Water Basin (in.)
Series 3000 Models 3240A to 3501A	8 3/4"
Series 3000 Models 3552A to 31301A	9 3/4"

TABLE 2. Cold Water Basin Operating Water Level

As an option, an electric water level control package is available in lieu of the above described mechanical make-up assembly. The package consists of a probe-type liquid level control assembly and a slow-closing solenoid valve. Stainless steel electrodes, factory-set at predetermined lengths, extend from an electrode holder into the cold water basin. **These electrodes should be periodically cleaned to prevent accumulations of scale, corrosion, sludge or biological growth from interfering with the electrical circuit.** With the electric water level control package, the water level is maintained at the recommended operating level regardless of the system thermal load. Therefore, it is not necessary, nor is it recommended that the operating level be adjusted.

During the start-up of units equipped with the electric water level control package, the control unit should be bypassed in order to fill the unit 1/2" below the overflow connection.

Operation at the recommended water level will ensure that the unit basin contains sufficient water volume to prevent air entrainment in the circulating pump during system start-up and to provide sufficient excess basin capacity to accept the total system pull-down volume.

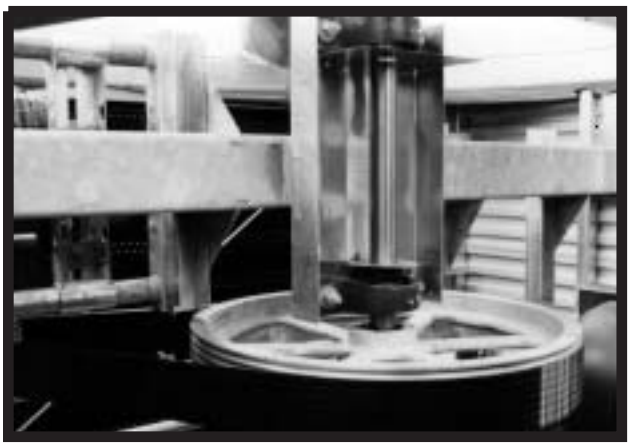
("Pull-down volume" is defined as that quantity of water suspended in the tower during operation plus that contained in the hot water basin, wet deck surface, external piping, and any heat exchangers which could drain to the tower cold water basin when the circulating pump is shut down.)

FAN MOTOR:
The standard fan motor used on Series 3000 Cooling Towers is a T.E.A.O. motor (Totally Enclosed, Air Over) with permanently lubricated ball bearings and special moisture protection on the bearings, shaft, and windings. The only servicing required during operation is to clean the outside surface of the motor at least quarterly to insure proper motor cooling. Additionally, after prolonged shutdowns, the motor insulation should be checked with a "megger" insulation tester prior to restarting the motor.

Maintenance Procedures
(continued)

FAN SHAFT BEARINGS:
The fan shaft is supported by two pillow block ball bearings, each equipped with a lubrication fitting and a slinger/locking collar to keep out moisture. **The bearings should be lubricated as follows:**

Initial Start-Up: Normally, no lubrication is required since the bearings have been lubricated at the factory prior to shipment. However, if the cooling tower has been stored at the job site for more than one year, bearings should be lubricated with new grease before initial operation. When lubricating, purge the old grease from the bearing by gradually adding grease until a bead of new grease appears at the seal on the underside of the bearing.



Upper and Lower Bearings — Series 3000
Figure 5

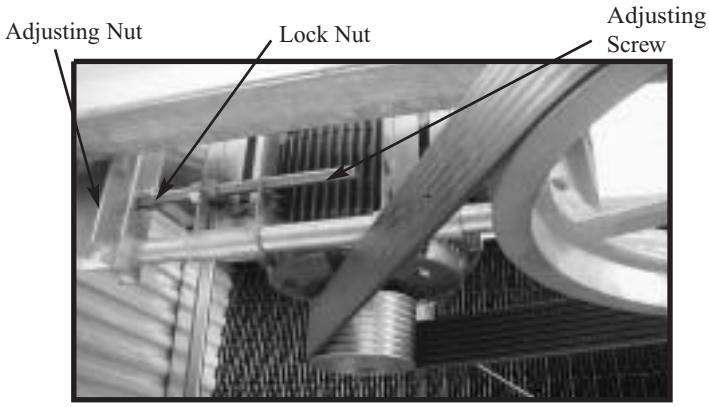
Seasonal Start-Up: Purge both bearings with new grease prior to start-up.

