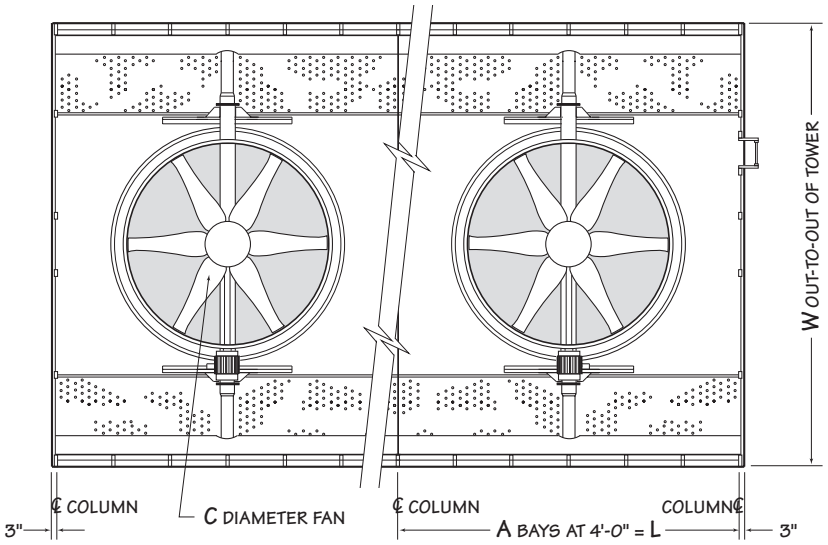
/ **Marley Sigma F Series** *Crossflow Cooling Tower* /

Technical Reference and Engineering Data

SPX Cooling Technologies

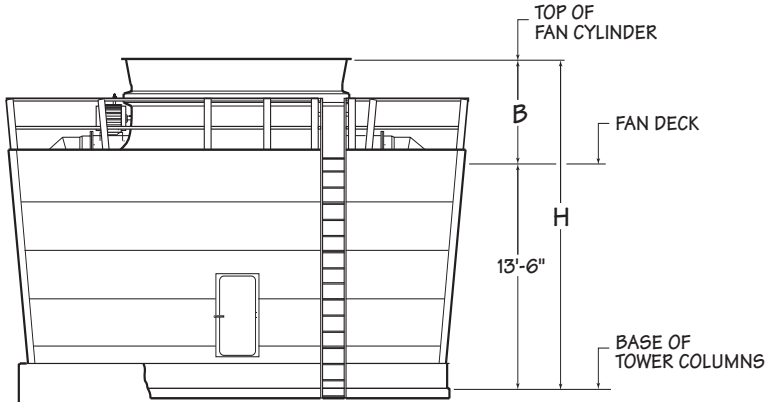
Balcke | Hamon Dry Cooling | Marley



Tower Plan

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

The Marley UPDATE web-based selection software — available at www.spxcooling.com — provides Sigma F Series model recommendations based on customer's specific design requirements.



Endwall Elevation

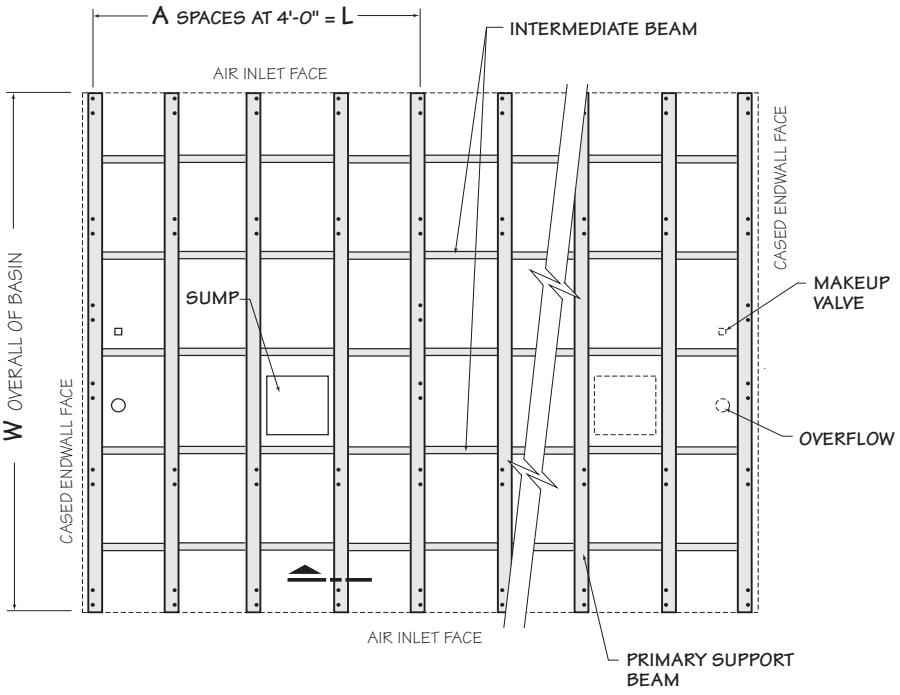
Tower Model	Dimensions					
	W	L	H	A	B	C
F1211	29′-2″	16′-0″	19′-6″	4	6′-0″	144″
F1221	31′-2″	16′-0″	20′-6″	4	7′-0″	168″
F1231	31′-2″	20′-0″	20′-6″	5	7′-0″	168″
F1241	31′-2″	24′-0″	20′-6″	6	7′-0″	168″
F1251	35′-2″	24′-0″	20′-6″	6	7′-0″	216″
F1261	35′-2″	28′-0″	20′-6″	7	7′-0″	216″

