

# TSC SERIES

Induced Draft Counter Flow Cooling Tower



LIANG CHI INDUSTRY (THAILAND) CO.,LTD.

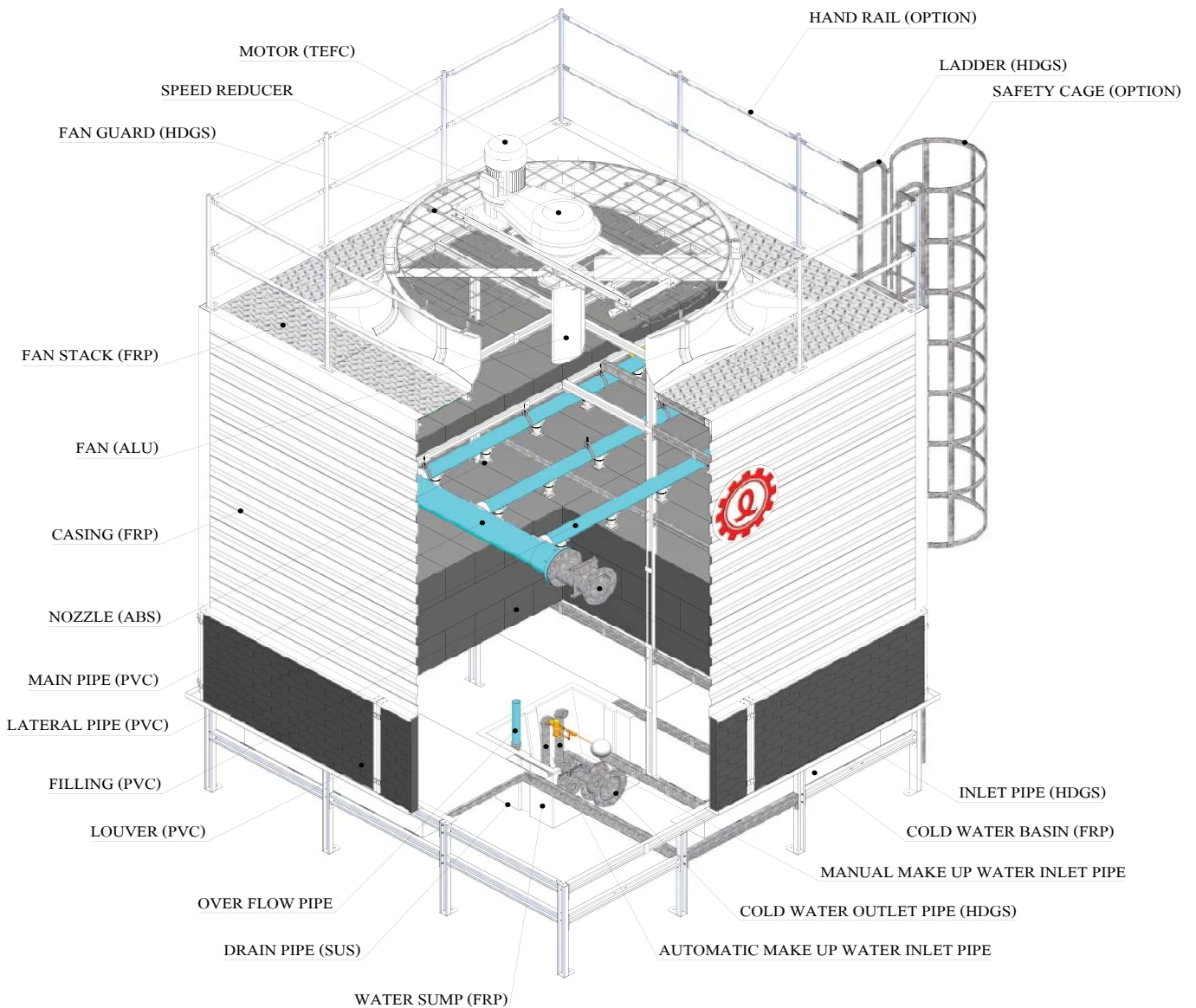


# TSC Series Features

Liang Chi proudly offers our industrial grade, site erected counter flow tower design that provides maximum cooling performance and can be supplied in a variety of structural materials and appliances to meet your specific cooling needs. We offers the most effective and cooling solution, All equipments are made with high quality field tested components and the counter flow design is ideal in a variety of industrial applications from power plants, petrochemical industry to large HVAC application.

All equipment is custom made to meet customers specifications, engineered to provide long and reliable service, even in the most demanding conditions. We have access to the widest range of reputable individual suppliers of manufacturing hardware. Some of which include; Howden Fan, Cofimco Fan, IVI Fan, ADDAX Drive shaft, Amarillo Gear, Murphy Vibration Switch, Hansen Gear, Motor ABB, Motor Brook, Motor Siemen, Motor Teco and more.

## Cooling Tower Structure



# Purchaser's Specification

Purchasers can outline all conditions which are applicable to the installation, so we can manufacture our cooling tower most efficiently and economically to suit your needs such specifications for consideration are as follow:

## Design Conditions

1. Total heat load : Kcal/Hr
2. Circulating water flow : M<sup>3</sup>/Hr
3. Pump head required : M
4. Water inlet temp. : °C
5. Water outlet temp. : °C
6. Ambient wet bulb temp. : °C
7. Average wind velocity and direction
8. Available installation area
9. Electrical voltage and frequency
10. Conditions of area surrounding installation

## Materials to be used

1. Mechanical equipment materials including fan, reducer and drive shaft.
2. Materials of framework (H.D.G.S. / FRP) and casing.
3. Materials and treatment of structure connector.
4. Materials and treatment of piping systems.

## Other Items

1. Purpose of tower usage.
2. Location of piping.
3. Capacity of cold water basin.
4. Quality of circulation water.
5. Time of delivery.