Operation: Lubricate bearings after every 2,000 hours of operation or once every three months, whichever occurs first.

Seasonal Shutdown: Purge bearings with new grease prior to any prolonged storage or downtime.

The fan shaft bearing should be lubricated only with a hand grease gun. Do not use high pressure grease guns since they may rupture the bearing seals.

ADJUSTABLE MOTOR BASE:
The motor base adjusting screw should be coated twice a year using a good quality corrosion inhibiting grease.



Adjustable Motor Base – Series 3000
Figure 6

BELTIDRIVE POWER TRAIN:
The BELTIDRIVE Power Train consists of a specially designed belt, with corrosion-resistant fan motor sheaves. The solid-backed, multi-groove, neoprene/polyester belt provides the premium quality necessary for cooling tower service. The corrosion-resistant sheaves extend the life of the belt by minimizing any possibility of rust or corrosion. These components provide a highly reliable system with low-maintenance requirements. The only service required on the BELTIDRIVE Power Train is to periodically check the condition of the belt and, when necessary, adjust the tension. The recommended service intervals are specified below:

INITIAL START-UP:
No servicing is required prior to initial tower start-up since the drive has been tensioned and aligned at the factory.

SEASONAL START-UP:
Readjust the tension on the belt.

OPERATION:
After the initial tower start-up or the installation of a new belt, the tension must be readjusted after the first 24 hours of operation. Thereafter, the condition of the belt should be checked quarterly and the tension adjusted as necessary, but at least once every three months.

To check the belt tension, place a straight edge along the belt from sheave to sheave as shown in Figure 7a or use a tape measure as shown in Figure 7b to measure belt deflection. Apply a moderate force by hand (approximately 40 lbs) evenly across the width of the belt in the center of the span between the sheaves. If the belt deflects between 1/4" and 3/8" as shown in Figure 7a and 7b, the belt is adequately tensioned.

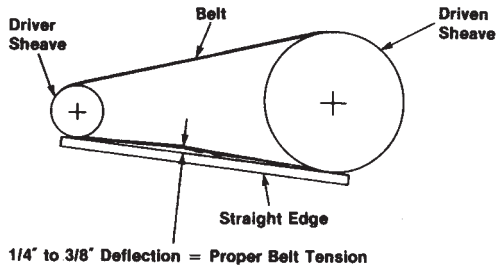


Figure 7a

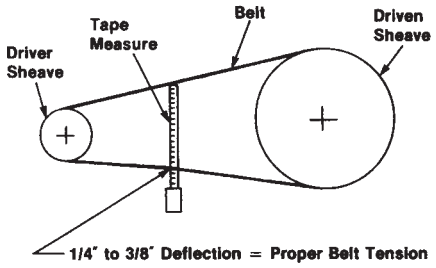


Figure 7b

If belt tensioning is required, proceed as follows:

1. Loosen the lock nut on the Motor Base Adjusting Screw.

2. Turn the Motor Base Adjusting Screw clockwise to tension the belt, or counterclockwise to relieve belt tension. During adjustment of belt tension, the drives should be rotated several times by hand to evenly distribute the tension throughout the belt.

3. When the belt is properly tensioned, retighten the locking nut on the Motor Base Adjusting Screw.

NOTE: There should be no “chirp” or “squeal” when the fan motor is started.

