

NC[®] 8400 steel

COOLING TOWER



Overview

Marley's flagship factory-assembled cooling tower, providing higher performance, fast installation and easy maintenance.

Primary Benefits

- Higher tonnage and efficiency per cell can lower energy costs up to 20%
- Up to 64% less installation time per cell, providing over \$1400 savings per cell, over previous designs
- Less than half the maintenance costs for gear drives compared to belt drive systems



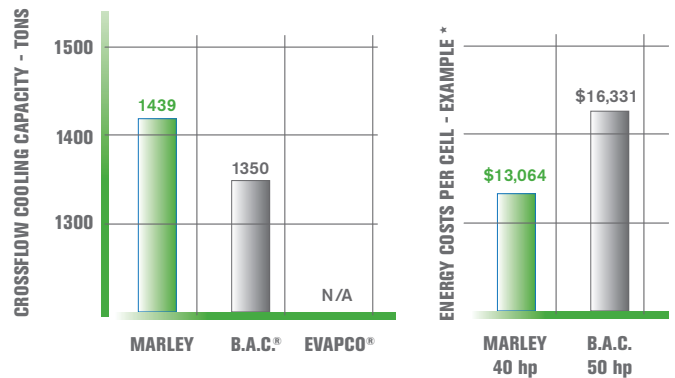
Benefit Detail

Higher Tonnage and Efficiency:

- Highest capacity package cooling tower in the market* helps to reduce the number of cells required, saving purchasing costs
- Higher efficiency design can provide up to 20% lower energy costs

Fast Installation:

- Up to 64% faster installation than previous designs provides over \$1000 in savings per cell
- Quick Installation features include:
 - Factory-mounted terminal box option – provides a single location for all controls wiring
 - Quick-Install guardrails and aluminum ladders and welded aluminum safety cages options
 - Four-point support allows parallel I-beams in any direction or separate piers



* assumes nameplate motor horsepower for a 610 ton cooling tower with a footprint of 250 sq ft – \$0.10/kWh and 50% annual usage

field installation hours	latest design	previous design
Ladder and Guardrail	2	3
Ladder Safety Cage	.25	4
Fan Cylinder	0	1
Access Platform	5	7
Factory Installed Terminal Box	4	16
total	11.25	31
based on \$75/hour, savings per tower cell would be over \$1,480		

*as of May, 2010

Benefit Detail

Easy Maintenance:

- Gear drive standard – 5 year no-hassle operation
- Integral louvers and eliminators provide water containment and freezing prevention compared to blade louvers used by other manufacturers
- Bolted and/or welded basins stop leaks better than tap screwed connections used by other manufacturers
- Large access doors and a flat fan deck designed as a walking surface makes tower service checks easier

Special Design Considerations

- ASHRAE® Std. 90.1 compliant
- Full set of design options:
 - CTI Certified sound options including attenuation and/or Ultra Quiet fan
 - Splash fill for dirty water applications - NC Alpha
 - Plume abatement - NCWD
 - Marley controls and VFD options for superior energy management
- 3D configuration specific drawings provided with quotes and orders
- FM Approval option on every model including FRP fan cylinder and PVC inlet piping

Capacity Range

101 to 1439 tons per cell at 95°/85°/78°F
 303 to 4307 GPM per cell hydraulic limit

No-Hassle System 5 Geareducer®		belt drive
Annual Maintenance	\$624	\$2,380
5 Year Maintenance	\$4,270	\$11,900
example savings	\$7,630	

Technical Features

- Induced draft, crossflow design with vertical air discharge
- Non-corrosive stainless steel or galvanized structure with bolted galvanized or welded stainless steel cold water basin
- TEFC motor, low sound fan standard
- Drift rates as low as 0.001%
- Belt drive available on all models up to 60hp
- Assembled with as much as 71% recycled content

Common Applications

HVAC

- Mission critical data centers, hospitals and health treatment facilities, commercial buildings, schools and colleges

Industrial

- Chemical, fertilizer, grain processing, ethanol production, metals, mining, oil refining, textiles and steel production

Power Generation

- Turbine inlet cooling, jacket cooling and trim cooling during peak heat load

THE NC—QUIET BY DESIGN

The NC is the result of extensive design studies focused on cooling tower sound control. These studies were complicated by the fact that the cooling tower market is typically driven by one of two powerful, yet often conflicting requirements. The most common is for a cooling tower that provides the required heat rejection capacity with a high level of reliability at low cost. Sound control, while important, is not the primary consideration for this application.

The other requirement, which is becoming ever more important in our crowded, fast-paced society, is driven by conditions that demand the lowest practical sound level. Energy efficiency, reliability, ease of maintenance and reasonable cost, while still extremely important, are not the highest priorities.

In the first case, sound is important, while in the second case it is extremely important. To best satisfy these two competing market requirements we created a multi-tiered approach, through key mechanical equipment selections, to sound control. The result is more options than any other cooling tower on the market today.

The result is a line of towers capable of meeting all but the most restrictive noise limitations—and that will react favorably to natural attenuation. Where the tower has been sized to operate within an enclosure, the enclosure itself will have a damping effect on sound. Sound also declines with distance—by about 6 dBA each time the distance doubles.

All standard NC cooling towers are equipped with low sound fans. This in combination with zero-splash crossflow film-fill results in a line of towers capable of meeting most noise limitations. Where noise at a critical point is likely to exceed an acceptable limit, several other options are available—listed below in ascending order of cost impact:

- The Marley "Quiet Package" includes the affordable Quiet Fan mechanical option, optimized to achieve the lowest possible sound levels while maintaining efficiency.
- A Marley Variable Speed Drive automatically minimizes the tower's noise level during periods of reduced load and/or reduced ambient temperature without sacrificing the system's ability to maintain a constant cold water temperature. This is a relatively inexpensive solution, and can pay for itself quickly in reduced energy costs. The natural nighttime reduction in wet-bulb temperature makes this a very feasible solution in most areas of the world. It also eliminates fan cycling. In combination with a Marley Quiet Package, the Marley Variable Speed Drive is capable of meeting all but the most restrictive noise limitations.
- The most extreme cases may require inlet and discharge sound attenuator sections—however, the static pressure loss imposed by discharge attenuators may necessitate an increase in tower size. Two stages of inlet or discharge attenuators supported by the tower and designed and tested for the most stringent requirements are available as an option. See page 24.
- For more severe cases requiring the lowest possible fan sound levels the Marley "Ultra Quiet" fan option is now available on most NC models. Tower height will increase—obtain current sales drawings from your Marley sales representative for accurate dimensions.

The advantage is yours. You now have the choices you need to balance your project's performance, space and cost requirements with your sound level needs for a win-win solution to your cooling system design.

ENCLOSURES

Occasionally, cooling towers are located inside architectural enclosures for aesthetic reasons. Although NC towers adapt well to enclosures, the designer must realize the potential impact of a poorly arranged enclosure on the tower's performance and operation. The designer must take care to provide generous air inlet paths, and the tower's fan cylinder discharge height should not be lower than the elevation of the top of the enclosure. *Marley Technical Report #H-004 "External Influences on Cooling Tower Performance"* is available at spxcooling.com or from your Marley sales representative.

As suggested in the aforementioned Technical Report, it may also be advisable to specify a design wet-bulb temperature 1°F higher than normal to compensate for potential recirculation initiated by the enclosure. You'll benefit from discussing your project with your Marley sales representative.



Marley "Ultra Quiet" fan

SYSTEM CLEANLINESS

Cooling towers are very effective air washers. Atmospheric dust able to pass through the relatively small louver openings will enter the circulating water system. Increased concentrations can intensify system maintenance by clogging screens and strainers—and smaller particulates can coat system heat transfer surfaces. In areas of low flow velocity—such as the cold water basin—sedimentary deposits can provide a breeding ground for bacteria.

In areas prone to dust and sedimentation, you should consider installing some means for keeping the cold water basin clean. Typical devices include side stream filters and a variety of filtration media.

WATER TREATMENT

To control the buildup of dissolved solids resulting from water evaporation, as well as airborne impurities and biological contaminants including Legionella, an effective consistent water treatment program is required. Simple blowdown may be adequate to control corrosion and scale, but biological contamination can only be controlled with biocides.

An acceptable water treatment program must be compatible with the variety of materials incorporated in a cooling tower—ideally the pH of the circulating water should fall between 6.5 and 8.0. Batch feeding of chemicals directly into the cooling tower is not a good practice since localized damage to the tower is possible. Specific startup instructions and additional water quality recommendations can be found in the **NC User Manual** which accompanies the tower and also is available from your local Marley sales representative. For complete water treatment recommendations, consult a competent, qualified water treatment supplier.

⚠ CAUTION

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

TYPICAL APPLICATIONS

The NC tower is an excellent choice for normal applications requiring cold water for the dissipation of heat. This includes condenser water cooling for air conditioning, refrigeration, and thermal storage systems, as well as their utilization for free-cooling in all of those systems. The NC can also be used in the cooling of jacket water for engines and air compressors, and are widely applied to dissipate waste heat in a variety of industrial, power and manufacturing processes.

Choosing the all stainless steel construction option, the NC can be confidently applied in unusually corrosive processes and operating environments. However, no single product line can answer all problems, and selective judgement should be exercised in the following situations

APPLICATIONS REQUIRING ALTERNATIVE COOLING TOWER SELECTIONS

Certain types of applications are incompatible with any cooling tower with film fill—whether NC or a competitive tower of similar manufacture. Film fill is subject to distortion in high water temperatures, and the narrow passages are easily clogged by turbid or debris-laden water. Some of the applications, which call for alternative tower designs are:

