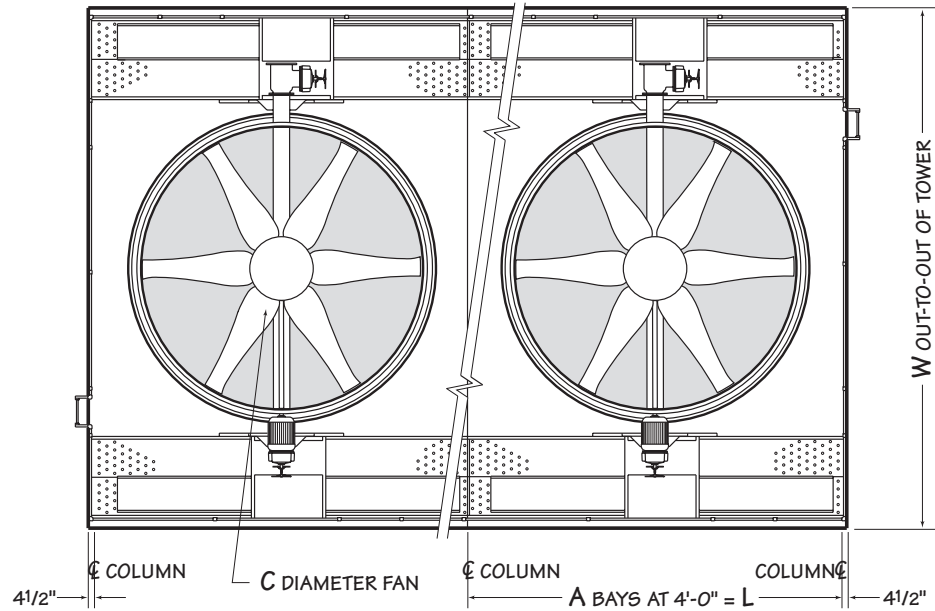


/ Marley Sigma Steel Crossflow Cooling Tower /

Technical Reference and Engineering Data



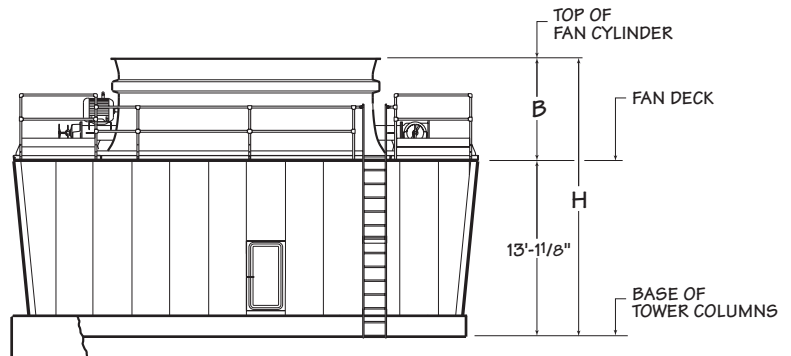
/ Tower Schematic /



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 Steel model recommendations based on customer's specific design requirements.