The drive alignment should be checked annually to ensure maximum belt life. This can be done by placing a straight edge across the driver and driven sheaves as shown in Figure 8a for standard drives and in Figure 8b for ENERGY-MISER Fan System drives. When the drives are properly aligned, the straight edge will contact all four points as indicated. There should be no more than 1/16" deviation from four point contact. If realignment is necessary, loosen the motor sheave and align it with the fan sheave. Allow approximately 1/4" for draw-up as the bushing screw is retightened.

Corrosion Protection

Series 3000 Cooling Towers are constructed of corrosion-resistant materials. The wet deck surface is made of an inert synthetic material, which requires no protection against rot, decay, rust or biological attack. Other materials used in construction of the equipment, which are listed below, should be inspected regularly.

Galvanized Steel Components

Galvanized steel components should be inspected for blemishes or corrosion. Affected areas should be wire brushed and recoated with a cold galvanizing compound .

Stainless Steel Components

Stainless steel components should be inspected for signs of blemishes or corrosion and cleaned with stainless steel wool as necessary. If more extensive corrosion is prevalent, contact your local OMRAN Representative.

Fiberglass Reinforced Polyester (FRP) Components

Series 3000 Cooling Towers are provided with FRP casing panels and air inlet louvers as standard. These components should be inspected for accumulation of dirt and cleaned with soap and water as necessary.

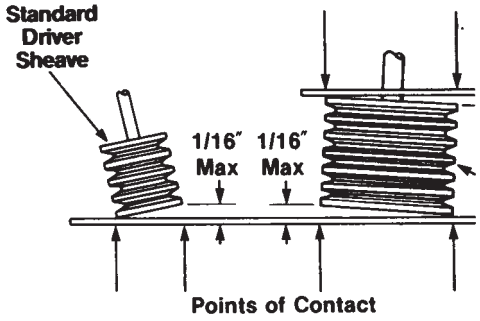


Figure 8a — Standard Drives

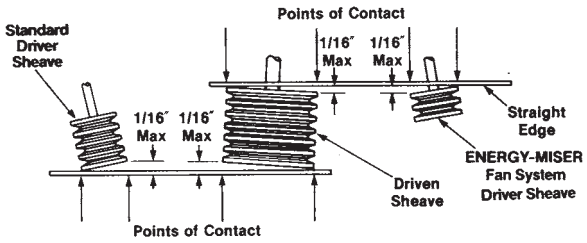


Figure 8b — ENERGY-MISER Fan System Drives

Winter Operation

The Series 3000 Cooling Tower can be operated at ambient temperatures below freezing provided proper operating methods are established and diligently followed. **Precautions that must be taken to insure satisfactory operation include:**

- Freeze protection of the water in the cold water basin when the tower is idle.
- Elimination of water in the optional BALANCE CLEAN Chamber and internal piping when the tower is idle.
- Control of ice formation during tower operation.

Freeze protection must be provided for the cold water basin during shutdown since ice formation in the basin can severely damage the cooling tower. A remote sump located indoors in a heated space is an ideal method since the water in the tower and connecting piping will drain by gravity whenever the circulating pump is stopped. Where a remote sump arrangement is impractical, a form of cold water basin heat must be provided in the tower itself. Electric immersion heaters or steam coils, controlled by a thermostat in the cold water basin, may be used. Consult your OMRAN Representative for details. Additionally, where a remote sump is not used, all exposed make-up lines and water piping that does not drain at shutdown should be traced with electric heater tape and insulated.

When the cooling tower is operated at wet bulb temperatures below freezing, ice may form on wetted areas in direct contact with the incoming air. Therefore, **the inlet louvers and outer face of the wet deck surface must be inspected frequently so that if icing occurs, steps can be taken to remove the ice before the tower is damaged or system performance impaired.**

When operating at subfreezing ambient temperatures, the cooling tower will normally produce leaving water temperatures appreciably below design. However, low leaving water temperatures tend to promote ice formation. Therefore, **when operating in subfreezing ambient temperatures, the leaving water temperatures should be maintained as high as possible. The recommended minimum water temperature in the cold water basin is 43°F. Additionally, frequent visual inspections should be performed to detect potential icing problems.**

The first step in maintaining a high leaving water temperature is to ensure the tower operates with the maximum possible heat load. Next, reduce the tower capacity by cycling fans. Modulating the water flow rate to the tower is not recommended as a method for cooling tower capacity control. **(CAUTION: Rapid on-off cycling can cause the fan motor to overheat. It is recommended that controls be set to allow a maximum of 6 on-off cycles per hour.)** If the tower is equipped with two-speed motors, operation at low speed may be sufficient to prevent icing.