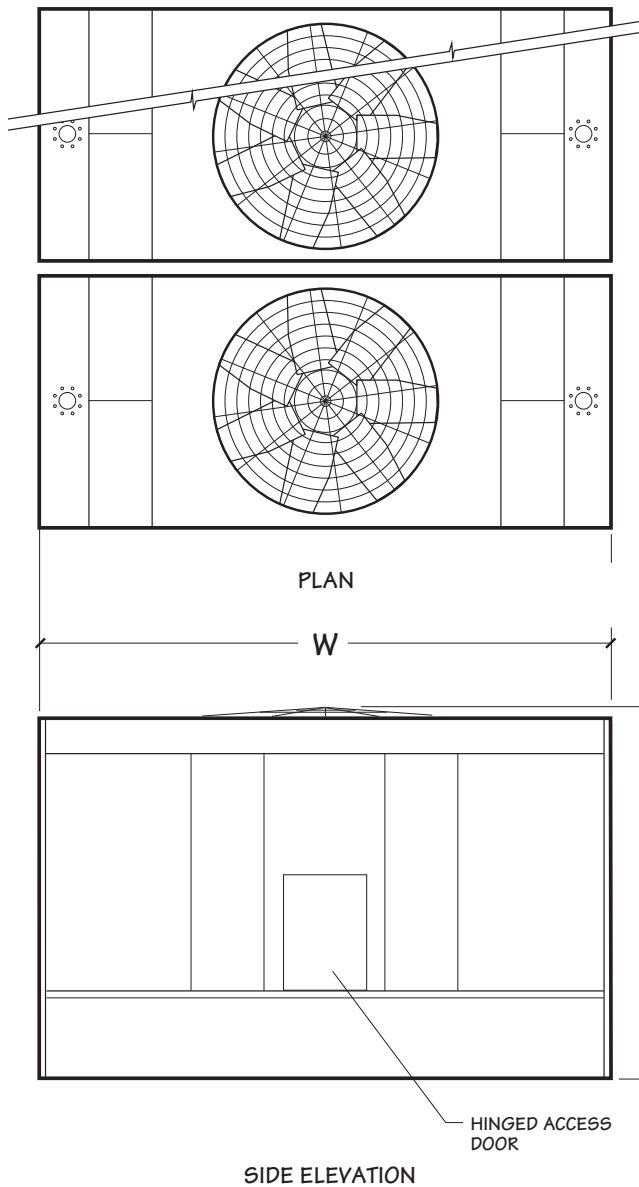
- **Water temperatures exceeding 125°F**—adversely affects the service life and performance of normal PVC fill. Higher temperature fill materials are available.
- **Ethylene glycol content**—can plug fill passages as slime and algae accumulate to feed on the available organic materials.
- **Fatty acid content**—found in processes such as soap and detergent manufacturing and some food processing—fatty acids pose a serious threat for plugging fill passages.
- **Particulate carry over**—often found in steel mills and cement plants—can both cause fill plugging, and can build up to potentially damaging levels on tower structure.
- **Pulp carry over**—typical of the paper industry and food processing where vacuum pumps or barometric condensers are used. Causes fill plugging which may be intensified by algae.

ALTERNATIVE SELECTIONS

In addition to the NC, SPX Cooling Technologies offers a full scope of products in various designs and capacities to meet the special demands of specific applications.

spxcooling.com—visit us on the web for a complete list of products, services, publications and to find your nearest sales representative.

NC8401 NC8402 NC8403 NC8405

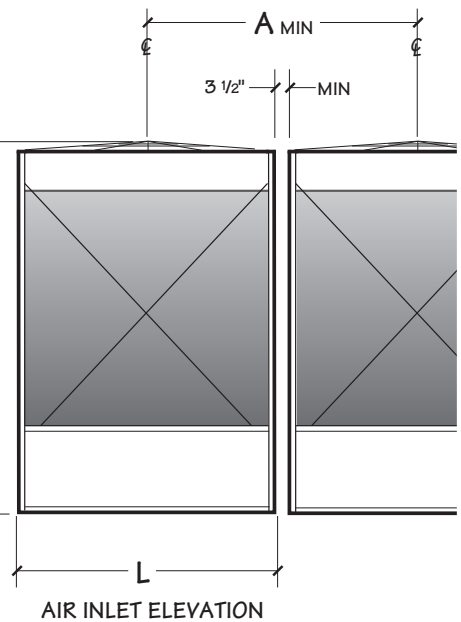


Use this data for preliminary layouts only. Obtain current drawing from your Marley sales representative.

UPDATE™ web-based selection software, available at spxcooling.com/update provides NC model recommendations based on customer's specific design requirements.

A Sound dBA Approach

Various low sound options are available from 2 to 19 dB reduction from the standard dBA options in the schematic data table. Consult *UPDATE* selection software for performance, sound levels and dimensions.



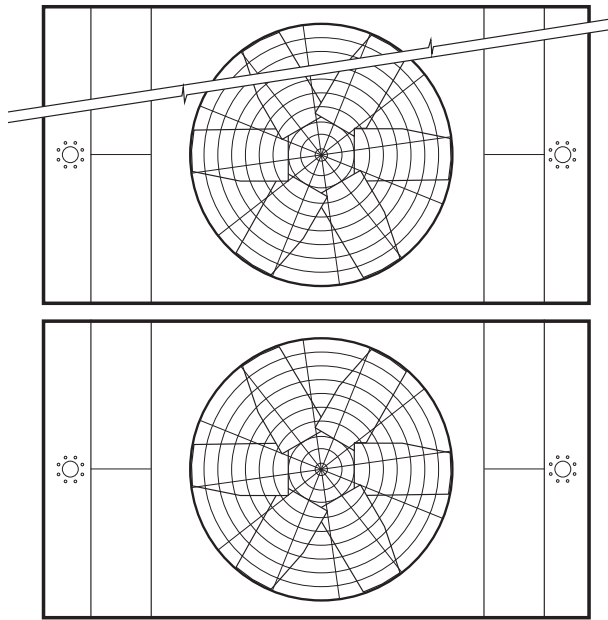
NC8401 NC8402 NC8403 NC8405

Model note 2	Nominal Tons note 3	Motor hp	dBA 5'-0" from air inlet face	Design Operating Weight lb	Shipping Weight lb	Dimensions			
						L	W	H	A
NC8401G-1	101	2	63	7889	4062	6'-6¼"	12'-10"	10'-2½"	6'-9¾"
NC8401H-1	117	3	65						
NC8401K-1	139	5	71						
NC8401M-1	159	7.5	73						
NC8401N-1	175	10	76						
NC8401P-1	198	15	78						
NC8402G-1	131	2	64	10319	4890	8'-4¾"	14'-2"	10'-3"	8'-8¼"
NC8402H-1	148	3	65						
NC8402K-1	175	5	68						
NC8402M-1	205	7.5	74						
NC8402N-1	228	10	76						
NC8402P-1	256	15	79						
NC8402Q-1	277	20	81	15844	7442	8'-4¾"	18'-2"	11'-11¼"	8'-8¼"
NC8403K-1	213	5	68						
NC8403M-1	243	7.5	72						
NC8403N-1	275	10	76						
NC8403P-1	312	15	79						
NC8403Q-1	342	20	80						
NC8403R-1	366	25	81	19480	8685	9'-10¾"	19'-11"	11'-11¼"	10'-2¼"
NC8403S-1	386	30	84						
NC8403T-1	423	40	85						
NC8405N-1	331	10	74						
NC8405P-1	377	15	76						
NC8405Q-1	412	20	78						
NC8405R-1	445	25	81	19480	8685	9'-10¾"	19'-11"	11'-11¼"	10'-2¼"
NC8405S-1	472	30	84						
NC8405T-1	515	40	87						

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- 3 Nominal tons are based upon 95°F HW, 85°F CW, 78°F WB and 3 GPM/ton. The UPDATE web-based selection software provides NC model recommendations based on specific design requirements.
- 4 Standard overflow is a 4" dia. standpipe in the collection basin floor. The standpipe removes for flush-out and draining. See page 18 for side overflow option.
- 5 Outlet sizes vary according to GPM and arrangement. See pages 18 and 19 for outlet sizes and details.
- 6 Makeup water connection may be 1" or 2" dia., depending upon tower heat load, water pressure, and desired connections. See page 13 for additional information.

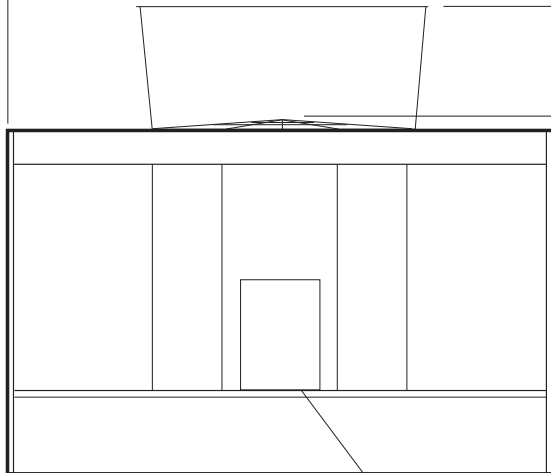
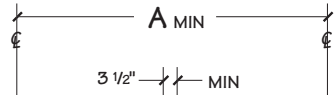
NC8407 NC8409



PLAN

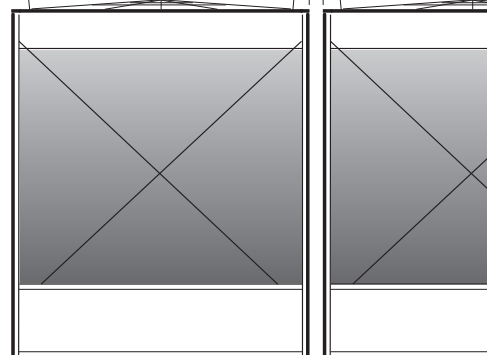
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VELOCITY RECOVERY CYLINDER INCREASES MODEL PERFORMANCE. REFER TO DATA TABLE AND UPDATE FOR ADDITIONAL INFORMATION. FAN GUARD NOT REQUIRED.



SIDE ELEVATION

16'-5 3/4" INSTALLED HEIGHT
11'-11 3/4" INSTALLED HEIGHT



AIR INLET ELEVATION

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UPDATE™ web-based selection software, available at spxcooling.com/update provides NC model recommendations based on customer's specific design requirements.

NC8407 NC8409

Model note 2	Nominal Tons note 3	Nominal Tons with VR Cylinder note 3	Motor hp	dBA 5'-0" from air inlet face	Design Operating Weight lb	Shipping Weight lb	Dimensions		
							L	W	A
NC8407M-1	338	352	7.5	66	25498	11829	11'-10 ³ / ₄ "	21'-0"	12'-2 ¹ / ₄ "
NC8407N-1	372	385	10	69					
NC8407P-1	428	448	15	70					
NC8407Q-1	468	490	20	72					
NC8407R-1	510	531	25	77					
NC8407S-1	540	561	30	79					
NC8407T-1	590	612	40	82					
NC8407U-1	629	653	50	83					
NC8407V-1	664	690	60	84	30949	13996	13'-10 ³ / ₄ "	22'-5"	14'-2 ¹ / ₄ "
NC8409P-1	488	502	15	65					
NC8409Q-1	530	546	20	67					
NC8409R-1	586	602	25	75					
NC8409S-1	616	636	30	79					
NC8409T-1	678	696	40	79					
NC8409U-1	721	741	50	81					
NC8409V-1	761	782	60	83					