## Features and Advantages

### 1. Highest Performance

Increased area of wet surface for uniform water distribution and higher heat transfer efficiency. The filling and draft eliminator allows the maximum air volume to pass through the cooling tower.

### 2. Lowest Maintenance

Constructed with durable materials such as H.D.G.S. (Standard: ASTM A123).

### 3. Economical Operation

Special axial fans, speed reducer and drift eliminator etc. maximize cooling performance at a lower energy.

### 4. Noise Level

Designed with large fans at low speed operation (i.e. the venturi fan cylinder) minimizes noise pollution.

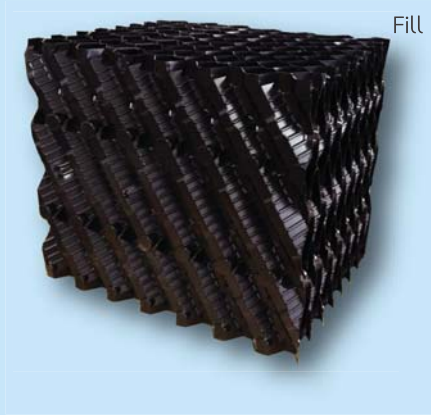


# Filling & Drift Eliminator

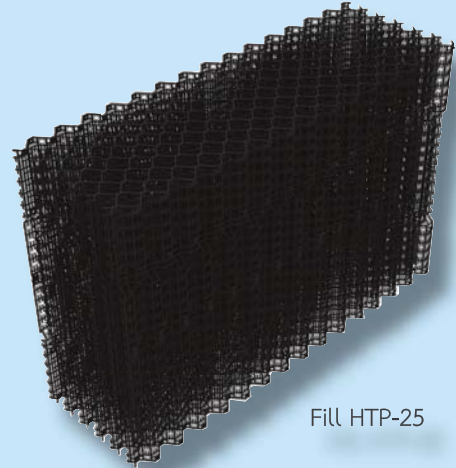
## **FILLING (PVC / PP)**

### **High efficiency fill for TSC Counter flow type**

All of Liang Chi's fill products have been engineered for maximum performance - our experienced engineers will work with you to determine the ideal film fill for your particular application. Liang Chi's standard fill is fabricated from rigid, corrugated PVC sheets that are conducive to cooling and resistant to ultraviolet (UV), rot fungus, organic/inorganic solvents, acids, alkalis and chemicals commonly found in cooling tower waters. As an option, Opti-Bar is also available for counter flow towers, Opti type uses a patented floating hanger design that allows fill layers to float for excellent fit in slanted counter flow designs. This design offers reduced pressure drop, improved splash surface, non-fouling ability and maximum strength



Fill Film Type LC-19



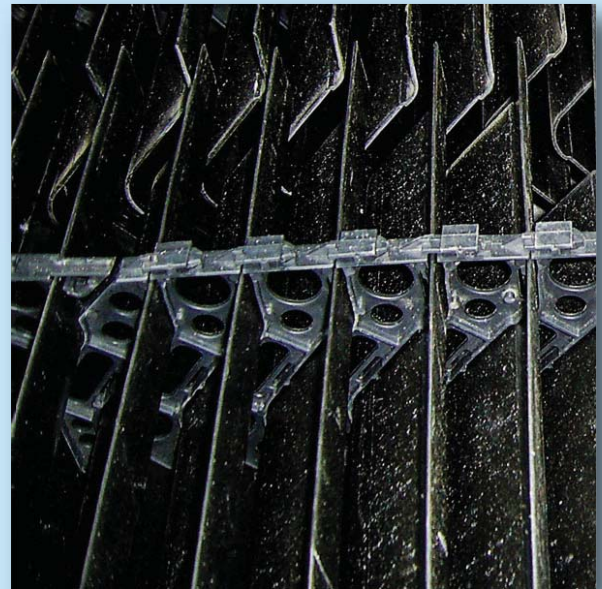
Fill HTP-25

## **DRIFT ELIMINATOR (PVC / PP)**

Specifically designed to achieve maximum drift removal efficiency in counter flow tower applications while keeping pressure drops significantly lower than cross flow cooling towers.



Drift LD-15



Drift LD-15W

# TSC Series – Main Equipment



## FAN MOTOR

Liang Chi's motors are specially designed for cooling tower applications in totally enclosed (TEFC) construction, to suit the industry in accordance with the IEC standard, IP55, and three phase. Equipped in the series is also a whole host of features for maximum profitability usable, and the various options are optimally adaptable to their respective task, while staying very compact at high efficiency.



## DURABLE AMARILLO GEAR REDUCER (Option)

Design features and ratings are in accordance with, or exceed the requirements of AGMA (The American Gear Manufacturers Association) and CTI (Cooling Technology Institute) standards.

### GEAR REDUCER

The gear reducers we use are spiral bevel, both the single and the double reduction models, providing superior performance, reliability, and long life expectancy with proper care and maintenance.

**Remark: Liang Chi belt reducer is used for standard.**

## DRIVE SHAFT AND COUPLING (Option)

We can provide either epoxy composite carbon fiber or stainless steel drive shaft; each specifically manufactured and engineered for the specific application to achieve optimum performance.

Our custom made stainless steel drive shaft is complete with spacers, couplings and hardware. The composite disc coupling also provides the best value as it is corrosion and fatigue resistant, light weight unlikely to misalign, and easy to install



stainless steel drive shaft (Seamless)



# TSC Series – Main Equipment



## FRP FAN STACK

Our fan stacks are Manufactured from high quality hand-laid FRP.

They are designed to suit your cooling tower fan size and are easy to assemble and dismantle. An access dor and fire retardancy can also be added depending on your need.



## AEROFOIL FAN BLADES

The fans perform an important function in the operation of a cooling tower, therefore our design, engineer, and construction teams are extremely experienced, to ensures it is continually reliable, and offers efficient, quiet operation, and a long service life.