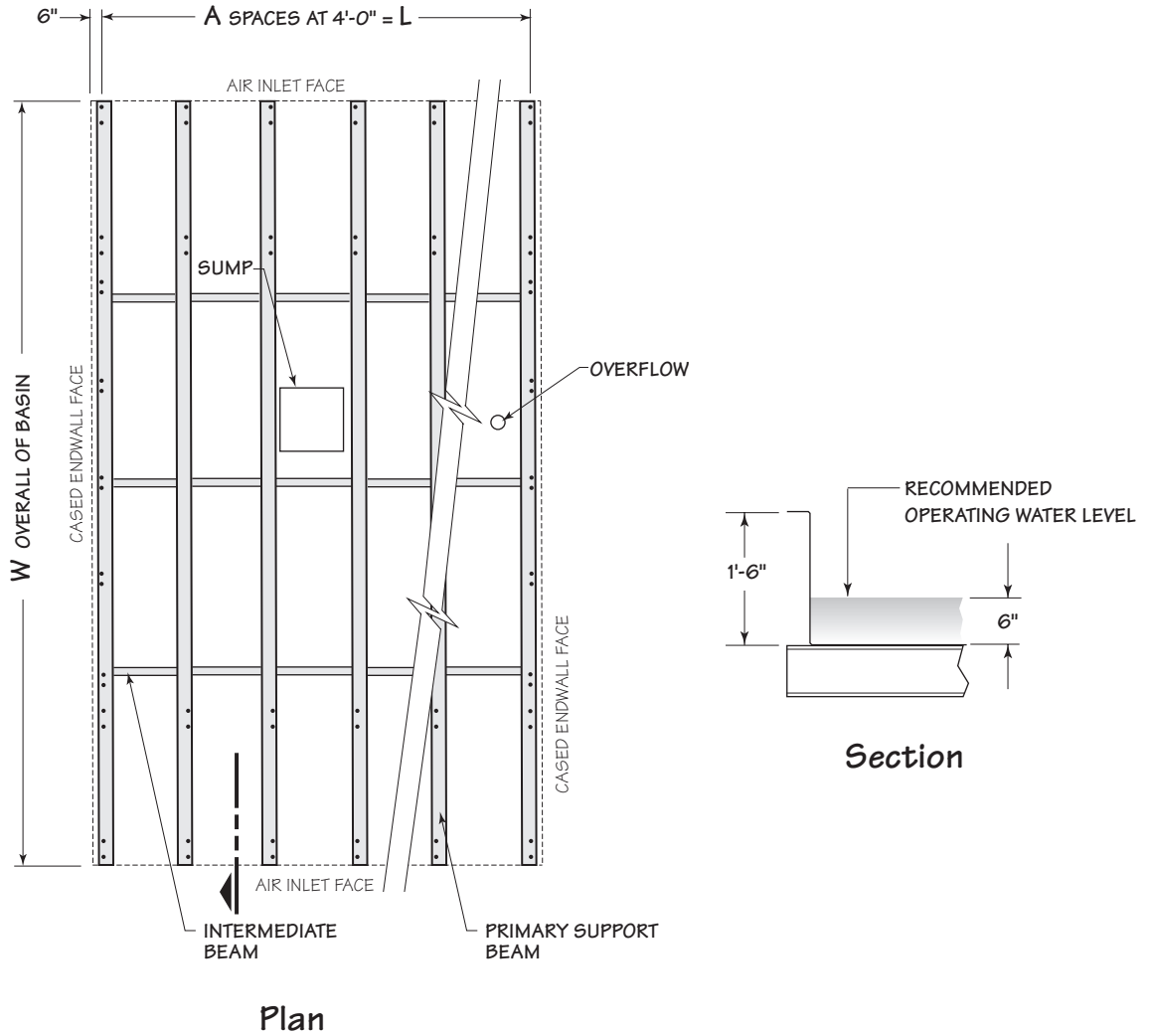
Endwall Elevation

Tower Model	GPM per cell	Dimensions						Maximum Motor hp	Average Pumping Head
		W	L	H	A	B	C		
121-111	500-4500	25'-4"	12'-0"	19'-1 1/8"	3	6'-0"	120"	60	17.3'
122-111	650-6000	27'-4"	16'-0"	19'-1 1/8"	4	6'-0"	144"	60	17.4'
123-111	650-6000	29'-4"	16'-0"	20'-1 1/8"	4	7'-0"	168"	75	17.4'
124-111	1000-7500	29'-4"	20'-0"	20'-1 1/8"	5	7'-0"	168"	75	17.4'
125-111	1000-7500	33'-4"	20'-0"	20'-1 1/8"	5	7'-0"	216"	75	17.5'
126-111	1000-9000	33'-4"	24'-0"	20'-1 1/8"	6	7'-0"	216"	100	17.5'
127-111	1500-10500	33'-4"	28'-0"	20'-1 1/8"	7	7'-0"	216"	100	17.6'