(Note: When two speed motors are used, the motor starter should include a 15 second time delay when switching from high to low speed.) However, it may also be necessary to cycle fans off periodically to prevent ice formation and/or to melt ice that accumulates on the intake louvers and face of the wet deck surface. Again, it is recommended that the controls be set to allow a maximum of 6 on-off cycles per hour.

Under severe conditions where fan cycling is insufficient to prevent icing, it may be necessary to operate the fan(s) in reverse to remove any ice accumulation by forcing warm air out to the intake louvers. **WARNING: At such times, DO NOT operate the fans in reverse any longer than is necessary since extended reverse operation may cause ice to form on the fan blades, fan stack, or eliminators and damage the tower.** Because of this possibility, cooling towers using reverse fan operation for ice removal should be equipped with a **vibration cutout switch** and the duration of reverse operation should be limited to a maximum of thirty minutes. A time delay of approximately 40 seconds between forward and reverse direction should be incorporated into the motor controls.

Lastly, **the importance of performing frequent visual inspections and routine maintenance services during operation in subfreezing weather cannot be overemphasized. These must be carried out on a routine basis to:**

1. Ensure all controls for capacity and freeze protection are set properly and functioning normally.

2. Prevent excessively high water levels and possible overflow of the cold water basin due to over pumping, clogged strainers, or make-up valve malfunction.

3. Discover any icing conditions that may develop before they reach the point where the tower or supports are damaged or system performance is impaired.

For more detailed information on winter operation and for recommended operating procedures on specific installation, contact your local OMRAN Representative.

Water Treatment

Corrosion and Scale Control

In cooling towers, cooling is accomplished by the evaporation of a portion of the process water as it flows through the tower. As this water evaporates, the impurities originally present remain in the re-circulating water. The concentration of the dissolved solids increases rapidly and can reach unacceptable levels. In addition, airborne impurities are often introduced into the re-circulating water, intensifying the problem. If these impurities and contaminants are not effectively controlled, they can cause scaling, corrosion, and sludge accumulations which reduce heat transfer efficiency and increase system operating costs, and potentially shorten the longevity of the equipment.

The degree to which dissolved solids and other impurities build up in the re-circulating water may be defined as the cycles of concentration. Specifically, cycles of concentration is the ratio of the concentration of a dissolved solid (for example – chlorides and sulfates) in the re-circulating water to the concentration of the same material in the make-up water. **For optimal heat transfer efficiency and maximum equipment life, the cycles of concentration should be controlled to maintain the quality of the recirculating water within the guidelines listed below:**

Re-circulated Water Quality Guideline

	Stainless Steel or Corrosion Protection System	Galvanized Steel[1]
pH	6.5 to 9.0	7.0 to 9.0[1]
Hardness as $CaCO_3$	30 to 500 ppm	30 to 500 ppm
Alkalinity as $CaCO_3$	500 ppm max.	500 ppm max.
Total Dissolved Solids	1200 ppm max.	1000 ppm max.
Chlorides	250 ppm max.	125 ppm max.
Sulfates	250 ppm max.	125 ppm max.

1 Units having galvanized steel construction and a circulating water pH of 8.3 or higher will require periodic passivazation of the galvanized steel to prevent 'white rust', the accumulation of white, waxy, non-protective zinc corrosion products on galvanized steel surfaces.

In order to control the cycles of concentration such that the above guidelines are maintained, it will be necessary to "bleed" or "blowdown" a small amount of re-circulating water from the system. This "bleed" water is replenished with fresh make-up water, thereby limiting the build-up of impurities.