## COOLING TOWER NOZZLES

The spray nozzle is an essential part in large cooling towers as it ensures equal distribution of water to the cooling system. We offer a range of superior quality nozzles, manufactured using the finest raw materials procured from authentic vendors of the market owing to their features of corrosion resistance, convenient usages, high durability, and optimum performance.



Low Pressure Type Nozzle LTS  
Turbulator Cooling Tower Nozzle



## OIL LEVEL SWITCH (Option)

An oil level switch will be provided and installed outside to protect for sudden loss of oil or low oil levels in the gear reducer.

## VIBRATION SWITCH (Option)

Available in a variety of models for applications on machinery or equipment where excessive vibration or shock can damage the equipment or otherwise pose a threat to safe operation.



# The Calculation of Make up Water

**The gradual loss of circulation water during operation is caused by the following factors :**

1. During the heat exchange , contact of cold air and hot water gets evaporated as vapor flowing out of the cooling tower
2. Where there is large air volume, a part of the gravitating water is discharged due to the cold air being driven by mechanical power (motor and fan)
3. When the water is circulating for long periods of time, the concentration of solids increases, thus water quality is affected by the growth of scales which should be expelled and replaced with fresh water.

## 1. The formula for evaporation loss

$$E = \frac{Q}{600} = \frac{(T_1 - T_2)}{600} \times L$$

- \*E = Evaporation water ( Kg / h)
- \*Q = Heat load ( Kcal / h)
- \*600 = Water evaporation heat (Kcal / h)
- \*T<sub>1</sub> = Inlet water temperature ( °C)
- \*T<sub>2</sub> = Outlet water temperature ( °C)
- \*L = Circulating water flow (Kg /h)

## 2. The loss of carry over

The loss of carry over depends on factors such the design of cooling and velocity . Generally, the loss is between 0.1% to 0.3% of the circulation water.

## 3. The loss of regular blowdown

To decrease the loss of regular blowdown, please follow the procedures below:

- A. The drain on cold water basin should be turned on slightly when the cooling tower is in operation.
- B. The operational water level should be increased to let the water flow out of the overflow outlet at any time.
- C. The water in the cold water basin and pipes should be replaced seasonally. The loss of regular blowdown is determined by the water quality and its concentration of solids. Generally, the loss is about 0.3% of circulation water

## 4. Make-up water

The total make-up water of circulating water is equal to:

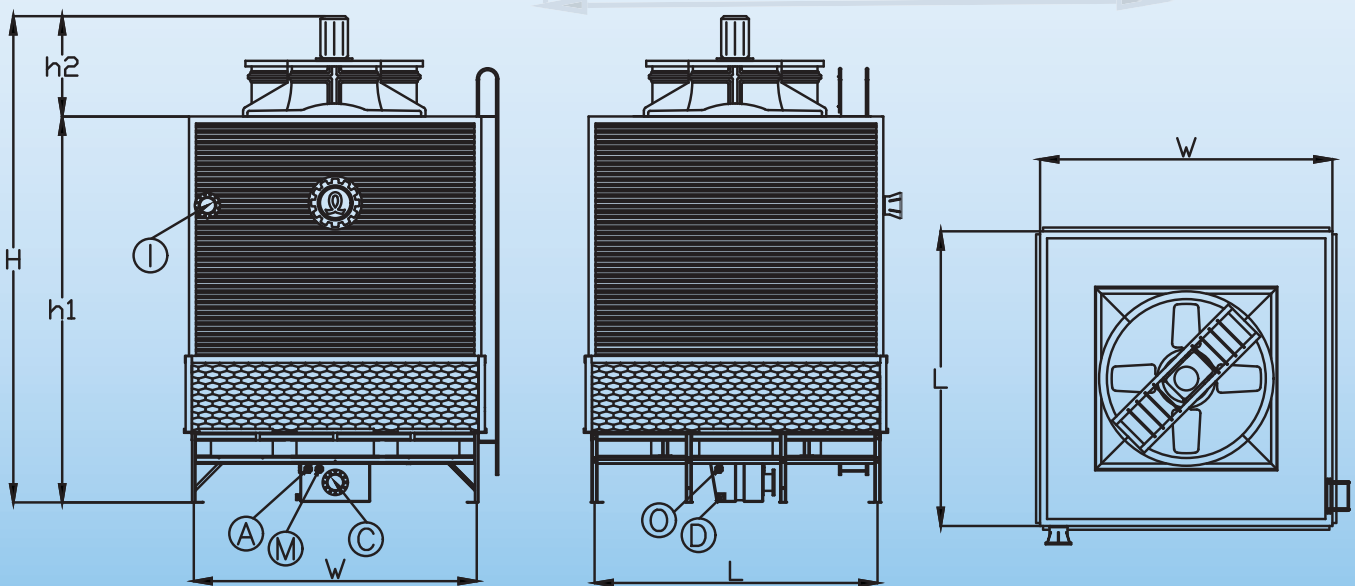
$$M = E + C + D$$

- M = Make-up water
- E = Evaporation loss
- C = Carry-over
- D = Regular blowdown loss

When the cooling tower is rigged on air conditioner, its cooling range is set up at 5°C. In this case, The male-up water needed for cooling tower is about 2% of circulation water.