Notes

- Use this bulletin for preliminary layouts only. Obtain current drawings from your Marley sales representative.
- Last number of model indicates number of cells. Change as appropriate for your selection. Primary engineering data is per cell.
- Height shown is from base of tower columns to top of fan cylinder.
- Pumping head shown is from base of tower columns

/ Steel Basin Support /

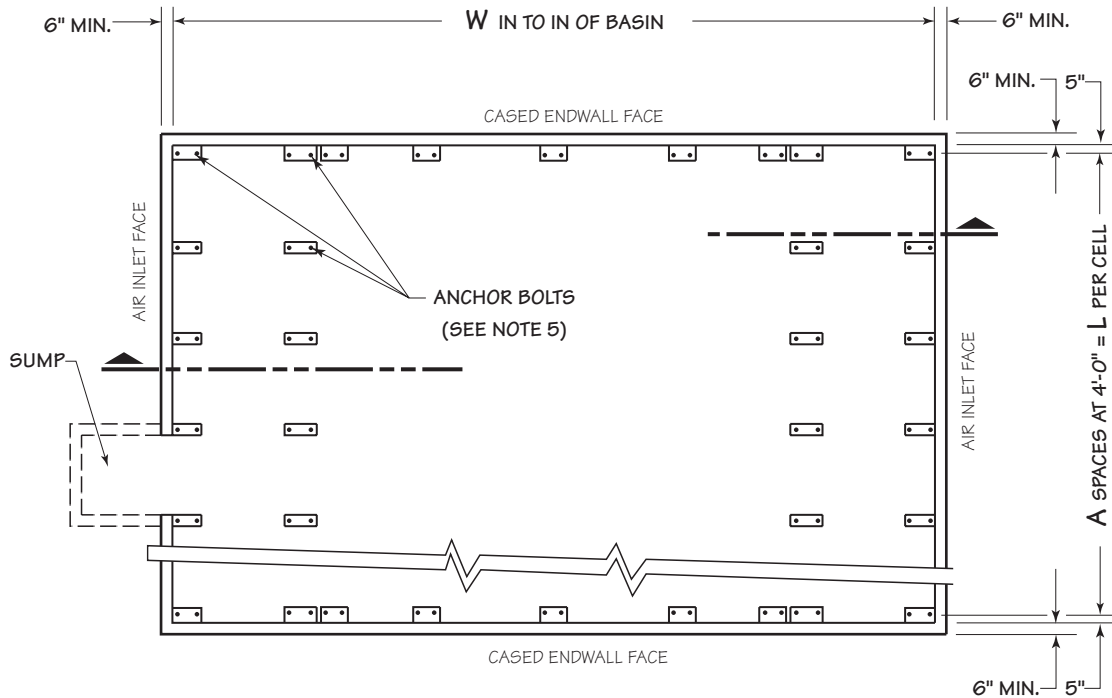


Tower Model	Dimensions			Operating Weight lb	
	A	W	L	Single Fan Cell	Each Cell Add
121-111	3	23'-8"	12'-0"	37,670	33,150
122-111	4	25'-8"	16'-0"	49,875	45,105
123-111	4	27'-8"	16'-0"	50,320	45,230
124-111	5	27'-8"	20'-0"	60,290	55,200
125-111	5	31'-8"	20'-0"	67,150	61,220
126-111	6	31'-8"	24'-0"	77,960	72,115
127-111	7	31'-8"	28'-0"	88,850	83,590