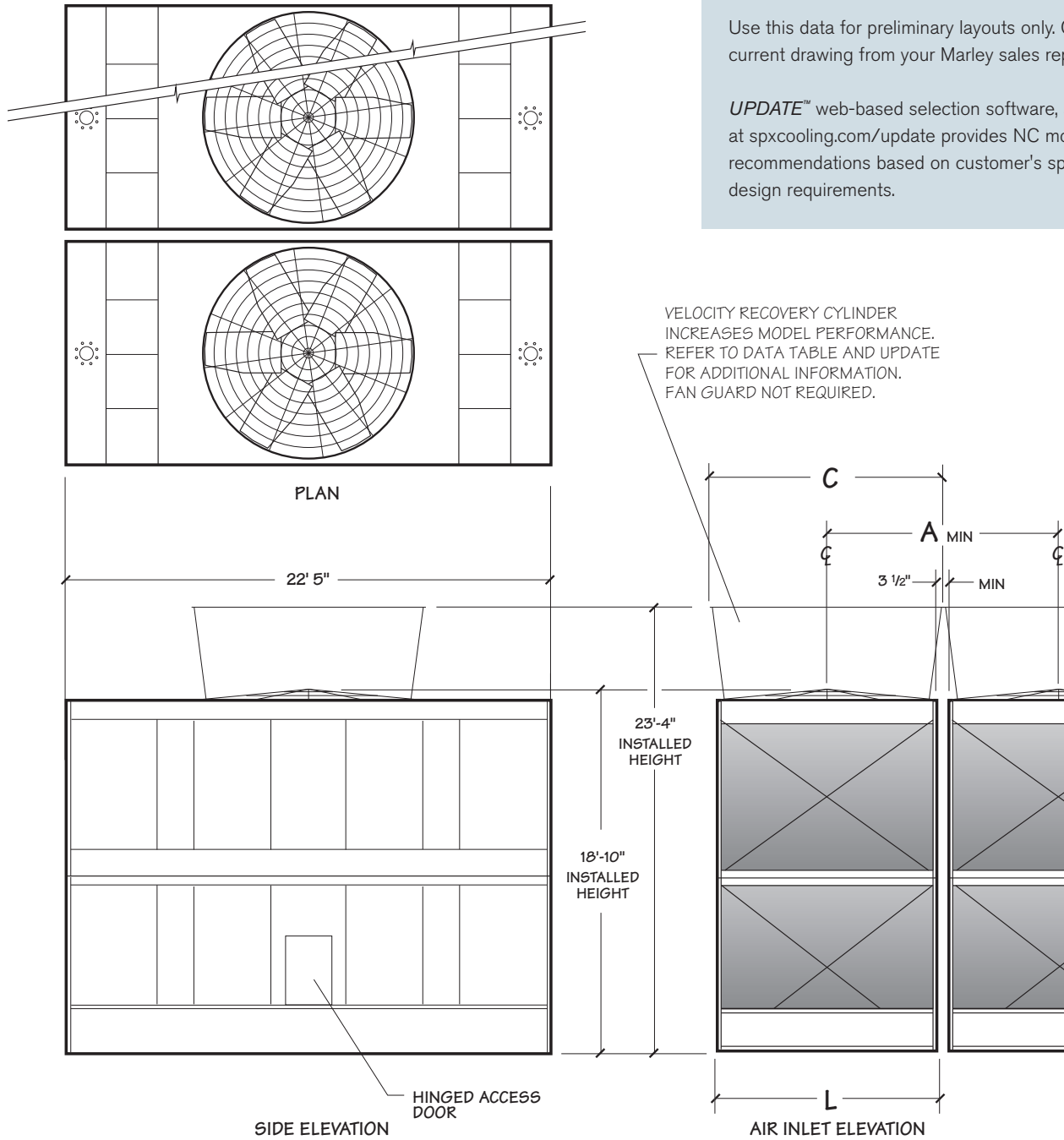
A Sound dBA Approach

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- 4 Standard overflow is a 4" dia. standpipe in the collection basin floor. The standpipe removes for flush-out and draining. See page 18 for side overflow option.
- 5 Outlet sizes vary according to GPM and arrangement. See pages 18 and 19 for outlet sizes and details.
- 6 Makeup water connection may be 1" or 2" dia., depending upon tower heat load, water pressure, and desired connections. See page 13 for additional information.

NC8411 NC8412



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VELOCITY RECOVERY CYLINDER INCREASES MODEL PERFORMANCE. REFER TO DATA TABLE AND UPDATE FOR ADDITIONAL INFORMATION. FAN GUARD NOT REQUIRED.

NC8411 NC8412

Model note 2	Nominal Tons note 3	Nominal Tons with VR Cylinder note 3	Motor hp	dBA 5'-0" from air inlet face	Design Operating Weight lb	Shipping Weight lb	Dimensions		
							L	A	C
NC8411Q-1	636	671	20	67	37863	18137	11'-10 ³ / ₄ "	12'-2 ¹ / ₄ "	11'-9 ¹ / ₈ "
NC8411R-1	680	717	25	69					
NC8411S-1	720	759	30	71					
NC8411T-1	809	854	40	77					
NC8411U-1	865	913	50	78					
NC8411V-1	910	961	60	82					
NC8411W-1	974	1019	75	84					
NC8412Q-1	711	747	20	67	43810	20653	13'-10 ³ / ₄ "	14'-2 ¹ / ₄ "	13'-9 ³ / ₁₆ "
NC8412R-1	762	799	25	69					
NC8412S-1	805	845	30	70					
NC8412T-1	906	951	40	74					
NC8412U-1	968	1012	50	78					
NC8412V-1	1020	1068	60	80					
NC8412W-1	1087	1136	75	84					
NC8412X-1	1183	1239	100	83					

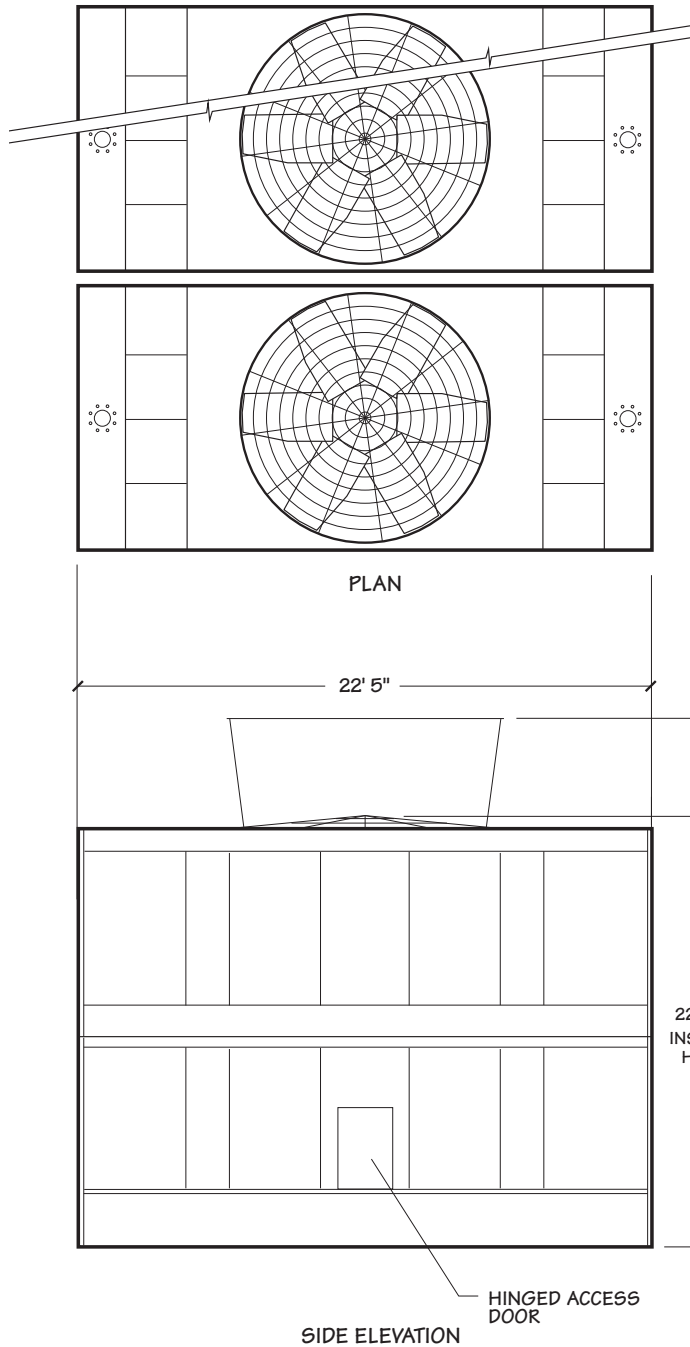
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- 4 Standard overflow is a 4" dia. standpipe in the collection basin floor. The standpipe removes for flush-out and draining. See page 18 for side overflow option.
- 5 Outlet sizes vary according to GPM and arrangement. See pages 18 and 19 for outlet sizes and details.
- 6 Makeup water connection may be 1" or 2" dia., depending upon tower heat load, water pressure, and desired connections. See page 13 for additional information.

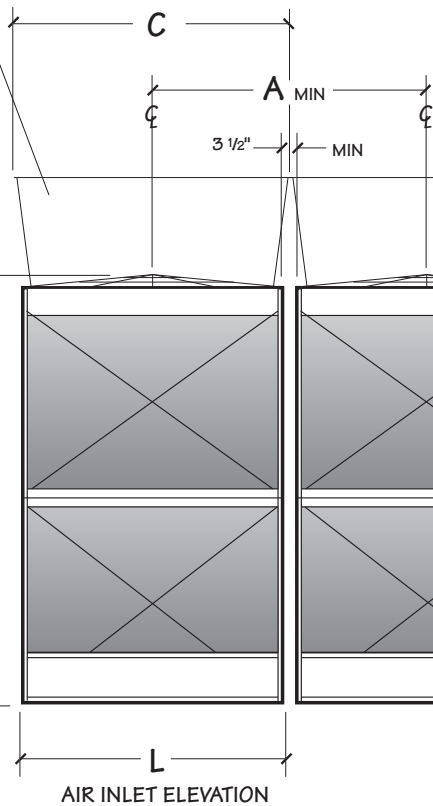
NC8413 NC8414



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NC8413 NC8414

Model note 2	Nominal Tons note 3	Nominal Tons with VR Cylinder note 3	Motor hp	dBA 5'-0" from air inlet face	Design Operating Weight lb	Shipping Weight lb	Dimensions		
							L	A	C
NC8413Q-1	692	735	20	67	43113	20744	11'-10 ³ / ₄ "	12'-2' ¹ / ₄ "	11'-9' ¹ / ₈ "
NC8413R-1	741	785	25	69					
NC8413S-1	780	833	30	72					
NC8413T-1	855	906	40	73					
NC8413U-1	941	1003	50	78					
NC8413V-1	993	1058	60	82					
NC8413W-1	1062	1129	75	84					
NC8413X-1	1147	1214	100	86					
NC8414Q-1	771	814	20	87	49957	23698	13'-10 ³ / ₄ "	14'-2' ¹ / ₄ "	13'-9' ³ / ₁₆ "
NC8414R-1	825	872	25	89					
NC8414S-1	873	921	30	70					
NC8414T-1	949	999	40	71					
NC8414U-1	1048	1108	50	78					
NC8414V-1	1107	1170	60	80					
NC8414W-1	1178	1242	75	84					
NC8414X-1	1288	1358	100	83					
NC8414Y-1	1366	1439	125	85					

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- 4 Standard overflow is a 4" dia. standpipe in the collection basin floor. The standpipe removes for flush-out and draining. See page 18 for side overflow option.
- 5 Outlet sizes vary according to GPM and arrangement. See pages 18 and 19 for outlet sizes and details.
- 6 Makeup water connection may be 1" or 2" dia., depending upon tower heat load, water pressure, and desired connections. See page 13 for additional information.