Notes

1. ***Use this bulletin for preliminary layouts only.*** Obtain current drawings from your Marley representative.
2. All table data is per cell.
3. All tower installations require a minimum of 4′-0″ from centerline of tower endwall column to any vertical obstruction at tower ladder location. Ladder can be located at any corner of the fan deck.

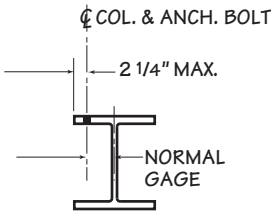
Ladder extends 8⅜″ below the base of tower columns on applications with a stainless steel cold water basin. Ladder stops at top of basin curb wall on applications with a concrete basin.
Tower installations with an elevation 20′-0″ or more from the top of the fan deck to grade or roof level require a safety cage on the tower ladder in compliance with OSHA standards. Marley ladder safety cages are available as an option.

/ Steel Basin Support /



Plan

Elevation

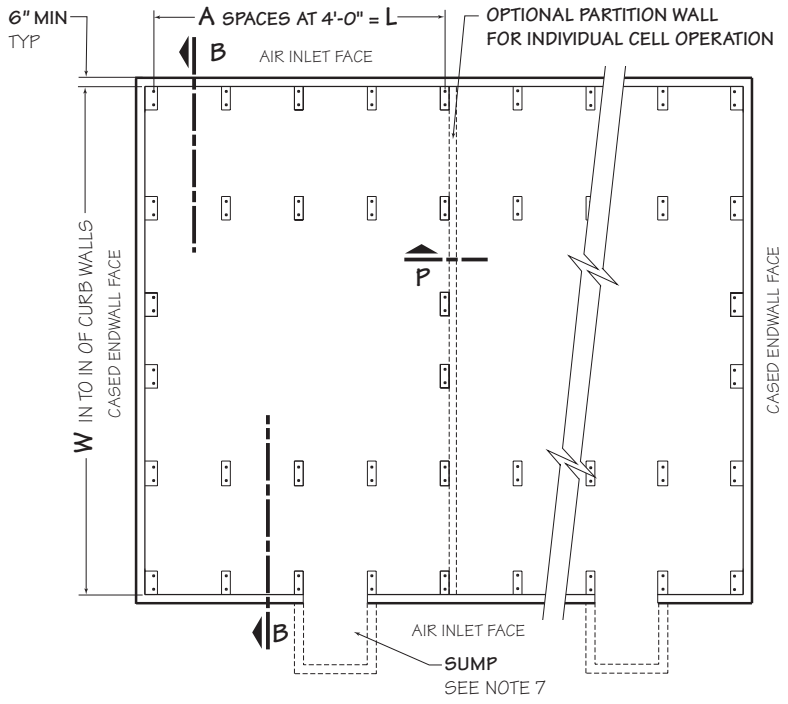


Section

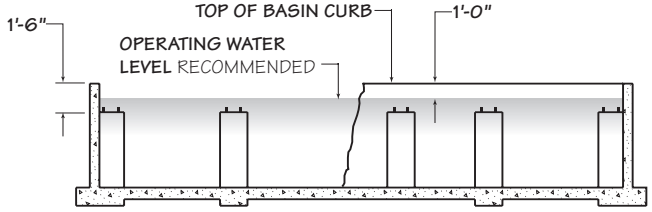
Tower Model	Dimensions			Operating Weight lb	
Note 4	A	W	L	Single Fan Cell	Each Cell Add
F1211	4	26′-6″	16′-0″	55,810	51,510
F1221	4	28′-6″	16′-0″	59,300	54,920
F1231	5	28′-6″	20′-0″	70,180	65,760
F1241	6	28′-6″	24′-0″	81,410	77,020
F1251	6	32′-6″	24′-0″	91,070	86,450
F1261	7	32′-6″	28′-0″	102,800	98,090