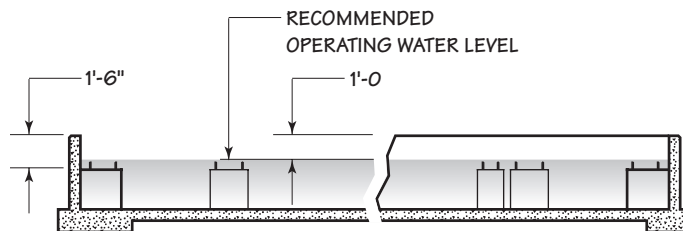
Notes

1. **Use this bulletin for preliminary layouts only.** Obtain current drawings from your Marley sales representative.
2. Steel beams must include $\frac{7}{8}$ " dia. holes to accept anchor bolts provided with tower. Other contractors or purchaser must design and erect supporting steel.
3. Maintain at least 2'-0" of clear space at tower endwalls for construction purposes. Air inlet faces must have unobstructed air supply. If obstructions exist nearby, consult your Marley sales representative.
4. Operating weight is wet weight of tower and steel basin, including 6" of water in the cold water basin.
5. View shown is typical single cell beam arrangement.

/ Concrete Basin /



Plan



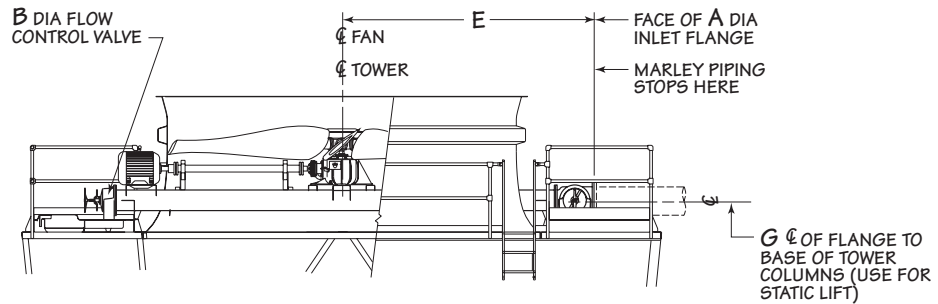
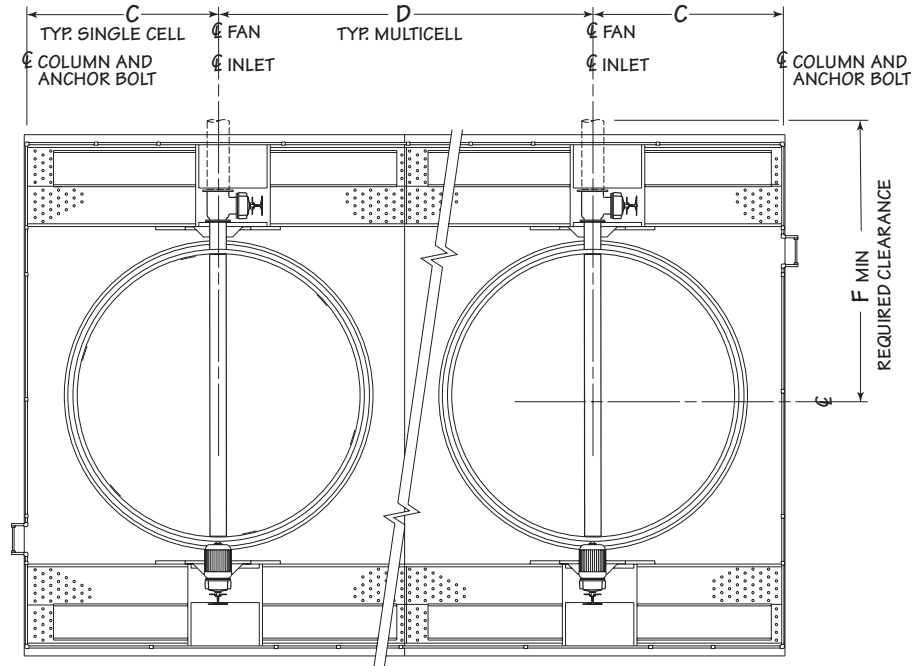
Section