Typically the bleed is accomplished automatically through a solenoid valve controlled by a conductivity meter. The conductivity meter set point is the water conductivity at the desired cycles of concentration and should be determined by a competent water treatment expert. (Note: The solenoid valve and conductivity meter must be supplied by other vendors.) Alternatively, a bleed line with a valve can be used to continuously bleed from the system. (Note: The bleed line and valve must be supplied by other vendors) In this arrangement, the rate of bleed can be adjusted using the valve in the bleed line and measured by filling a container of known volume while noting the time period.**The bleed rate and water quality should be periodically checked to ensure adequate control of the water quality is being maintained.**

The required continuous bleed rate may be calculated by the formula:

Bleed Rate = Evaporation Rate/(Number of Cycles of Concentration) –1

The evaporation rate can be determined by one of the following:

The evaporation rate is approximately 2 GPM per 1 million BTU/HR of heat rejection.

The evaporation rate is approximately 3 GPM per 100 tons of refrigeration.

Evaporation Rate = Water Flow Rate x Range x .001

Example: At a flow rate of 900 GPM and a cooling range of 10ºF, the evaporation rate is 9 GPM
(900 GPM x 10ºF x .001 = 9 GPM).

If the site conditions are such that constant bleed-off will not control scale or corrosion and maintain the water quality within the guidelines, chemical treatment may be necessary. If a chemical treatment program is used, it must meet the following requirements:

1. **The chemicals must be compatible with the unit construction** (zinc coated steel) as well as all other materials used in the system (pipe, heat exchanger, etc.)

2. Chemicals to inhibit scale and corrosion should be added to the re-circulating water by an automatic feed system on a continuously metered basis. This will prevent localized high concentrations of chemicals, which may cause corrosion. **It is recommended the chemicals be fed into the system at the discharge of the re-circulating pump.** They should not be batch fed directly into the cold water basin.

3. **Acid water treatment is *not* recommended unless the Unit(s) have been furnished with the Corrosion Protection System or is constructed of stainless steel** — in which cases acid treatment can be used provided the requirements of paragraphs 1 and 2 above are maintained.

Biological Control

Bleed-off with or without chemical treatment for scale and corrosion will NOT control biological contamination The growth of algaes, slimes and other micro-organisms, if unchecked, will reduce system efficiency and may contribute to the growth of potentially harmful micro-organisms, including Legionella, in the recirculating water system.

Accordingly, a biocide treatment program is recommended for all towers even those where scale and corrosion control in not being used.

Initial Start-up:

It is highly recommended a biocide treatment specifically designed to control biological contamination be initiated when the cooling tower system is first filled with water and administered on a regular basis thereafter in accordance with the supplier's instructions. Liquid biocides may be added to the basin of the cooling tower in dilute form. If a solid form of biocide is used, it should be added to the system via a pot feeder. **If ozone water treatment is used, ozone concentrations should not exceed 0.1–0.5 ppm to ensure maximum equipment life.**

Start-up Following a Shut-Down Period

To minimize the risk of biological contamination during a shut-down period, it is strongly recommended that the entire system (cooling tower, system piping, heat exchangers, etc.) be drained when the system is to be shutdown for three (3) days or more. To resume operation of a drained system, clean all debris, such as leaves and dirt from the cooling tower and re-fill the system with fresh water. While operating the circulating pump(s) and **prior to operating the cooling tower fans, execute one of the following two alternative biocide treatment programs:**

1. Resume treatment with the biocide that had been used prior to shutdown. Maintain biocide at the residual and for the time period recommended by the water treatment supplier as being necessary to bring the system under good biological control (residual and time will vary with the type of biocide). **Only after this treatment period is completed should the tower fan (s) be started.**

2. Check the pH of circulating water and, if necessary, adjust it to 7.0 to 7.6. Then add sufficient sodium hypochlorite to the system to maintain a level of 4 to 5 mg/l (ppm) free chlorine over a six (6) hour period. Check the concentration several times over the period, adding more sodium hypochlorite as necessary to maintain the concentration. Test kits for measuring the free residual of chlorine are commercially available. Only after this treatment period is completed should the tower fan(s) be started.