Notes

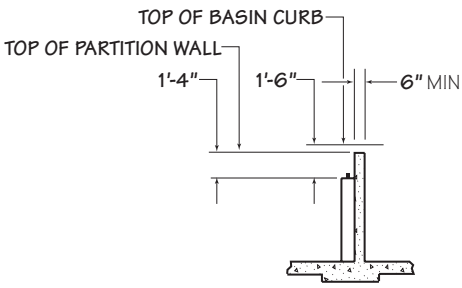
1. ***Use this bulletin for preliminary layouts only.*** **Do not use for construction.** Obtain current drawings from your Marley representative.
2. Operating weight is total wet weight including stainless steel collection basin with 6″ (recommended operating water level) of water.
3. Purchaser to design, construct and furnish supporting steel complete with 13⁄16″ diameter holes for anchor bolts to suit the general dimensions of current Marley drawings.
4. Last number of model indicates number of cells. Change as appropriate for your selection. Primary engineering data is per cell.
5. Maintain no less than 2′-0″ of clear space at tower endwalls for construction purposes. Louvered faces must have unobstructed air supply. If obstructions exist nearby, consult your Marley representative.



Plan



Section B



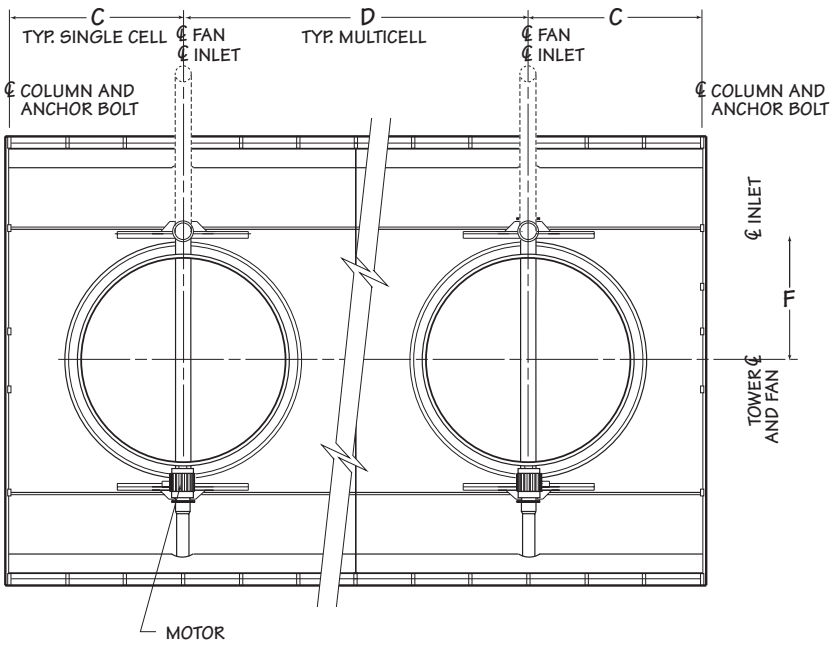
Section P

Tower Model	Dimensions			Operating Weight lb	
Note 4	A	W	L	Single Fan Cell	Each Cell Add
F1211	4	26′-4″	16′-0″	39,220	35,920
F1221	4	28′-4″	16′-0″	41,460	38,160
F1231	5	28′-4″	20′-0″	48,200	44,860
F1241	6	28′-4″	24′-0″	55,300	51,980
F1251	6	32′-4″	24′-0″	61,260	57,880
F1261	7	32′-4″	28′-0″	68,280	64,800