Tower Model	Dimensions			Operating Weight lb	
	A	W	L	Single Fan Cell	Each Cell Add
121-111	3	23'-6"	12'-0"	25,200	21,525
122-111	4	25'-6"	16'-0"	32,280	28,430
123-111	4	27'-6"	16'-0"	33,300	29,080
124-111	5	27'-6"	20'-0"	39,230	35,025
125-111	5	31'-6"	20'-0"	42,800	37,715
126-111	6	31'-6"	24'-0"	48,780	43,910
127-111	7	31'-6"	28'-0"	54,830	50,550

Notes

1. **Use this bulletin for preliminary layouts only.** Do not use for construction. Obtain current drawings from your Marley sales representative. Concrete basin design and construction are by other contractors or purchaser.
2. Operating weight is total wet operating weight of tower only, excluding water in concrete basin.
3. Maintain at least 2'-0" of clear space at tower endwalls for construction purposes. Air inlet faces must have unobstructed air supply. If obstructions exist nearby, consult your Marley sales representative.
4. Minimum basin depth is 1'-6". Basin depth may vary to suit your storage requirements.
5. All anchor bolts complete with nut and washer must be furnished by others. Bolts must be 3/4" diameter with 1 1/2" all-thread projection.
6. Other contractors or purchaser must design, locate, construct, and furnish sump(s) and overflow(s) to suit requirements. The sump(s) should be designed according to the pump manufacturer's recommendations. Other design sources: ANSI/HI specifications 1.1-1.5 for centrifugal pumps, 2.1-2.5 for vertical pumps, and 9.8 for pump intake design.

/ Inlet Piping Plan /



Tower Model	GPM per cell	Dimensions						
		A	B	C	D	E	F	G
121-111	500-3800	10"	8"	6'-0"	12'-0"	8'-10½"	13'-1¼"	14'-6¾"
	3801-4500	12"	10"			9'-0½"		14'-7¾"
122-111	650-6000	14"	10"	8'-0"	16'-0"	10'-0½"	14'-1¼"	14'-7¾"
123-111	650-6000	14"	10"	8'-0"	16'-0"	11'-0½"	15'-1¼"	14'-7¾"
124-111	1000-6000	14"	10"	10'-0"	20'-0"	11'-0½"	15'-1¼"	14'-7¾"
	6001-7500	16"	12"			11'-1½"		14'-8¾"
125-111	1000-7500	16"	12"	10'-0"	20'-0"	13'-1½"	17'-1¼"	14'-8¾"
126-111	1000-9000	16"	12"	12'-0"	24'-0"	13'-1½"	17'-1¼"	14'-8¾"
127-111	1500-10500	18"	14"	14'-0"	28'-0"	13'-5⅝"	17'-1¼"	14'-9¾"

Notes

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 "G". 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 tower endwall into plenum area. Review of the system by SPX engineering is required.
4. Marley piping terminates at face of a cast iron flat face flange. Bolt circle conforms to class 125 lb. ANSI B 16.1 specifications.
5. Supports on tower for crossover piping are part of the tower design. **Do not support the riser's dead load or operating load from the tower. Do not brace the riser's seismic or thrust loads against the tower.**
6. Butterfly valves or piping expansion joints (if used) are by others and must be located outside the limits of the cooling tower "F".
7. Motor must be located 180° from inlet.

/ Operating and Environmental Awareness /

Sound Control

Sound produced by a Sigma Steel 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 dampening 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 sales 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 sales 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

Contaminants including Legionella, an effective consistent water treatment program is required. Controlling blowdown may be adequate in mitigating the potential of 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.

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.

/ Temperature Control and Energy Management /

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 Drive

Frequency modulation devices work well on induced draft, propeller fan cooling towers such as the Sigma Steel cooling tower. 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.



SPX Cooling Technologies

Balcke | Hamon Dry Cooling | Marley

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

In the interest of technological progress, all products are subject to design and/or material change without notice
©2005 SPX Cooling Technologies, Inc. | Printed in USA

TECH SSIG-06