# Dimension and standard specifications

TSC MODEL	NOMINAL FLOW LPM	DIMENSIONS ( mm. )					FAN DIAMETER (mm.)	FAN MOTOR Hp x Pole
		WIDTH	LENGTH	HEIGHT				
		W	L	h1	h2	H		
80	1350	2440	2440	3950	830	4780	1480	5 x 10P
100	1750	2440	2440	3950	830	4780	1680	5 x 10P
125	2100	3050	3050	3950	830	4780	1680	5 x 10P
150	2460	3050	3050	3950	880	4830	1780	7.5 x 4P
175	2770	3050	3050	4750	880	5630	1780	7.5 x 4P
200	3500	3660	3660	4750	1325	6075	2450	7.5 x 6P
225	3833	3660	3660	4750	1325	6075	2450	7.5 x 6P
250	4200	3660	3660	4750	1360	6110	2450	10 x 6P
300	5283	4270	4270	4750	1360	6110	2950	10 x 6P
350	5917	4270	4270	4950	1425	6375	2950	15 x 6P
400	6667	4880	4880	4950	1425	6375	2950	15 x 6P
450	7333	4880	4880	4950	1635	6585	2950	20 x 6P
500	8500	4880	4880	5450	2100	7550	3520	25 x 6P
600	10000	5490	5490	5450	2100	7550	3520	30 x 6P
700	11050	6100	6100	5850	2100	7950	3520	30 x 6P
800	13050	6710	6710	5850	2100	7950	4120	30 x 6P
900	15350	7320	7320	6050	2170	8220	4120	40 x 6P



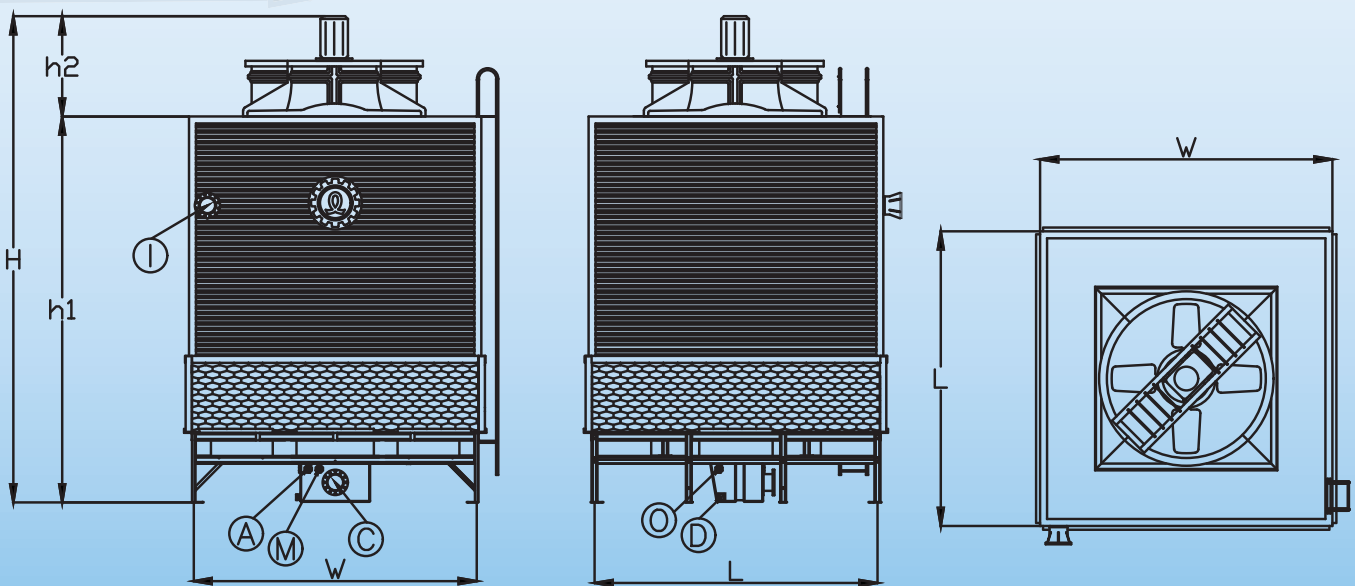
**Remark :**

1. Design temperature 37-32-28 °C.
2. Total pump head required for cooling tower circulation pump is the sum of condenser water pressure drop, piping Friction loss and tower head.
3. The location of the sump shown is for reference only. Actual location depends on final submission.