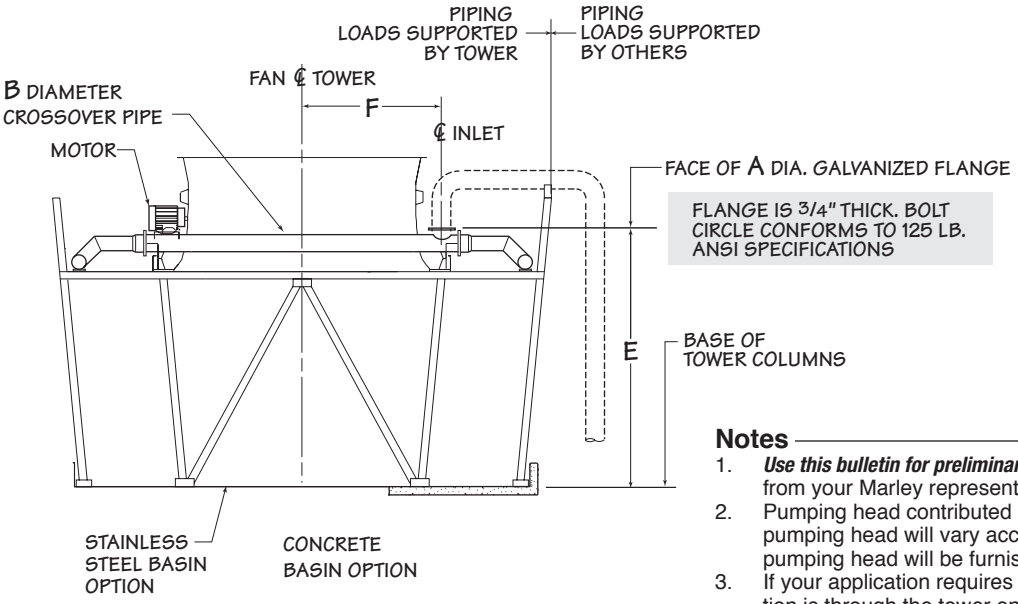
Notes

1. ***Use this bulletin for preliminary layouts only.*** **Do not use for construction.** Obtain current drawings from your Marley representative.
2. Tower weight is total wet operating weight of tower only excluding water in the concrete basin.
3. Purchaser to design, construct and furnish concrete basin complete to suit the general dimensions of current Marley drawings.
4. Last number of model indicates number of cells. Change as appropriate for your selection. Primary engineering data is per cell.
5. All anchor bolts complete with nut and washer will be furnished by others. Bolts are ¾″ diameter with 1½″ all thread projection. Material should be stainless steel.
6. Maintain no less than 2′-0″ of clear space at tower endwalls for construction purposes. Louvered faces must have unobstructed air supply. If obstructions exist nearby, consult your Marley representative.
7. Purchaser must design, construct, and furnish sump(s) and overflow(s) to suit requirements. The sump should be designed according to the pump manufacturer's recommendations.