Tired of having to design your piping and tower layout to accommodate the standards of cooling tower manufacturers? Marley's multiple variety of piping systems accommodates your design intentions to make your layout of the NC both expedient and economical.

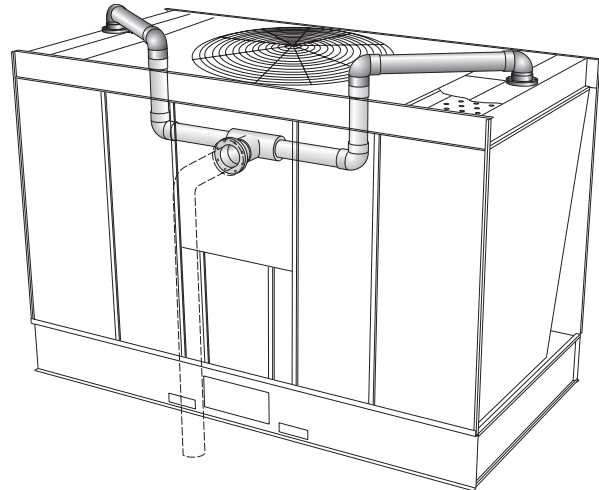
- Single or dual hot water inlet connections.
- Side inlet, bottom inlet or top inlet connections.
- Side or bottom cold water outlet connections.
- A variety of makeup, overflow and drain options.

For the single inlet connection all piping to the distribution basins is part of the tower package. Installation and design costs are reduced and the need for extra piping and supports are eliminated. The single bottom inlet connection is perfect for multicell applications—keeping all the inlet piping below the tower.

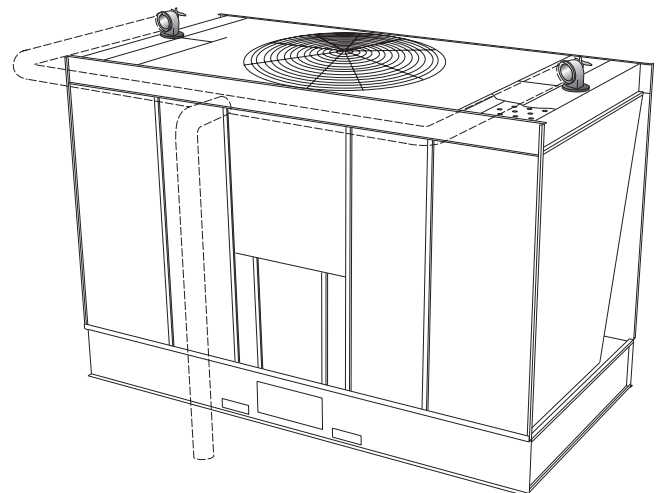
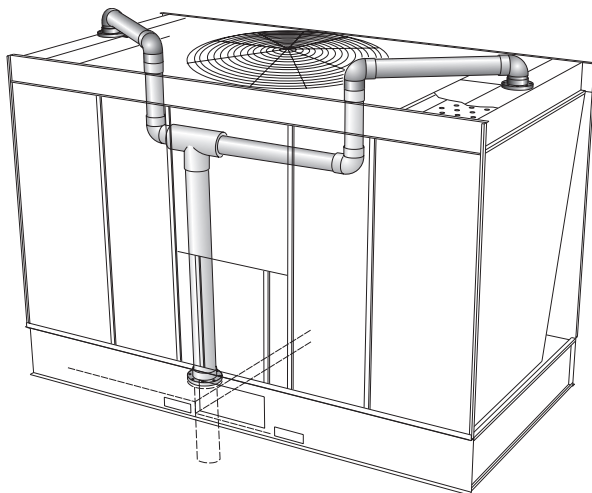
Unless otherwise specified, single-cell towers normally have a cased-face outlet appropriate for the design water flow rate—see pages 18 and 19. This usually assures the lowest possible installed tower elevation. Cased-face outlet connection pipes extend approximately 3" outside the basin, and are beveled for weld connection and also grooved for a mechanical coupling.

Outlet piping can be kept below the cold water basin level by choosing either a depressed sump or a bottom outlet connection in lieu of the cased-face outlets. Both outlet designs conform to standard class 125 ANSI pipe flange specifications. Easily removable debris screens are optional on bottom outlets and are standard on all other outlet arrangements.

Depressed sumps are made of inert fire-retardant FRP or heavy-gauge welded stainless steel. Unless otherwise specified towers with galvanized steel collection basins are supplied with FRP sumps and towers with stainless steel basins are supplied with stainless sumps.



Multicell towers, intended to operate together as a common unit, are joined by steel flumes between the collection basins. These flumes equalize the operating water level between basins and also provide a flow passage from cells not equipped with outlets or makeup valves, often eliminating the need to specify an outlet and makeup valve for each cell on a multicell installation. Select the number of outlets required to maintain a maximum flow of 1371 GPM through each flume for NC8401 through NC8405 models and 2203 GPM for NC8407 through NC8414 models. Flow values are for cased-face outlet or bottom-outlets without trash screen. Refer to NC sales drawings to obtain flow values for sumps and bottom outlets with trash screens.



If each cell is to be equipped with an outlet, cased-face outlet can be used on end cells of multicell towers, but not on interior cells. For direct outlet from each cell on installations of three or more cells, use either the depressed sump or bottom outlet on interior cells.

The best choice for a tower used with a remote or indoor storage tank—see page 22—or on a concrete cold water basin is usually a bottom outlet.

A cased-face outlet equipped tower can be installed on a flat concrete slab if a side drain and overflow are also specified—see page 18. Consult your Marley sales representative for complete information.

MAKEUP

The amount of water constantly evaporated from a cooling tower varies directly with the heat load applied. In addition to evaporation, water is normally lost to the blowdown (bleed-off) necessary to maintain dissolved solids concentration at an acceptable level in the circulating water system.

The NC is equipped with one or more float-operated, mechanical makeup valves to automatically replenish this lost water. The tables on this page, calculated for a concentration of 3 times normal, indicate the rate of water loss—and the size of valve(s) required. If your installation's cold water basin will drain by gravity to a remote storage tank—or if you plan a separate means of controlling makeup water—a price reduction is available for deleting the Marley valve(s). We also offer an optional electronic liquid-level control.

In most instances cooling towers will see the highest water usage at design heat load. Off design conditions (99% of the time) water usage will be less. For a better understanding of how much water your application will use throughout the year, consult our water usage calculator at:

spxcooling.com/watercalc

If too much water is still being consumed consult your Marley sales representative for water saving alternatives.

Makeup Water Flow Required—GPM to Maintain Three (3) Concentrations						
Tower GPM	Cooling "Range" (HW – CW)					
	5°F	10°F	15°F	20°F	30°F	40°F
200	2	3	4	5	8	10
400	3	5	8	10	15	20
600	4	8	12	15	23	30
800	5	10	15	20	30	40
1000	7	13	19	25	38	50
1500	10	19	29	38	57	75
2000	13	25	38	50	75	100
3000	19	38	57	75	113	150
4000	25	50	75	100	150	200
5000	32	63	94	125	188	250
6000	38	75	113	150	225	300
8000	50	100	150	200	300	400

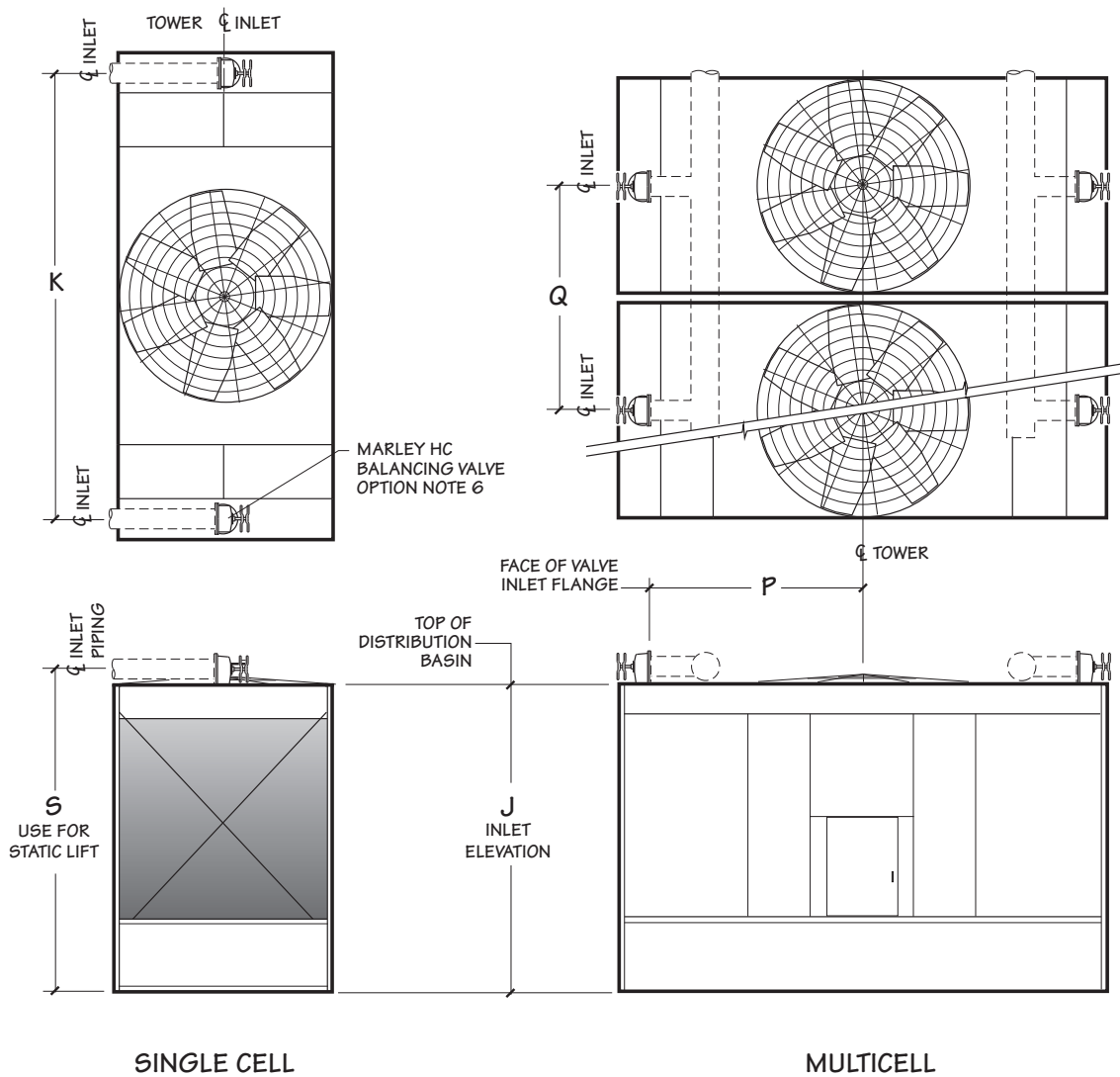
NOTE

- If circulating water is to be maintained at 2 concentrations instead of 3, multiply table GPM values by 1.36 before sizing makeup valve.