# Dimension and standard specifications

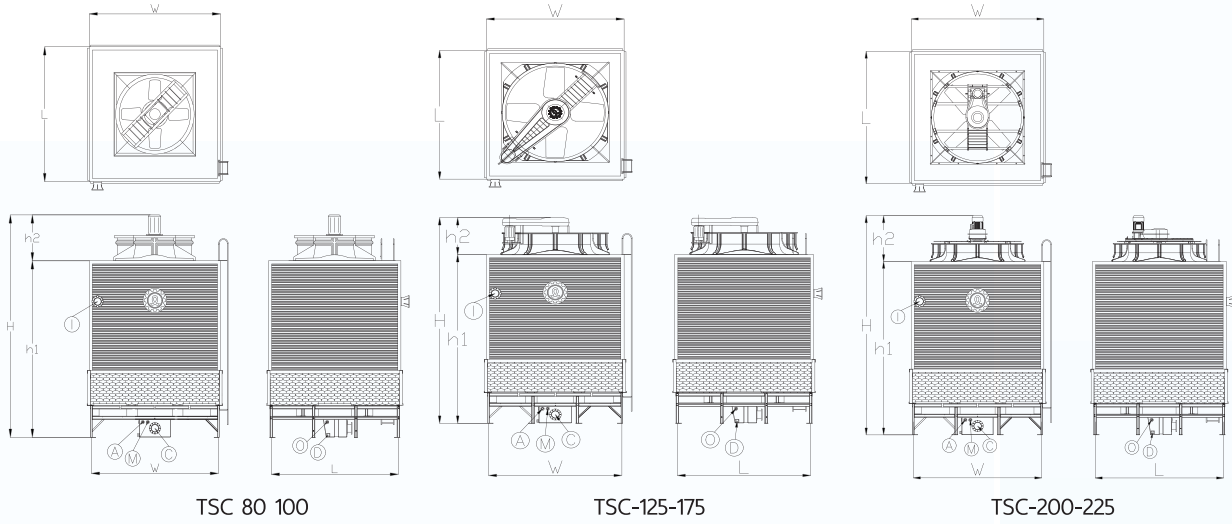
TSC MODEL	DIMENSIONS (mm.)						APPROX. WEIGHT		TOTAL HEAD (m.)
	INLET	OUTLET	DRAIN	OVER FLOW	AUTO FILTER	QUICK FILTER	DRY	OPERATING	
	I	C	D	O	A	M	kg	kg	
80	6B(150A) x 1	6B(150A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	1300	3455	4.0
100	6B(150A) x 1	6B(150A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	1350	3505	4.5
125	8B(200A) x 1	8B(200A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	1450	4560	4.5
150	8B(200A) x 1	8B(200A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	1550	4660	4.5
175	8B(200A) x 1	8B(200A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	1600	4710	5.0
200	8B(200A) x 1	8B(200A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	1750	6025	5.5
225	8B(200A) x 1	8B(200A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	1800	6075	6.0
250	8B(200A) x 1	8B(200A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	2500	6775	6.5
300	10B(250A) x 1	10B(250A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	3450	9110	6.5
350	10B(250A) x 1	10B(250A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	3550	9210	6.5
400	10B(250A) x 1	10B(250A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	4150	11405	6.5
450	10B(250A) x 1	10B(250A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	5250	12505	7.0
500	10B(250A) x 1	10B(250A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	5750	13005	8.0
600	12B(300A) x 1	12B(300A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	2B(50A) x 1	6950	16015	9.0
700	12B(300A) x 1	12B(300A) x 1	2B(50A) x 1	3B(80A) x 1	2 1/2B(65A) x 1	2 1/2B(65A) x 1	9550	20650	10.0
800	12B(300A) x 1	12B(300A) x 1	2B(50A) x 1	3B(80A) x 1	2 1/2B(65A) x 1	2 1/2B(65A) x 1	11550	24880	11.0
900	12B(300A) x 2	14B(350A) x 1	2B(50A) x 1	3B(80A) x 1	2 1/2B(65A) x 1	2 1/2B(65A) x 1	13650	29435	11.0



**Remark:**

1. We reserve the right to make change in the specification and dimension without notice.

# Cooling Tower Water Flow Rate and Temperatures



TSC 80 100

TSC-125-175

TSC-200-225

SELECTION TABLE MODEL TSC COOLING TOWER

(UNIT) : LPM

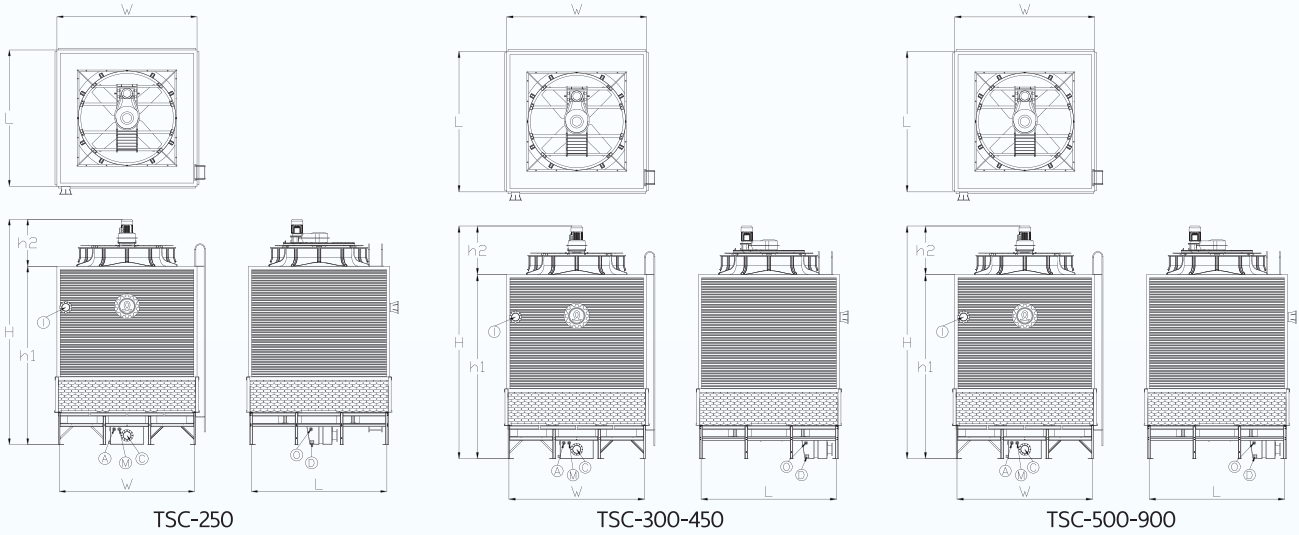
W.B	RANGE	°C	MODEL								
			TSC-80	TSC-100	TSC-125	TSC-150	TSC-175	TSC-200	TSC-225	TSC-250	TSC-300
27 °C	5	38-33	1863	2376	2843	3335	3704	4741	5123	5619	7059
		37-32	1569	2017	2417	2833	3168	4029	4383	4805	6040
		36-31	1289	1672	2007	2351	2650	3346	3668	4019	5055
		35-30	1021	1340	1612	1886	2147	2685	2972	3254	4097
28 °C	5	38-33	1643	2110	2528	2964	3310	4214	4579	5021	6311
		37-32	1350	1750	2100	2460	2770	3500	3833	4200	5283
		36-31	1069	1402	1686	1974	2245	2810	3107	3402	4283
		39-34	1951	2485	2973	3488	3869	4958	5351	5870	7374
29 °C	5	38-33	1415	1832	2197	2574	2896	3663	4007	4391	5523
		37-32	1121	1468	1765	2066	2347	2941	3249	3558	4479
		36-31	836	1112	1340	1567	1804	2232	2498	2733	3444
		39-34	1722	2208	2644	3101	3459	4409	4785	5247	6595
30 °C	5	38-33	1175	1537	1848	2163	2455	3079	3398	3721	4684
		37-32	877	1165	1404	1641	1888	2338	2614	2860	3604
		40-35	1804	2311	2767	3244	3616	4613	5001	5484	6892
		39-34	1483	1917	2300	2695	3028	3833	4189	4591	5774
31 °C	5	38-33	920	1220	1471	1719	1976	2449	2736	2993	3772
		41-36	1891	2418	2895	3395	3779	4827	5228	5733	7204
		40-35	1555	2007	2407	2821	3166	4012	4380	4801	6037
		39-34	1232	1610	1935	2265	2568	3224	3555	3893	4900
28 °C	6	39-33	1449	1875	2249	2635	2962	3748	4099	4491	5649
		38-32	1198	1564	1880	2201	2494	3132	3452	3780	4758
		37-31	957	1264	1522	1779	2036	2534	2819	3085	3886
		36-30	722	967	1167	1364	1580	1943	2189	2393	3018
29 °C	6	39-33	1256	1638	1968	2304	2608	3279	3609	3953	4975
		38-32	1004	1323	1593	1863	2130	2653	2949	3228	4065
		37-31	757	1013	1223	1428	1654	2036	2290	2505	3158
		40-34	1519	1962	2353	2757	3096	3922	4284	4695	5905