Where it is not practical to drain the system during shut-down periods, a by-pass line with shut-off valves should be installed so the cooling water can be circulated throughout the system, including the cooling tower cold water basin, while by-passing the tower fill. Then, after each shut-down of three (3) days or more, the system should be treated prior to restarting the tower using one of the two methods described above. However, **while circulating the treated cooling tower water through the entire system, the cooling tower fill should be by-passed and the tower fan(s) kept inoperative**. After the biocide residual has been maintained at the required level for at least six (6) hours, the water can be directed over the fill and the tower returned to service. The standard water treatment program (including the biological treatment) should be resumed at this time.

For specific recommendations on treatment for scale, corrosion, or biological control, consult a qualified water treatment consultant.

EVAPORATIVE COOLING EQUIPMENT INSPECTION SHEET

Report Number _____

DATE: _____ MODEL NUMBER: _____ OMRAN Serial No. _____ Owner I.D. _____

Job Name and Location: _____ Report prepared by: _____

Photograph on File Yes ☐ No ☐ Owner's Representative: _____

Owner's Phone No.: _____

GENERAL OBSERVATION

	YES/NO	COMMENTS
OMRAN Labels Intact/Legible/Current	☐ ☐	_____
Unit Operating Satisfactorily (Sound, Vibration, etc.)	☐ ☐	_____
Water Leaks	☐ ☐	_____
Unit Properly Installed (Level, Piping, Layout)	☐ ☐	_____
Unit in Satisfactory Condition (Exterior & Interior Casings, Pans)	☐ ☐	_____
Fan & Drive System Rotates Freely	☐ ☐	_____
Sheaves Properly Aligned	☐ ☐	_____
Corrosion Protection System	☐ ☐	_____
ENERGY-MISER Fan System	☐ ☐	_____
BELTIDRIVE PowerTrain Drive System	☐ ☐	_____

SPECIFIC COMPONENT OBSERVATIONS

DRIVE SYSTEM	EXISTING PART BY OMRAN ? (YES/NO)	CONDITION/COMMENTS (SIZE, MATERIAL, MANUFACTURER, ETC.)
Motor Sheave	☐ ☐	_____
Fan Sheave	☐ ☐	_____
Belts	☐ ☐	_____
Fan Motor	☐ ☐	_____
Fan Wheel	☐ ☐	_____
Shaft	☐ ☐	_____
Bearings	☐ ☐	_____
WATER/AIR SYSTEM		
Spray Pump	☐ ☐	_____
Pump Motor	☐ ☐	_____
Strainers	☐ ☐	_____
Make-up Assembly	☐ ☐	_____
Louvers	☐ ☐	_____
Distribution Boxes	☐ ☐	_____
Eliminators	☐ ☐	_____
Spray Header & Branches	☐ ☐	_____
Nozzles	☐ ☐	_____
Fill	☐ ☐	_____
Coil	☐ ☐	_____

Suction Connection Size _____ Location _____

ACCESSORIES

	EXISTING PART BY OMRAN ? (YES/NO)		CONDITION/COMMENTS (SIZE, MATERIAL, MANUFACTURER, ETC.)
Sound Attenuation	☐	☐	_____
Air Inlet/Discharge Screens	☐	☐	_____
Extended Lube Lines	☐	☐	_____
Fan Damper Controls	☐	☐	_____
Fan Dampers	☐	☐	_____
High Level Switch	☐	☐	_____
Low Level Switch	☐	☐	_____
Water Level Control	☐	☐	_____
Pan Heaters	☐	☐	_____
Sump Sweeper Piping	☐	☐	_____
Distribution Pan Covers	☐	☐	_____
Extended Motor Base Adjustment	☐	☐	_____
Vibration Cutout Switch	☐	☐	_____
Positive Closure Dampers	☐	☐	_____

OPERATING HISTORY

MOTOR (New, Replaced, Rebuilt)

_____

_____

CONTROL SEQUENCE (Note Control Manufacturer); OPERATION (Year-Round, Seasonal, etc.)