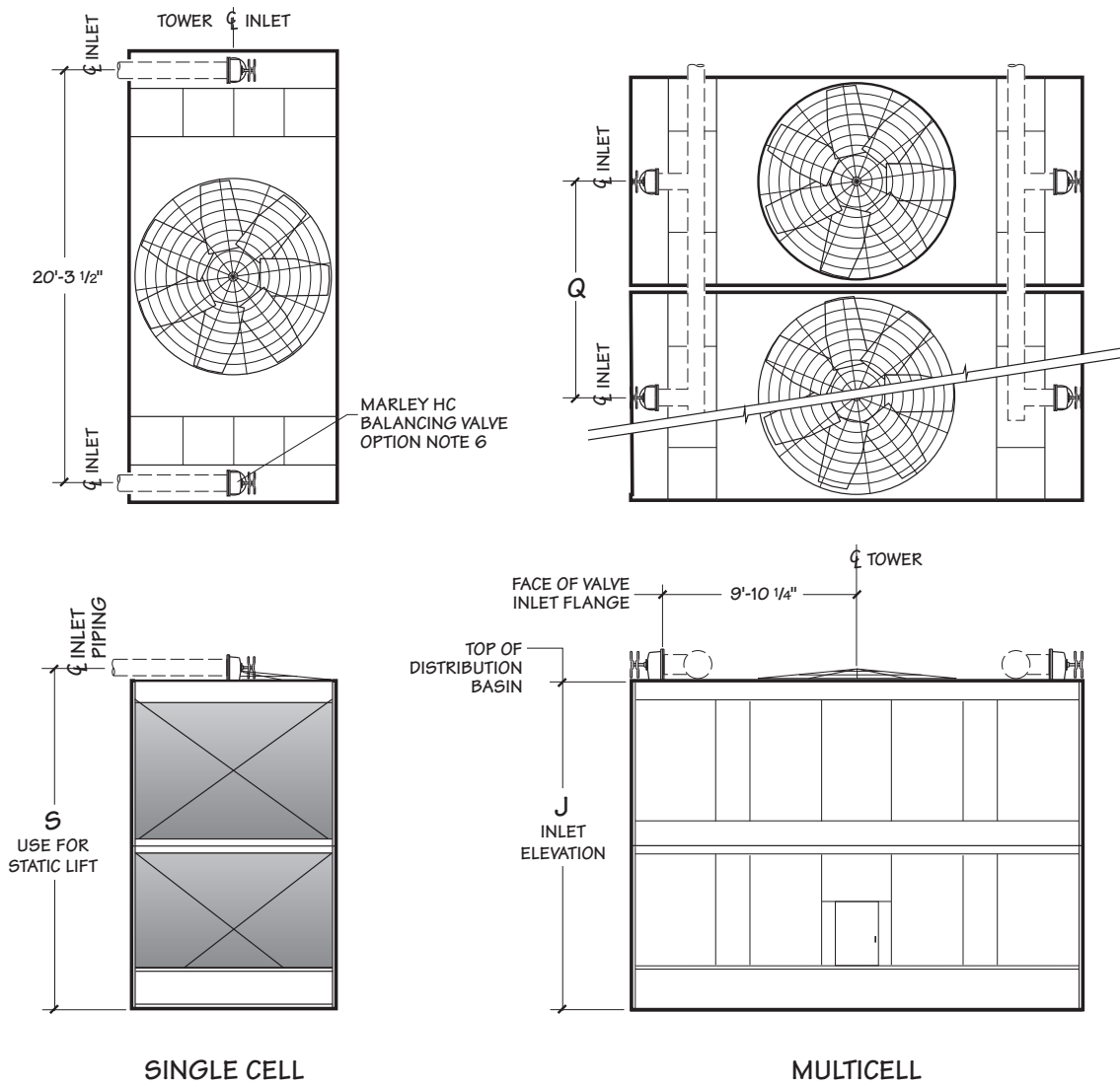
Makeup Valve Flow Capacities—GPM		
Pressure at Valve Inlet while flowing—psig	1" Diameter Valve	2" Diameter Valve
10	56	90
20	78	120
30	92	143
40	106	160
50	117	167

NOTE

- If makeup water pressure exceeds 50 psig, use pressure reducer ahead of valve.
- For flow requirements exceeding the above limitations, use multiples of the same size valve.



Model	Dimensions					Fan Diameter	Inlet Diameter
	J	K	S	P	Q		
NC8401	9'-9"	11'-1"	10'-5 ⁵ / ₁₆ "	5'-3"	6'-9 ³ / ₄ "	72"	2 at 6"
NC8402	9'-9"	12'-5"	10'-5 ⁵ / ₁₆ "	5'-11"	8'-8 ¹ / ₄ "	84"	2 at 6"
NC8403	11'-5 ⁵ / ₁₆ "	16'-0 ¹ / ₂ "	12'-2 ⁷ / ₁₆ "	7'-8 ³ / ₄ "	8'-8 ¹ / ₄ "	84"	2 at 8"
NC8405	11'-5 ⁵ / ₁₆ "	17'-9 ¹ / ₂ "	12'-2 ⁷ / ₁₆ "	8'-7 ¹ / ₄ "	10'-2 ¹ / ₄ "	108"	2 at 8"
NC8407	11'-5 ⁵ / ₁₆ "	19'-0 ⁷ / ₈ "	12'-2 ⁷ / ₁₆ "	9'-2 ⁵ / ₁₆ "	12'-2 ¹ / ₄ "	120"	2 at 8"
NC8409	11'-5 ⁵ / ₁₆ "	20'-3 ¹ / ₂ "	12'-4 ⁷ / ₁₆ "	9'-9 ¹ / ₂ "	14'-2 ¹ / ₄ "	144"	2 at 10"



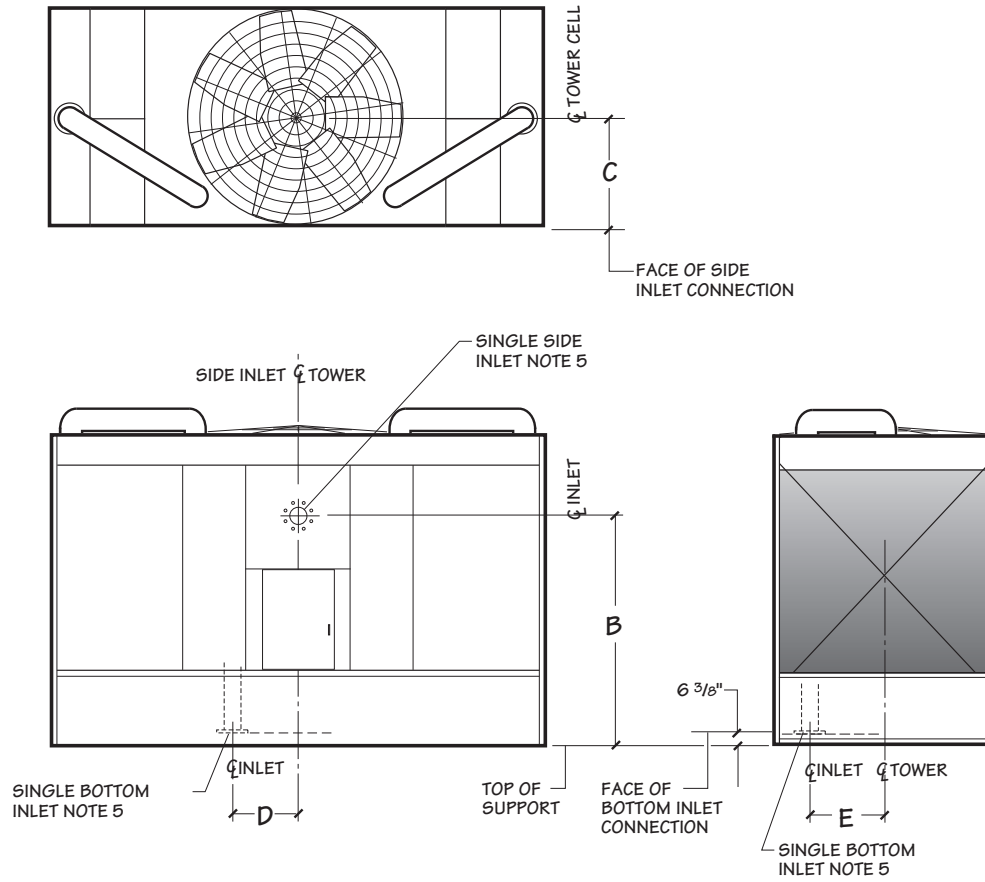
SINGLE CELL

MULTICELL

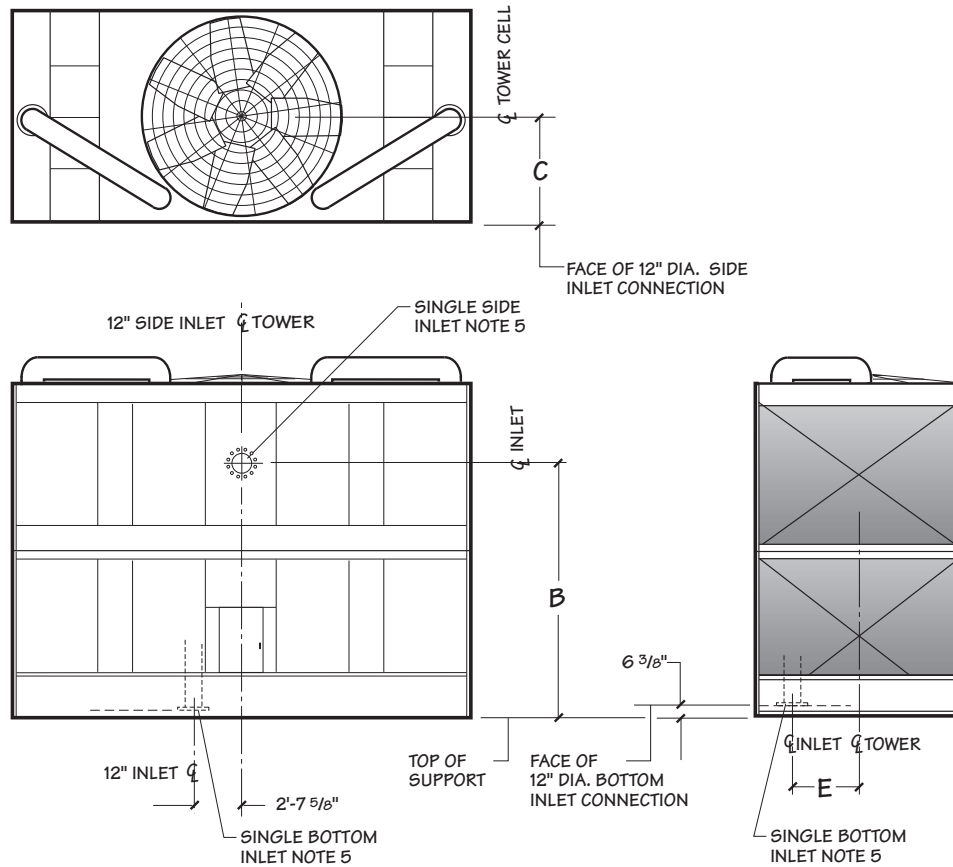
Model	Dimensions			Fan Diameter	Inlet Diameter
	J	S	Q		
NC8411	18'-3 ⁵ / ₈ "	19'-2 ³ / ₄ "	12'-2 ¹ / ₄ "	132"	2 at 10"
NC8412	18'-3 ⁵ / ₈ "	19'-2 ³ / ₄ "	14'-2 ¹ / ₄ "	144"	2 at 10"
NC8413	22'-0 ³ / ₄ "	22'-11 ³ / ₈ "	12'-2 ¹ / ₄ "	132"	2 at 10"
NC8414	22'-0 ³ / ₄ "	22'-11 ³ / ₈ "	14'-2 ¹ / ₄ "	144"	2 at 10"