TEMPERATURE

( UNIT ) : US.GPM

100 - 90 - 83 °F	330	430	516	604	684	860	946	1036	1304
100 - 90 - 84 °F	299	392	471	551	626	785	867	949	1195
100 - 90 - 85 °F	268	353	425	497	568	707	786	860	1083

# Cooling Tower Water Flow Rate and Temperatures



SELECTION TABLE MODEL TSC COOLING TOWER

(UNIT) : LPM

W.B	RANGE	°C	MODEL							
			TSC-350	TSC-400	TSC-450	TSC-500	TSC-600	TSC-700	TSC-800	TSC-900
27 °C	5	38-33	7917	8904	9806	11384	13390	14762	17427	20497
		37-32	6769	7620	8387	9729	11445	12632	14915	17543
		36-31	5661	6380	7016	8132	9567	10574	12488	14689
		35-30	4584	5172	5683	6579	7742	8571	10125	11910
28 °C	5	38-33	7073	7962	8763	10167	11960	13198	15583	18329
		37-32	5917	6667	7333	8500	10000	11050	13050	15350
		36-31	4793	5407	5942	6880	8095	8960	10585	12451
		39-34	8270	9301	10244	11894	13990	15420	18203	21410
29 °C	5	38-33	6186	6969	7666	8887	10456	11552	13642	16046
		37-32	5012	5654	6214	7195	8466	9370	11068	13019
		36-31	3849	4350	4775	5521	6497	7207	8516	10018
		39-34	7392	8320	9158	10627	12500	13792	16283	19153
30 °C	5	38-33	5243	5913	6499	7527	8856	9799	11575	13616
		37-32	4028	4551	4996	5778	6799	7541	8911	10482
		40-35	7727	8695	9572	11108	13067	14414	17017	20016
		39-34	6468	7286	8015	9293	10933	12076	14261	16775
31 °C	5	38-33	4216	4763	5229	6048	7117	7892	9326	10970
		41-36	8077	9088	10006	11613	13660	15065	17786	20920
		40-35	6764	7618	8381	9719	11433	12627	14911	17539
		39-34	5484	6185	6799	7874	9265	10250	12108	14242
28 °C	6	39-33	6328	7128	7841	9091	10695	11815	13953	16412
		38-32	5325	6005	6601	7647	8997	9952	11756	13828
		37-31	4346	4907	5390	6236	7339	8131	9608	11302
		36-30	3371	3812	4183	4832	5688	6316	7465	8782
29 °C	6	39-33	5569	6279	6903	7997	9408	10406	12291	14458
		38-32	4547	5133	5638	6524	7677	8505	10049	11820
		37-31	3528	3989	4377	5058	5952	6609	7811	9189
		40-34	6615	7451	8197	9504	11181	12350	14584	17154

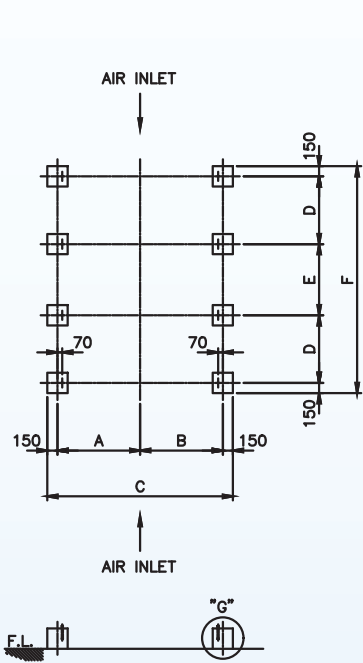
TEMPERATURE

( UNIT ) : US GPM

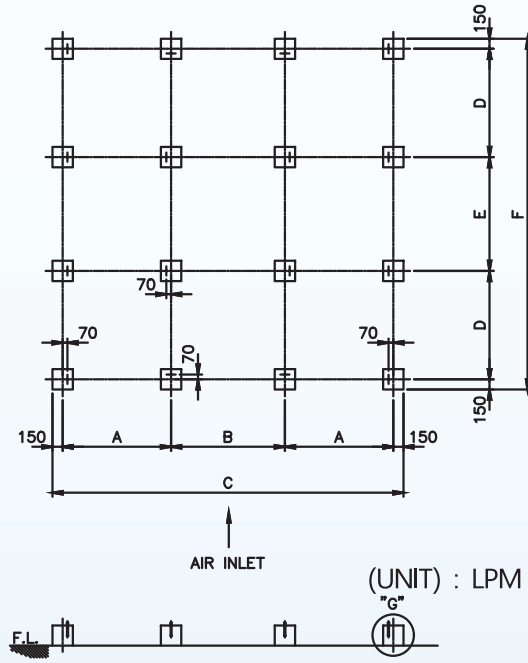
100 - 90 - 83 °F	1460	1646	1810	2097	2467	2728	3222	3790
100 - 90 - 84 °F	1337	1509	1658	1920	2259	2500	2953	3474
100 - 90 - 85 °F	1212	1368	1502	1739	2046	2266	2677	3150