_____

_____

_____

MAINTENANCE HISTORY (Belts, Sheaves, Bearings, Shafts, etc.)

_____

_____

REPORTED PROBLEMS SPECIFIC TO THIS UNIT

_____

_____

OVERALL EVALUATION AND RECOMMENDATIONS

(Note appropriate accessories available to enhance operation or facilitate maintenance)

_____

_____

_____

Prior to undertaking start-up or performing any inspection or maintenance of OMRAN equipment, make certain the power has been disconnected. Refer to the appropriate operating and maintenance manuals and comply with all caution label instructions.

Suggestions for Spring Start-Up of Your Evaporative Cooling Equipment

1. Inspect the Unit.

a. Check eliminators for proper position.
b. Check position of strainer screens and air inlet screens to be sure screens have not shifted during shutdown.
c. Check fan wheels, bearings, fan motors, and pumps (if applicable) for lubrication. See item 5.
d. Rotate all fan shafts by hand to make sure they turn freely.
e. Check fan motors for proper rotation. Directional arrows on fan housing sides indicate correct rotation.
f. Clear fans of any trash or debris that may have accumulated during shutdown.
g. Check make-up valve for shut-off ability. Check ßoat ball for buoyancy.
h. Check spray nozzles/troughs for proper distribution.
i. Check surface for scale, sludge or debris and clean if necessary.
j. Check access door gaskets and replace, if necessary.
k. Check the condition of the cooling tower ṬIl. If it is clogged or deteriorated, replace it with Factory Authorized Replacement Fill.

2. Inspection of Casing.

a. While the unit is still drained, thoroughly inspect the unit casing. Clean and touch-up any areas showing signs of deterioration. Any damaged area should be cleaned to bare metal and reṬnished with Zinc-Rich Compound (ZRC). This is also the time when any casing joint leaks can be easily repaired.
b. Remove any deposits that have built up and were not cleared by ßushing the sump. Touch up the area beneath deposits as required.

3. Fill the Cold Water Sump with Fresh Water to the Overßow Level.

a. At *initial start-up* or before restart-up where the sump was completely drained; the initial biocide treatment should be applied at this time (see Water Treatment section of the appropriate maintenance manual).
b. *Following* a *shut-down period,* where the sump was *not* completely drained: it is recommended that an initial shock treatment of appropriate biocides be administered at restart-up to eliminate accumulated biological contaminants.

4. Fill Pan with Water and Check Float Valve Level.

After the unit has been in operation under load for several days, operating water level should be checked. The operating water level should be approximately Ṭve (5) inches below the center line of the overßow connection.

5. Adjust Belt Tension of Fan Motors.

Proper belt tension is determined by pressing against a single belt midway between sheaves with one Ṭnger, which should deßect the belt 1/2" with moderate pressure. To adjust belts, loosen locknut on the inside of the frame angle and rotate the exterior nut as necessary. Re-tighten locknut and recheck tension.

6. Lubricate Bearings.

a. *Sleeve Bearings:* Use the OMRAN oil that was shipped with the unit. During the Ṭrst week of operation, reṬll each bearing cup several times to saturate the felt wick in the bearing cartridge. DO NOT USE OILS CONTAINING DETERGENTS FOR LUBRICATION.
b. *Ball Bearings:* Purge bearings with new grease.
c. *Fan Motors, Pumps* (if applicable): Lubrication should be in accordance with motor manufacturer's recommendations.

7. Check and Adjust Accessories.

a. *Capacity Control Dampers:* Using the crank arm, rotate damper shaft through the full range (open to closed positions) to make sure there is no binding.
b. *Electric Damper Controls:* Verify wiring is correct and end switch setting is correct. Refer to suggested wiring diagrams supplied with the submittal data.