NOTE

- 1 Use this bulletin for preliminary layouts only. Obtain current drawings from your Marley sales representative.
- 2 Pumping head contributed by the tower is static lift "S". Add your system dynamic pipe losses for total.
- 3 The tower will support the vertical weight of piping shown within the plan area of the tower only. All piping loads, including thrust and lateral loads of riser and horizontal piping must be supported independent of the tower. See inlet piping drawings for details.
- 4 All piping and supports—and their design—are by others.
- 5 Allow adequate clearance for entry to tower access doors and safe use of optional ladder. Refer to appropriate Marley drawings.
- 6 You may choose to use 90° short radius flanged elbows in place of HC balancing valves on single-cell towers where inlet piping is balanced for equal flow. Pipe elevation remains as shown.



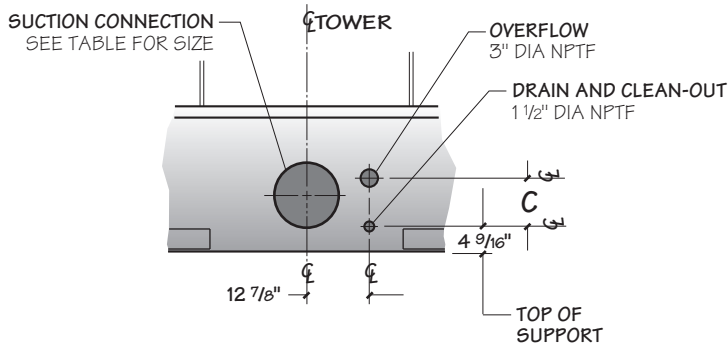
Model	Dimensions				Inlet Diameter
	B	C	D	E	
NC8401	7'-6 ⁷ / ₁₆ "	3'-3 ¹ / ₁₆ "			6"
NC8402	7'-6 ⁵ / ₈ "	5'-0 ¹³ / ₁₆ "	2'-4 ¹ / ₈ "	2'-0"	8"
NC8403	9'-3 ⁹ / ₁₆ "	5'-0 ¹¹ / ₁₆ "	2'-4 ³ / ₁₆ "	2'-5"	8"
NC8405	9'-2 ⁹ / ₁₆ "	5'-11 ⁷ / ₈ "	2'-7 ¹¹ / ₁₆ "	3'-0 ¹ / ₄ "	10"
NC8407	9'-1 ¹¹ / ₁₆ "	7'-0 ¹ / ₈ "	2'-10 ⁵ / ₈ "	4'-2"	10"
NC8409	9'-2 ¹ / ₈ "	8'-0"	2'-10 ⁷ / ₈ "	4'-8"	10"



Model	Dimensions		
	B	C	E
NC8411	16'-1 1/2"	7'-3 7/16"	4'-6"
NC8412	16'-1 1/2"	8'-2 1/2"	5'-5 15/16"
NC8413	19'-10 5/8"	7'-3 7/16"	4'-6"
NC8414	19'-10 5/8"	8'-2 1/2"	5'-5 15/16"

NOTE

- 1 Use this bulletin for preliminary layouts only. Obtain current drawings from your Marley sales representative.
- 2 All external piping loads, including weight, thrust and lateral loads of riser and horizontal piping plus the weight of water in the internal riser must be supported independent of the tower. Internal riser adds additional vertical operating loads to external piping at the bottom inlet flange.
- 3 All piping and supports beyond the inlet connection—and their design—are by others.
- 4 Allow adequate clearance for entry to tower access doors and safe use of optional ladder. Refer to appropriate Marley drawings.
- 5 You may choose either a bottom inlet connection or a side inlet connection. The bottom inlet connects at the tower collection basin floor. Refer to appropriate Marley drawings.
- 6 Contact your Marley sales representative for the required pump head for single-inlet applications.
7. Weight of internal piping must be added to tower weights. Contact your Marley sales representative for combined tower weight information.

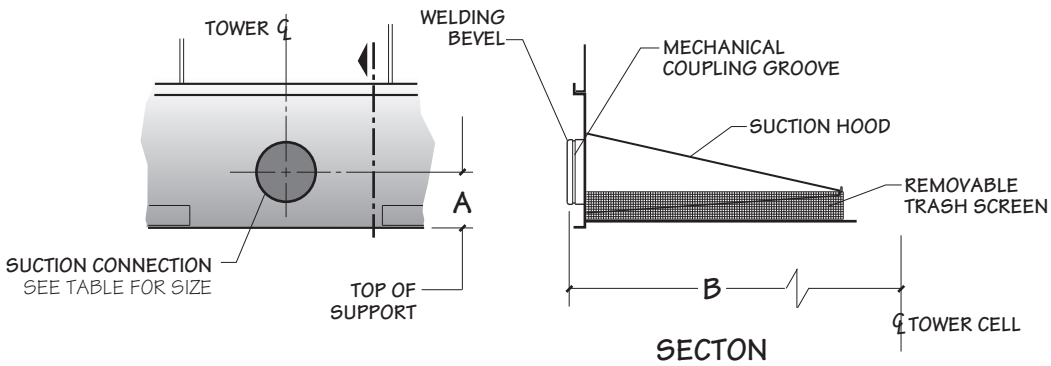


**DRAIN AND OVERFLOW CONNECTION
OPTION**

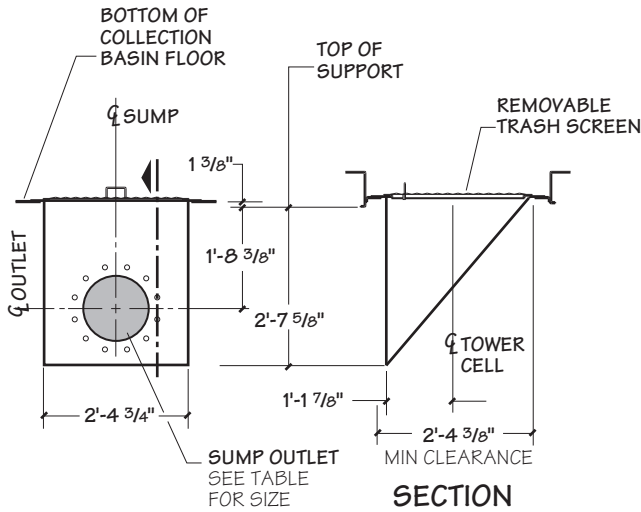
Model	Dimensions		
	A	B	C
NC8401	10"	3'-4 1/8"	8 1/8"
NC8402	10"	4'-3 3/8"	8 1/8"
NC8403	11 1/4"	4'-3 3/8"	10 3/16"
NC8405	11 1/4"	5'-0 3/8"	10 3/16"
NC8407	11 1/4"	6'-0 3/8"	10 3/16"
NC8409	11 1/4"	7'-0 3/8"	10 3/16"
NC8411	11 1/4"	6'-0 3/8"	11 15/16"
NC8412	11 1/4"	7'-0 3/8"	11 15/16"
NC8413	11 1/4"	6'-0 3/8"	11 15/16"
NC8414	11 1/4"	7'-0 3/8"	11 15/16"

NOTE

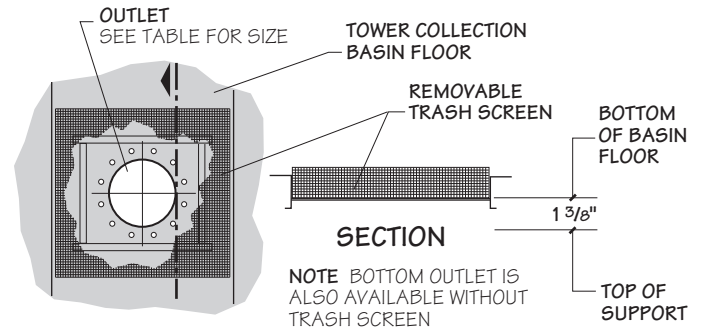
- Standard overflow is a 4" dia. standpipe in the collection basin floor. The standpipe removes for flush-out and draining.