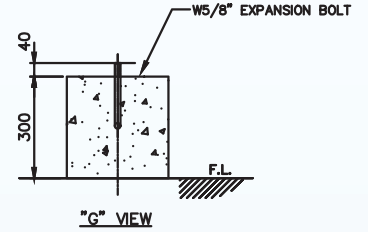
# Recommended Concrete Foundations



TSC-80-100



TSC-125-900

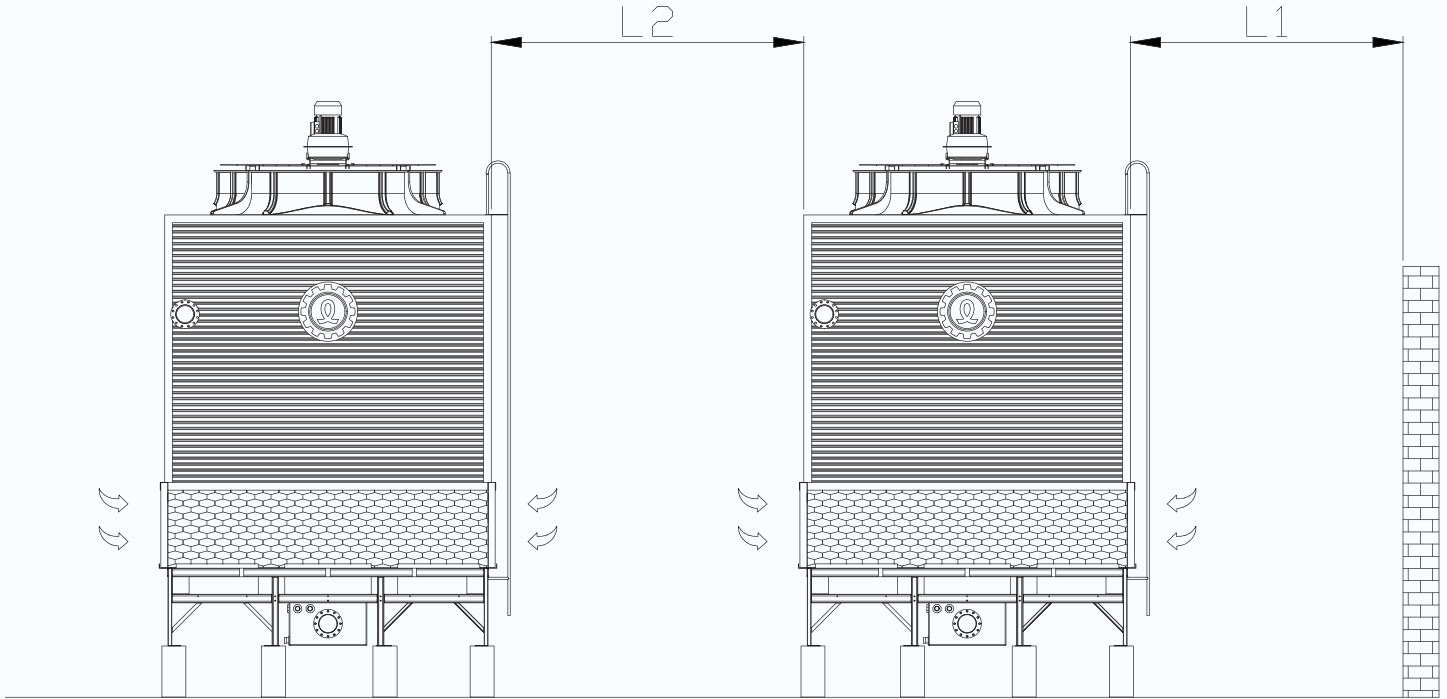


(UNIT) : LPM

(UNIT) : MM

TSC ITEMS	80	100	125	150	175	200	225	250	300	350	400	450	500	600	700	800	900
A	1220	1220	1000	1000	1000	1220	1220	1220	1400	1400	1600	1600	1600	1830	2000	2000	2000
B	1220	1220	1050	1050	1050	1220	1220	1220	1470	1470	1680	1680	1680	1830	2100	2710	3320
C	2740	2740	3350	3350	3350	3960	3960	3960	4570	4570	5180	5180	5180	5790	6400	7010	7620
D	720	720	1000	1000	1000	1220	1220	1220	1400	1400	1600	1600	1600	1830	2000	2000	2000
E	1000	1000	1050	1050	1050	1220	1220	1220	1470	1470	1680	1680	1680	1830	2100	2710	3320
F	2740	2740	3350	3350	3350	3960	3960	3960	4570	4570	5180	5180	5180	5790	6400	7010	7620
G	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16

# Recommended Installation Area



## Recommended Installation Area :

1. A drafty site is needed for installation.
2. The installation site should be distant from places that are full of dust and acidic air.
3. The location should be remote from chimney or other heat source areas.
4. Enough space should be made for connection of pipe to main machine.
5. Be sure to keep the tower vertically when installing it, the anchor bolt and steel support of water basin should be locked closely.
6. In design, the air will be sucked in through inlet louver into the tower so the proper distance between louvers and surrounding objects should be kept to avoid air deficiency due to the excessive resistance.