/ Inlet Piping Plan 2 /



Plan

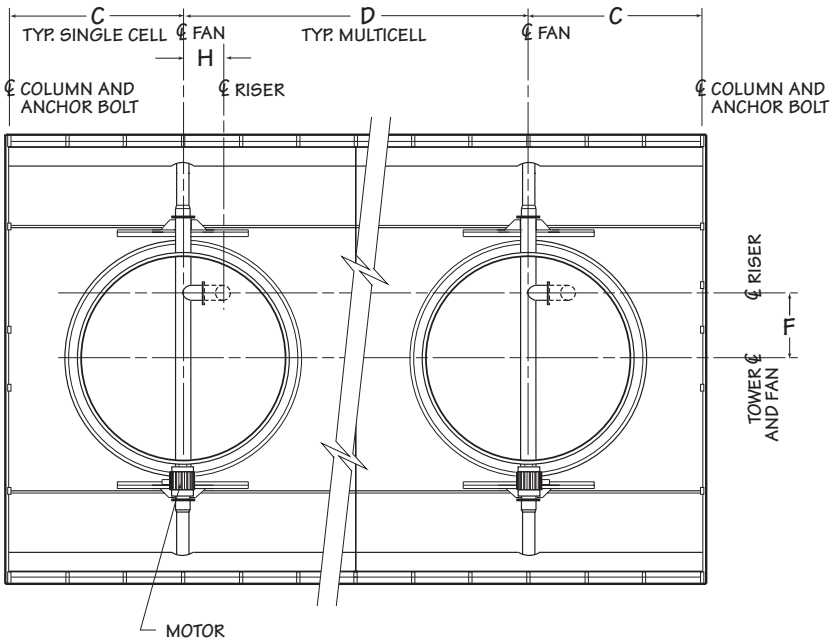


End Elevation

Notes

1. ***Use this bulletin for preliminary layouts only.*** Obtain current drawings from your Marley representative.
2. Pumping head contributed by the tower is static lift **E**. Actual pumping head will vary according to tower circulating GPM. Total pumping head will be furnished at time of proposal.
3. If your application requires a bypass system, recommended location is through the tower endwall into the plenum area. Review of the system by SPX engineering is required.
4. All header and riser piping to be furnished by others. A corrosion-resistant material or coating for piping is recommended. All inlet piping loads, including thrust and seismic, outside of tower plan area must be supported by others.

Tower Model Series	Flow/Cell GPM	Dimensions					
		A	B	C	D	E	F
F1210	1,050-5,750	12″	10″	8′-0″	16′-0″	15′-10 ⅞″	7′-6″
F1220	1,050-5,750	14″	12″	8′-0″	16′-0″	15′-11 ⅞″	8′-6″
F1230	1,320-7,200	14″	12″	10′-0″	20′-0″	15′-11 ⅞″	8′-6″
F1240	1,500-8,650	14″	12″	12′-0″	24′-0″	15′-11 ⅞″	8′-6″
F1250	1,500-8,650	16″	14″	12′-0″	24′-0″	16′-0 ⅞″	10′-6″
F1260	1,850-10,100	16″	14″	14′-0″	28′-0″	16′-0 ⅞″	10′-6″



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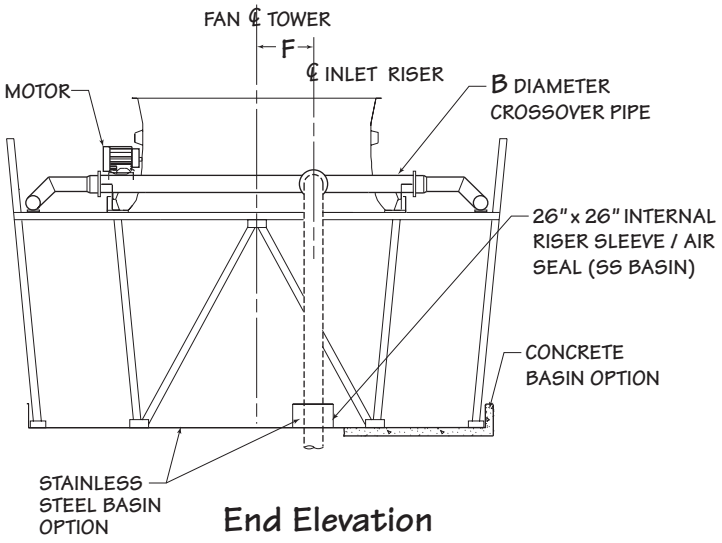
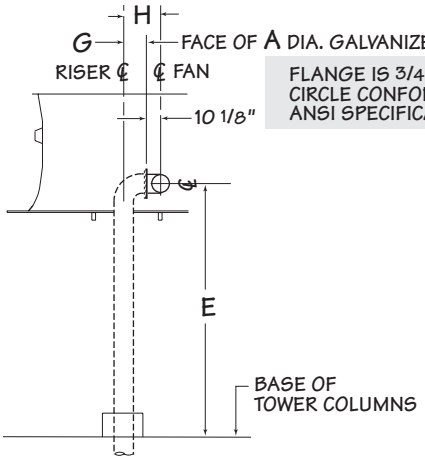