CASED-FACE OUTLET CONNECTION



**DEPRESSED SIDE-OUTLET
SUMP CONNECTION**
STAINLESS STEEL OR FRP

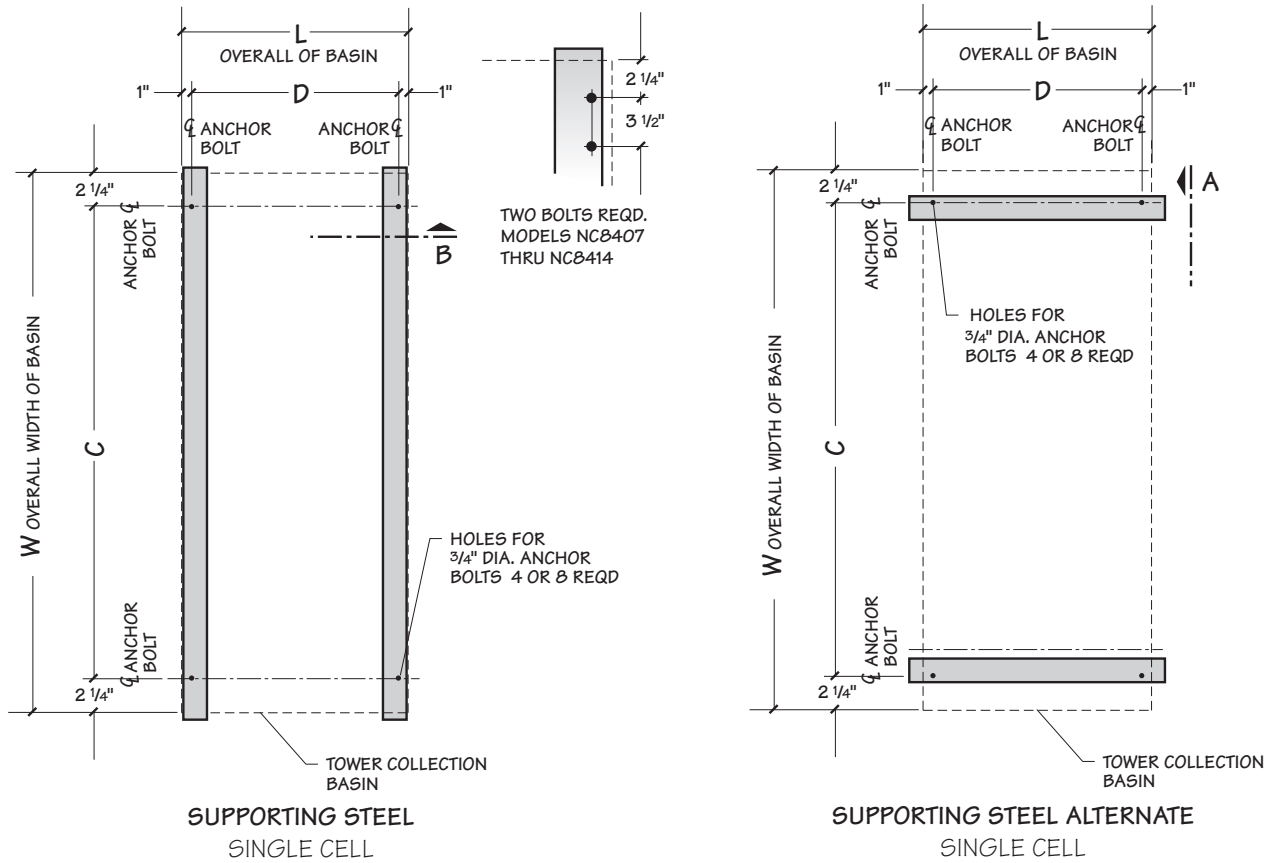


BOTTOM OUTLET CONNECTION

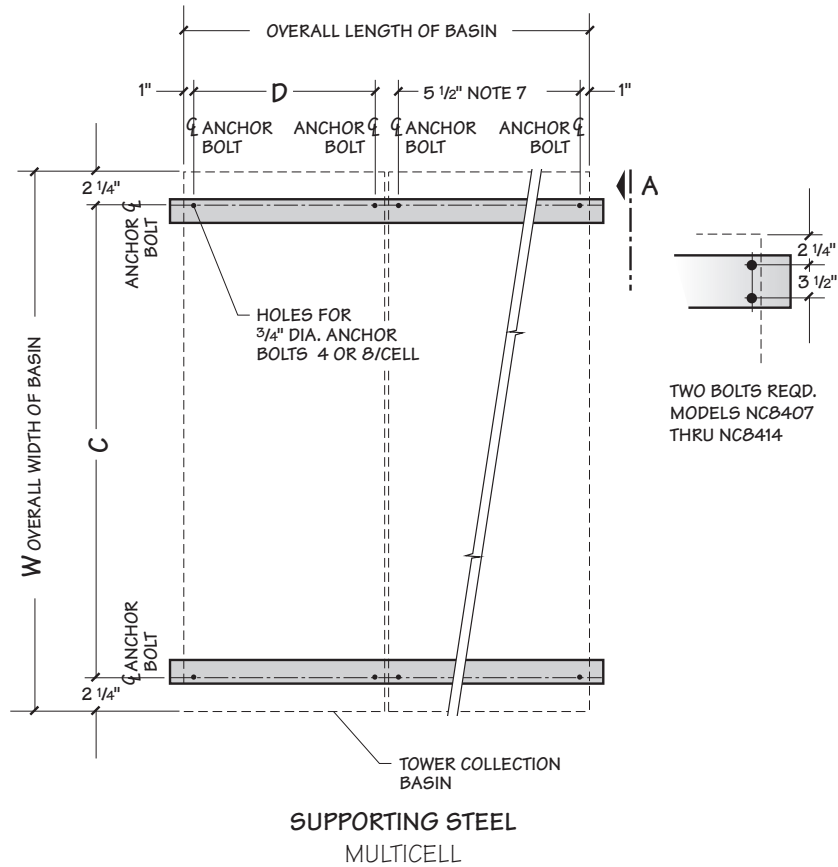
Maximum GPM Per Outlet Diameter												
Outlet Type	Flow Type	Model	Outlet Diameter									
			4"	6"	8"	10"	12"	14"	16"	18"	20"	24"
Bottom	pump flow w/ anti-vortex plate or gravity flow w/ or w/o anti-vortex plate	NC8401 thru NC8405	157	355	630	993	1413	1729	2285	2509	3322	4019
		NC8407 thru NC8414	167	380	673	1061	1510	1848	2442	3164	3829	4896
	pump flow w/o anti-vortex plate	NC8401 thru NC8414	71	162	287	453	644	788	1042	1349	1676	2433
Sump	pump flow w/ anti-vortex plate or gravity flow w/ or w/o anti-vortex plate	NC8401 thru NC8405		900	1595	2515	3578	4284				
		NC8407 thru NC8414		900	1595	2515	3578	4379				
	pump flow w/o anti-vortex plate	NC8401 thru NC8414		630	1116	1761	2505	3065				
cased-face outlet	pump flow only	NC8401 thru NC8405		900	1595	2515	3578					
		NC8407 thru NC8414		900	1595	2515	3578	4379				

NOTE

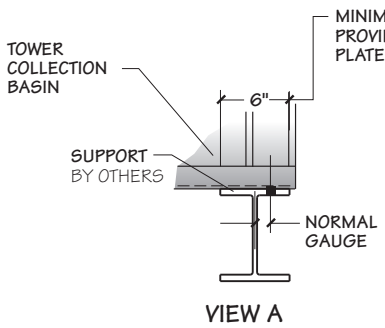
- Flow rate may be limited by the maximum GPM for unit size.
- For gravity-flow situations (as to an indoor tank), use bottom outlet or depressed side outlet sump. Cased-face outlet is not recommended for gravity flow.
- GPM limits are the outlet capacities per outlet based on the design operating water level—81/2" above the top of support on models NC8401 through NC8405—91/2" on NC8407 thru NC8414.



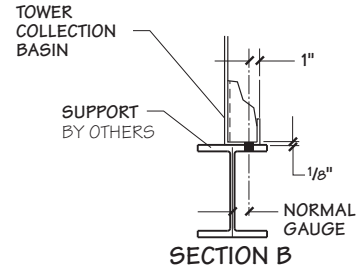
Model	Dimensions				Design Operating Weight/Cell lb	Design Operating Load at Anchor lb	Wind p and Seismic g Loads lb <small>note 4</small>			
	W	L	C	D			Max Vertical Reaction at Anchor		Max Horizontal Reaction at Anchor	
NC8401	12'-10"	6'-6 1/4"	12'-5 1/2"	6'-4 1/4"	7889	1972	48.41 x p	3025 x g	31.41 x p	1972 x g
NC8402	14'-2"	8'-4 3/4"	13'-9 1/2"	8'-2 3/4"	10319	2580	41.26 x p	2962 x g	34.68 x p	2603 x g
NC8403	18'-2"	8'-4 3/4"	17'-9 1/2"	8'-2 3/4"	15844	3961	72.72 x p	5147 x g	52.13 x p	3755 x g
NC8405	19'-11"	9'-10 3/4"	19'-6 1/2"	9'-8 3/4"	19480	4870	67.43 x p	5186 x g	57.16 x p	4672 x g
NC8407	21'-0"	11'-10 3/4"	20'-7 1/2"	11'-8 3/4"	25333	6333	58.98 x p	5248 x g	60.26 x p	5837 x g
NC8409	22'-5"	13'-10 3/4"	22'-0 1/2"	13'-8 3/4"	30654	7663	53.79 x p	5058 x g	64.33 x p	6268 x g
NC8411	22'-5"	11'-10 3/4"	22'-0 1/2"	11'-8 3/4"	37680	9420	160.70 x p	14373 x g	102.78 x p	9422 x g
NC8412	22'-5"	13'-10 3/4"	22'-0 1/2"	13'-8 3/4"	43515	10879	137.29 x p	14412 x g	102.78 x p	10929 x g
NC8413	22'-5"	11'-10 3/4"	22'-0 1/2"	11'-8 3/4"	42929	10782	233.33 x p	18387 x g	123.85 x p	10735 x g
NC8414	22'-5"	13'-10 3/4"	22'-0 1/2"	13'-8 3/4"	49562	12391	199.34 x p	20173 x g	123.85 x p	12466 x g
NC Models with Velocity Recovery Cylinder										
NC8407	21'-0"	11'-10 3/4"	20'-7 1/2"	11'-8 3/4"	25498	6375	73.88 x p	5875 x g	66.51 x p	5875 x g
NC8409	22'-5"	13'-10 3/4"	22'-0 1/2"	13'-8 3/4"	30949	7737	69.06 x p	6342 x g	71.83 x p	6342 x g
NC8411	22'-5"	11'-10 3/4"	22'-0 1/2"	11'-8 3/4"	37863	9466	185.13 x p	14563 x g	109.65 x p	9468 x g
NC8412	22'-5"	13'-10 3/4"	22'-0 1/2"	13'-8 3/4"	43810	10952	160.06 x p	14599 x g	110.28 x p	11003 x g
NC8413	22'-5"	11'-10 3/4"	22'-0 1/2"	11'-8 3/4"	43113	10778	262.17 x p	18607 x g	130.72 x p	10781 x g
NC8414	22'-5"	13'-10 3/4"	22'-0 1/2"	13'-8 3/4"	49957	12489	226.22 x p	20389 x g	131.35 x p	12574 x g



TWO BOLTS REQD.
MODELS NC8407
THRU NC8414



VIEW A



SECTION B

NOTE

- 1 Use this bulletin for preliminary layouts only. Obtain current drawings from your Marley sales representative for final design.
- 2 Purchaser to provide tower support complete with holes and anchor bolts. Do not use studs! Anchor points must be framed flush and level at top.
- 3 Design operating weight occurs with collection basin full to overflow level. Actual operating weight varies with GPM and piping scheme.
- 4 Wind reactions can be calculated by multiplying by p , which is the wind pressure in psf. Seismic reactions can be calculated by design g . Wind loads are additive to operating loads.
- 5 Tower may be placed on a flat concrete slab. Side outlet and optional side drain and overflow must be specified. See pages 13 and 18 and consult your Marley sales representative.
- 6 Tower may be supported from piers at each anchor bolt location, as a support alternative.
7. Dimensions between anchor bolts may vary depending on the number of cells and options. Dimensions shown are for a standard two cell arrangement. Obtain current drawings from your Marley sales representative for final dimension.

When the ambient air temperature falls below 32°F, the water in a cooling tower can freeze. *Marley Technical Report #H-003 "Operating Cooling Towers in Freezing Weather"* describes how to prevent freezing during operation. Available at spxcooling.com or ask your Marley sales representative for a copy.