Suggestions for Winterizing Your Evaporative Cooling Equipment

For All Cooling Towers, Closed Circuit Coolers and Evaporative Condensers

1. Provision must be made to protect the water in the basin from freezing when the unit is idle. This can be accomplished by using a remote sump installed in a heated space or installing steam/hot water coils or electric immersion heaters in the tower basin.

2. All outdoor water lines, including the make-up water line to the unit and drain lines from the unit should be traced with heater cable and insulated.

3. During operation, frequent visual inspections of the unit must be performed regularly to:

   a. Insure all operating controls are properly set and functioning normally.
   b. Insure the method of freeze prevention is effective.
   c. Discover any icing conditions before they develop to the point where the unit is damaged or system performance is impaired.

4. A regular preventive maintenance program must be established and carried out despite adverse weather conditions. Items covered should include:

   a. Regular lubrication of moving parts.
   b. Regular checking of the make-up value and cleaning of strainers to prevent high water levels in basin.
   c. Regular checking and cleaning of hot water distribution system to assure uniform ßow over unit.

5. All outdoor water lines should be insulated and traced with heating cable.

Coil Protection for Closed Circuit Industrial Coolers

1. Charge the coil with ethylene glycol to prevent the system ßuid from freezing. The percentage of ethylene glycol should be determined based upon the conditions in your area.

2. If no ethylene glycol is used, adequate* ßow through the coil must be maintained so that the temperature of the circulating ßuid is never less than 50˚F.

3. During light load periods, artiṬcial heat should be applied directly to the circulating fluid.

4. A vacuum breaker or air vent should be installed at the high point of the system and an adequately sized drain should be installed at the low point to permit emergency drainage of the coil.

5. All outdoor water lines and the spray pump body should be traced with heating cable and insulated.

We would like to emphasize again the importance of frequent, regular visual inspection of the units while in operation during the winter months. Early detection of a potential cold weather problem can often result in a simple, inexpensive remedy now, rather than a major repair and inconvenience later.

PROPER MAINTENANCE - Proper winterizing, Spring start-up procedures, and scheduled periodic maintenance will prolong the life of the equipment, and ensure the trouble-free performance for which the unit was designed. Detailed instructions for maintenance are given in the OMRAN Operating and Maintenance Manual, which is included with every unit shipped. This manual should be read and kept in a safe place. Additional copies are available from your local OMRAN Representative.

QUICK REFERENCE
Maintenance Check List

COOLING TOWERS
EVAPORATIVE CONDENSERS
INDUSTRIAL FLUID COOLERS

Once Every Month:		JAN.	FEB.	MAR.	APR.	MAY	JUN.	JUL.	AUG.	SEPT.	OCT.	NOV.	DEC.
1.	Check fan and motor bearings and lubricate, if necessary.												
2.	Check tightness and adjustment of thrust collars on sleeve bearing units and locking collars on ball bearing units.												
3.	Check belt tension and adjust if necessary.												
4.	Clean strainer (if atmosphere is extremely dirty, it may be necessary to clean strainer weekly).												
5.	Check for biological growth in sump. Consult water treatment specialist if such growth is not under control.												
6.	Clean and ßush sump.												
7.	Check spray distribution system. Check and re-orientate nozzles, if necessary. On evaporative condensers and industrial ßuid coolers, with trough type distribution systems, adjust and ßush out troughs, if necessary.												
8.	Check operating water level in the pan and adjust ßoat valve, if required.												
9.	Check bleed-off rate and adjust if necessary.												
10.	Check fans and air inlet screens and remove any dirt or debris.												

Once a Year: Inspect and clean protective Ţnish inside and out. Look particularly for any signs of spot corrosion. Clean and reŢnish any damaged protective coating.

Before undertaking start-up procedures or performing inspection or maintenance of OMRAN equipment, make certain the power has been disconnected. Refer to appropriate operating and maintenance manuals and comply with all caution label instructions.
Continuing research results in steady improvements, therefore , these specifications are subject to change without notice.