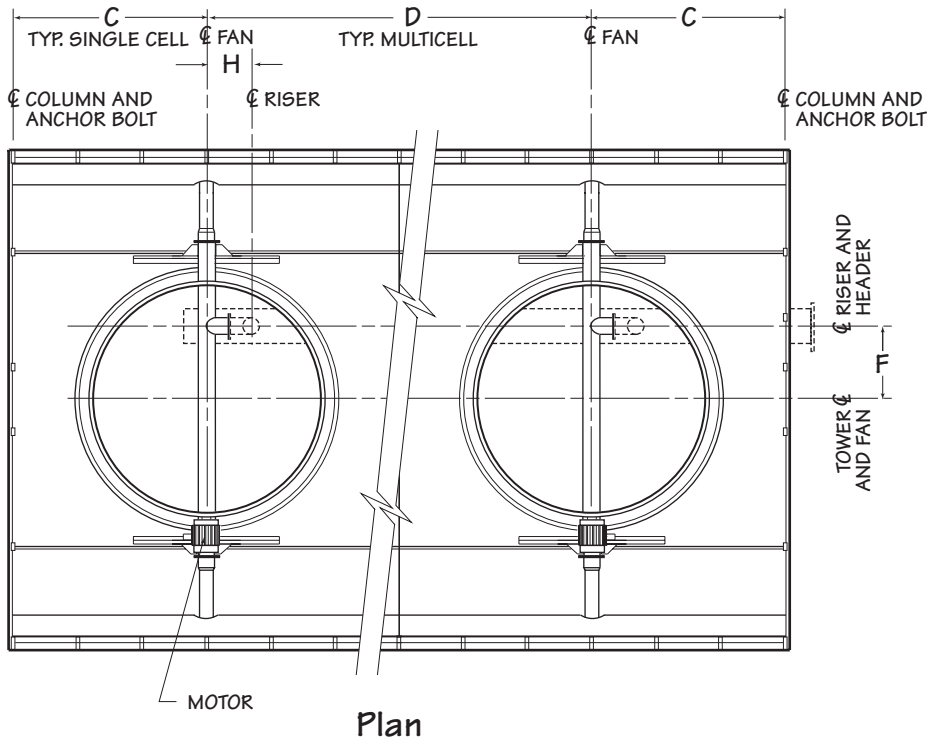
End Elevation



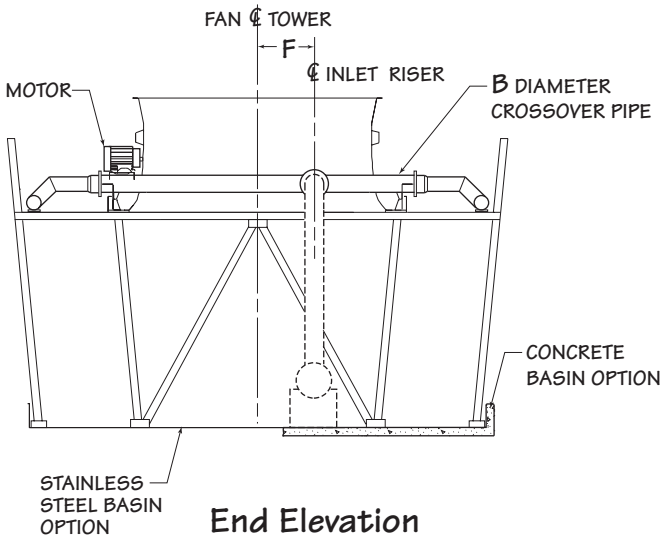
Side Elevation

Tower Model Series	Flow/Cell GPM	Dimensions							
		A	B	C	D	E	F	G	H
F1210	1,050-5,750	12″	10″	8′-0″	16′-0″	15′-0 ¾″	3′-3″	1′-7 ⅞″	2′-6″
F1220	1,050-5,750	14″	12″	8′-0″	16′-0″	15′-1 ¾″	3′-6″	1′-7 ⅞″	2′-6″
F1230	1,320-7,200	14″	12″	10′-0″	20′-0″	15′-1 ¾″	3′-6″	2′-7 ⅞″	3′-6″
F1240	1,500-8,650	14″	12″	12′-0″	24′-0″	15′-1 ¾″	3′-6″	1′-7 ⅞″	2′-6″
F1250	1,500-8,650	16″	14″	12′-0″	24′-0″	15′-2 ¾″	3′-9″	1′-7 ⅞″	2′-6″
F1260	1,850-10,100	16″	14″	14′-0″	28′-0″	15′-2 ¾″	3′-9″	3′-1 ⅞″	3′-9″