During shutdown, water collects in the cold water basin and may freeze solid. You can prevent freezing by adding heat to the water left in the tower—or, you can drain the tower and all exposed pipework at shutdown.

ELECTRIC BASIN HEATERS

An automatic basin water heater system is available consisting of the following components:

- Stainless steel electric immersion heater(s).
 - Threaded couplings are provided in the side of the collection basin.
- NEMA 4 enclosure containing:
 - Magnetic contactor to energize heater.
 - Transformer to convert power supply to 24 volts for control circuit.
 - Solid state circuit board for temperature and low-water cutoff.Enclosure may be mounted on the side of the tower.
- Control probe in the collection basin to monitor water temperature and level.

Heater components are normally shipped separately for installation by others.

Note: any exposed piping that is still filled with water at shutdown—including the makeup water line—should be electrically traced and insulated (by others).

STEAM JET BASIN HEATERS

Penberthy Houdaille bronze steam jet heaters (1/4" to 3/4") are available for freeze protection (installation by others). Injectors install in a coupling provided in the side of the collection basin. Live steam, as required, is injected directly into the water. Condensed steam adds water to the basin, and the excess will exit the overflow of the tower.

INDOOR STORAGE TANK

With this type of system, water flows from an indoor tank, through the load system, and back to the tower, where it is cooled. The cooled water flows by gravity from the tower to the tank located in a heated space. At shutdown, all exposed water drains into the tank, where it is safe from freezing.

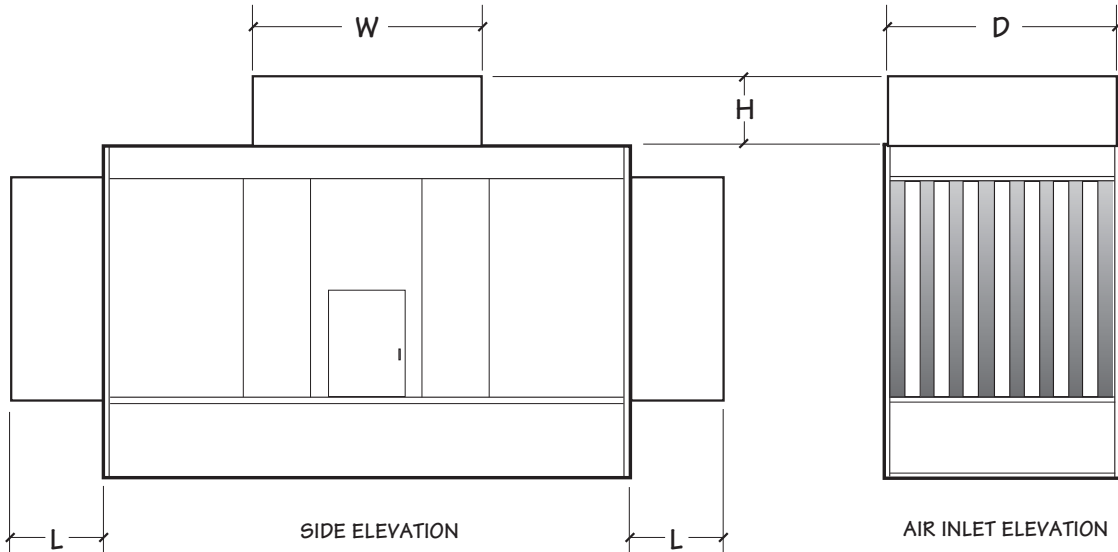
The table on page 23 lists typical drain-down capacities for all NC tower models. Although we do not produce tanks, many of our representatives offer tanks supplied by reputable manufacturers.

The amount of water needed to successfully operate the system depends on the tower size and GPM and on the volume of water contained in the piping system to and from the tower. You must select a tank large enough to contain those combined volumes—plus a level sufficient to maintain a flooded suction on your pump. Control makeup water according to the level where the tank stabilizes during operation.

NC Drain-Down Capacity					
Model	Range of Tower Design GPM	Drain Down Maximum Gallons	Model	Range of Tower Design GPM	Drain Down Maximum Gallons
NC8401	132-280	371	NC8409	481-1200	1673
	290-450	402		1210-1800	1769
	460-620	421		1810-2400	1877
	630-780	442		2410-3000	1910
	790-919	457		3010-3565	1993
NC8402	183-380	508	NC8411	410-1300	1763
	390-590	537		1310-2000	1974
	600-800	568		2010-2700	2128
	810-1010	590		2710-3300	2216
	920-1200	606		3310-4049	2360
NC8403	285-700	811	NC8412	481-1400	2050
	710-1030	877		1410-2200	2231
	1040-1390	925		2210-3000	2422
	1400-1700	960		3010-3800	2571
	1710-2113	1009		3810-4753	2770
NC8405	337-810	969	NC8413	410-1200	1919
	820-1230	1041		1210-1900	2124
	1240-1610	1120		1910-2600	2331
	1620-2030	1173		2610-3300	2494
	2040-2509	1211		3310-4049	2672
NC8407	410-1000	1320	NC8414	481-1400	2244
	1010-1500	1424		1410-2200	2471
	1510-2000	1493		2210-3000	2711
	2010-2500	1542		3010-3900	2940
	2510-3037	1614		3910-4753	3137

NOTE

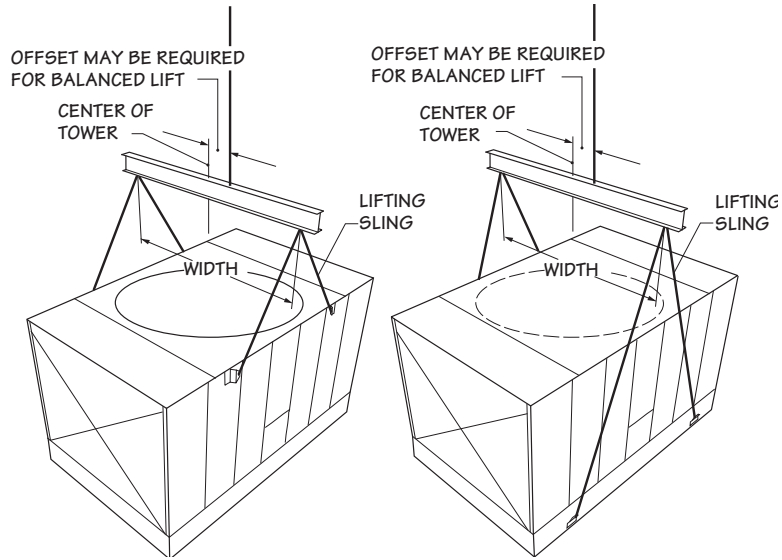
- Volumes shown are maximums for the GPM ranges indicated. Actual volumes will usually be less. Contact your Marley sales representative for more specific information.



Model	Dimensions				Add To Design Operating Weight lb	
	L	W	D	H	Discharge Attenuator	Inlet Attenuators
NC8401	2'-3 ¹ / ₄ "	6'-10"	6'-1 ¹ / ₂ "	2'-3"	620	1523
	4'-6 ¹ / ₂ "	6'-10"	6'-1 ¹ / ₂ "	4'-6"	1241	3045
NC8402	2'-3 ¹ / ₄ "	7'-10 ¹ / ₄ "	8'-0"	2'-3"	774	1869
	4'-6 ¹ / ₂ "	7'-10 ¹ / ₄ "	8'-0"	4'-6"	1547	3738
NC8403	2'-3 ¹ / ₄ "	7'-10 ¹ / ₄ "	8'-0"	2'-3"	774	2101
	4'-6 ¹ / ₂ "	7'-10 ¹ / ₄ "	8'-0"	4'-6"	1547	4201
NC8405	2'-3 ¹ / ₄ "	9'-9"	9'-6"	2'-3"	1051	2460
	4'-6 ¹ / ₂ "	9'-9"	9'-6"	4'-6"	2102	4920
NC8407	2'-3 ¹ / ₄ "	10'-8 ³ / ₈ "	11'-6"	2'-3"	1395	3115
	4'-6 ¹ / ₂ "	10'-8 ³ / ₈ "	11'-6"	4'-6"	2791	6231
NC8409	2'-3 ¹ / ₄ "	12'-9 ³ / ₈ "	13'-6"	2'-3"	1616	3508
	4'-6 ¹ / ₂ "	12'-9 ³ / ₈ "	13'-6"	4'-6"	3233	7016
NC8411	2'-3 ¹ / ₄ "	11'-8 ⁷ / ₈ "	11'-6"	2'-3"	1564	5562
	4'-6 ¹ / ₂ "	11'-8 ⁷ / ₈ "	11'-6"	4'-6"	3128	11125
NC8412	2'-3 ¹ / ₄ "	12'-9 ³ / ₈ "	13'-6"	2'-3"	1616	6272
	4'-6 ¹ / ₂ "	12'-9 ³ / ₈ "	13'-6"	4'-6"	3233	12545
NC8413	2'-3 ¹ / ₄ "	11'-8 ⁷ / ₈ "	11'-6"	2'-3"	1564	6417
	4'-6 ¹ / ₂ "	11'-8 ⁷ / ₈ "	11'-6"	4'-6"	3128	12834
NC8414	2'-3 ¹ / ₄ "	12'-9 ³ / ₈ "	13'-6"	2'-3"	1616	7051
	4'-6 ¹ / ₂ "	12'-9 ³ / ₈ "	13'-6"	4'-6"	3233	14103

NOTE

- 1 Use this bulletin for preliminary layouts only. Obtain current drawings from your Marley sales representative. All table data is per cell.
- 2 Attenuators are field installed by others with hardware provided by Marley
- 3 Attenuators are supported by the tower. Additional support not required.
- 4 Discharge attenuators are not available for NC models with velocity recovery cylinders.



Model	Width	Minimum Sling Length
NC8401	6'-7"	6'-0"
NC8402	8'-6"	6'-0"
NC8403	8'-6"	8'-0"
NC8405	10'-0"	8'-0"
NC8407	12'-0"	9'-0"
NC8409	14'-0"	18'-0"
NC8411 Top	12'-0"	9'-0"
NC8411 Bottom	12'-0"	18'-0"
NC8412 Top	14'-0"	9'-0"
NC8412 Bottom	14'-0"	18'-0"
NC8413 Top	12'-0"	9'-0"
NC8413 Bottom	12'-0"	18'-0"
NC8414 Top	14'-0"	9'-0"
NC8414 Bottom	14'-0"	18'-0"

NOTE

- All hoisting clip holes are 1 ¼".
- On multicell tower installations, overall length of shackle pins should not exceed 5 ¼".
- For overhead lifts or where additional safety is required, add slings beneath the tower unit.

NC 8400 steel
cooling tower

ENGINEERING DATA



SPX COOLING TECHNOLOGIES, INC.

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OVERLAND PARK, KANSAS 65213 USA

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In the interest of technological progress, all products are subject to design and/or material change without notice

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