*\*Please refer to table for the Details.*

TSC / DISTANCE	L1	L2
80-125	2400	1300
150-175	2500	1600
200-225	3100	1900
250-350	3100	2200
400-450	3200	2500
500-600	3800	2800
700	3900	3100
800	3900	3400
900	3900	3700

## After Sales service

On top of the quality of our towers, we focus heavily on after sales service. This is because we understand that a malfunctioning cooling tower will have adverse effects on essential air conditioning systems so we try to address these issues most rapidly. We have established a service section, comprising 5 engineers, 10 foremen, over 50 service personnel, and many more experienced employees in the section, so we can ensure that your trust in us is well justified.



Before

After

## Product Performance Test



Liang Chi Cooling Tower Knowledge Library  
(In Shanghai)  
Sole Cooling Tower Knowledge  
Library in The World

### Two CTI Certified Test Labs In Asia



Test Laboratory  
(Shanghai Factory)

### Test Laboratory (Taoyuan Factory)



## R&D Technician and Quality Guarantee

With over half a century of experience in Taiwan and more than 40 years in Thailand, Liang Chi has laid a good foundation for research and development techniques, together with expert technicians responsible for testing. We continuously improve and innovate, eager to meet the environmental demands, power conservation, and other modern updates to technical developments. Customers can rest assured that their investment in us will yield the greatest economic benefits, as we trust that our skillfully constructed cooling towers will exceed all expectations.



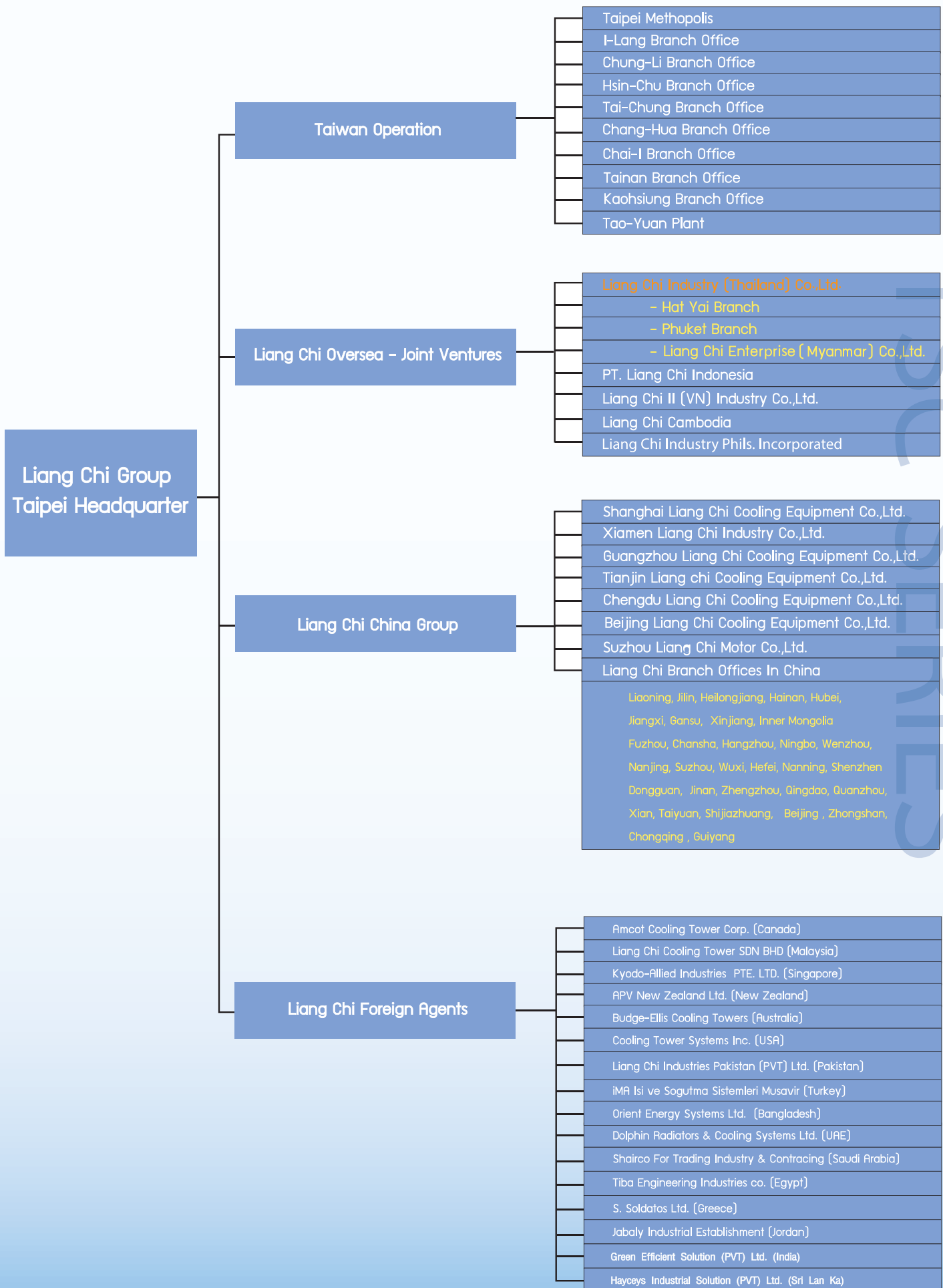
ISO-9001-2015

The Manager System of Liang Chi (Thailand)





# Sales and Service Network



# LIANG CHI STRONG WORLDWIDE SALES AND SERVICE NETWORKS



*Together we cool*

#### **E-mail**

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FRP Dep. : sales\_frp@liangchi.co.th  
Cooling Tower Dep. : cooling@liangchi.co.th  
Spare Parts Dep. : sp@liangchi.co.th

#### **Sales Offices**

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