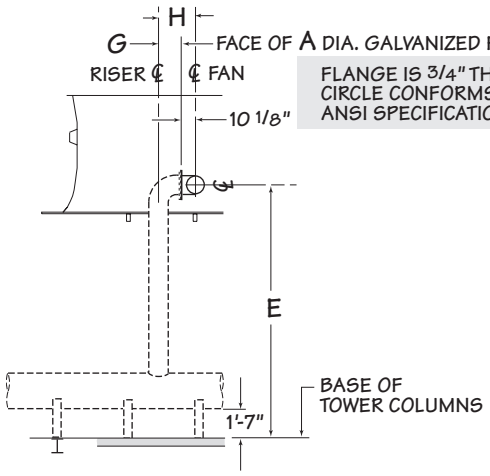
/ Inlet Piping Plan 4 /



Plan



End Elevation



Side Elevation

Notes

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2. Pumping head contributed by the tower is static lift **E**. Actual pumping head will vary according to tower circulating GPM. Total pumping head will be furnished at time of proposal.
3. If your application requires a bypass system, recommended location is through the tower endwall into the plenum area. Review of the system by SPX engineering is required.
4. All header and riser piping to be furnished by others. A corrosion-resistant material or coating for piping is recommended. **Do not** support riser dead load or operating load from inlet connection or tower structure.

Cooling towers are usually selected to produce a specific cold water temperature at the higher summertime wet-bulb temperatures. During the remainder of the year, the cooling tower is capable of producing much colder water. Unless your system will benefit from the coldest possible water temperature, you should consider controlling cold water temperatures to higher levels. You'll also save energy by using such control. For greater insight on cold water temperature control, please read "Cooling Tower Energy and its Management", *Technical Report #H-001A,* available from your Marley sales representative or on the web at **spxcooling.com**.

Always control leaving water temperature by manipulating the quantity of air that the fan moves through the tower. Varying the quantity of water flow is not normally recommended and can be harmful in freezing weather. You can alternately start and stop single-speed motors to maintain water temperatures within an acceptable range. However, exceeding a total acceleration time of 30 seconds per hour can overheat the motor, causing the insulation to fail. Limiting the number of motor starts, on the other hand, can produce significant variations in the temperature of the water delivered to the process.

Increased flexibility can simplify your operating procedures and save you money in the long run, both on operation and on maintenance. Here are two of the more popular options.

Two-Speed Motors

Two-speed motors improve operating flexibility by increasing the number of potential operating modes. Users in northern climates will find that the tower can carry winter loads at half-speed; reducing fan power requirements by 85+% during that time. Two-speed motors also help to control icing during wintertime operation. See Marley *Technical Report #H-003*, "Operating Cooling Towers During Freezing Weather," available from your Marley sales representative or on the web at **spxcooling.com**.

Normally, two-speed motors are provided in 1800/900 RPM, single winding configuration, which is the least expensive two-speed option. They are also available in other combinations including the more expensive double winding.

Variable Speed Fan

Frequency modulation devices work well on induced draft, propeller fan cooling towers such as the Sigma. However, their design must include the capability to lock out any critical fan speeds and the very low fan speed ranges.

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

Caution

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

Sound Control

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

- In many cases, noise concerns are limited to nighttime, when ambient noise levels are lower and neighbors are trying to sleep. You can usually resolve these situations by using two-speed motors in either 1800/900 or 1800/1200 RPM configuration—operating the fans at reduced speed without cycling "after hours". The natural nighttime reduction in wet-bulb temperature makes this a very feasible solution in most areas of the world, but the need to avoid cycling may cause the cold water temperature to vary significantly.
- The Marley Variable Frequency 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.
- Where noise is a concern at all times—for example, near a hospital—the best solution is to oversize the tower so it can operate continuously at reduced (1200 or 900 RPM) motor speed. Typical sound reductions are 7 dBA at 2/3 fan speed or 10 dBA at 1/2 fan speed.
- Extreme cases may require inlet and discharge sound attenuator sections—however, the static pressure loss imposed by attenuators may necessitate an increase in tower size. This is the least desirable approach because of the significant cost impact—and because of the obstruction to normal maintenance procedures.

Your Marley representative will help you meet your sound requirements.

Enclosures

Occasionally, cooling towers are located inside architectural enclosures for aesthetic reasons. Although Sigma 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. Obtain a copy of Marley *Technical Report #H-004*, "External Influences on Cooling Tower Performance" from your Marley sales representative or on the web at **spxcooling.com**..

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 representative.

Keeping It Clean

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 ***Sigma User Manual*** which accompanies the tower and also is available from your local Marley sales representative. For complete water treatment recommendations and services, contact your local Marley sales representative.

SPX Cooling Technologies

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7401 W 129 Street // Overland Park, KS USA 66213 // +1 913 664 7400 // spxcooling@ct.spx.com // **www.spxcooling.com**

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