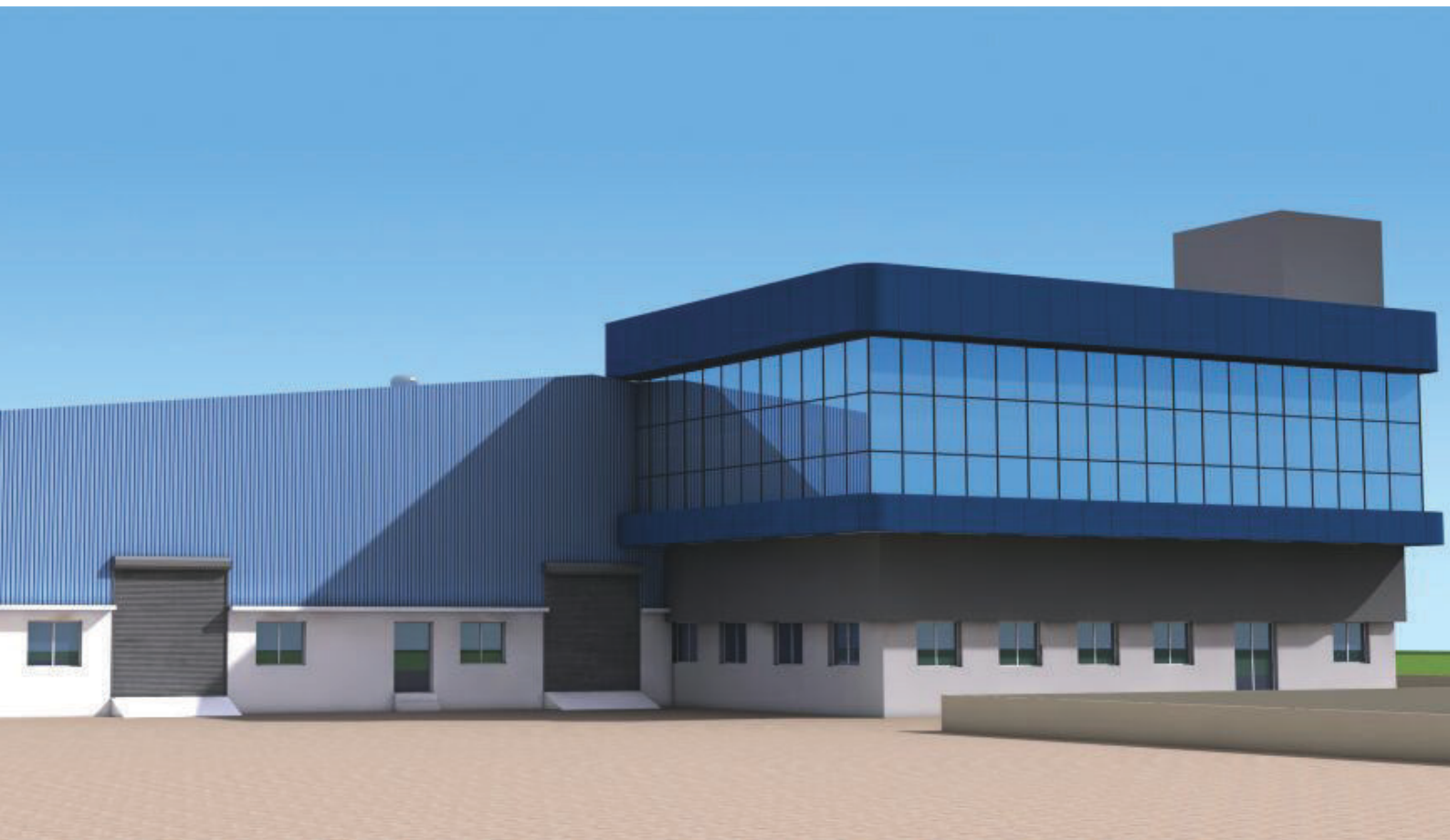




GALVANIZED COOLING TOWER



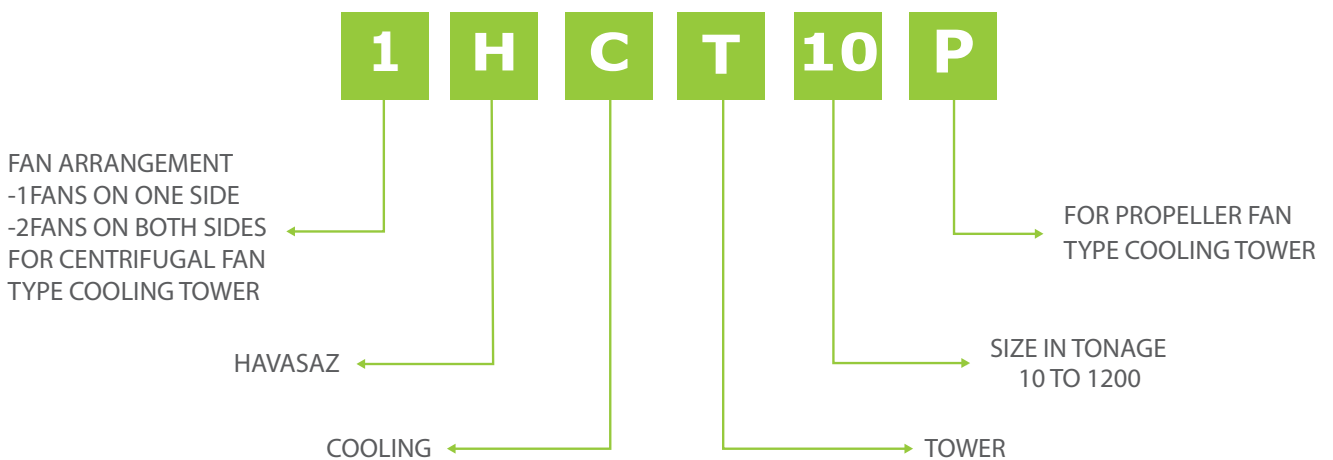
GALVANIZED COOLING TOWER



CONTENTS

Introduction	4
General Data	7
Dimensions And Connections	8
Performance Chart	12
Selection Example	13
Sound Power Level	14
Cooling Tower With Propeller Fan	15
Piping Diagrams	17
Engineering Specifications	18
Conversion Table	19
Psychrometric Chart	20

Nomenclature



INTRODUCTION

HAVASAZ counter-flow forced draft cooling towers designed according to the final data and standard of CTI (cooling tower institute) and the technology of construction is based on models and techniques of cooling towers in BALTIMORE aircoil company in America.

HAVASAZ can design cooling towers in different models and capacities in wet-bulb ambient (to 82 °F) with high efficiency.

Havasaz cooling towers are manufactured in 29 standard types, their capacities are between 10 to 1200 tons of refrigeration. They run used in air-conditioners, chillers and process cooling plants.

DESCRIPTION AND GENERAL POINT:

Air cooler transfer to the atmosphere, thermal energy losses coming from hydraulic circuit .It cools the water flow coming from the pump, according to piping pressure loss. The aim of this cycle is to help you to get the maximum result from cooling tower.

FAN:

These are centrifugal fans made of galvanized steel plate, with proper thickness and high quality balanced in dynamic and static terms, accord-

ing to specifications of NICOTRA company.

They are driven by a belt-pulley rotating at a low speed. they run silent, without vibration.

MOTOR:

All electric motors used in HAVASAZ cooling tower enclosed fan cooled with degree of protection of IP54- .

All motors are 380V3-Ø50-Hz and operate at 1450rpm and selected to match the horsepower requirements of the fans.

CASING:

HAVASAZ cooling tower is made of standard galvanized steel plates bolted to each other. Unit containing a number of panels depending on the size of unit profiles mounted to the base of the tower ensure the panels to be attached to each other.

ELIMINATOR:

They are made of PVC or galvanized steel plate and formed specially to prevent water particles from being drifted with the air. They are attached top the tower.

FILL:

These are specially designed plates made

of galvanized steel ,PVC or ABS, providing maximum heat transfer are easy to attach and remove.

SPRAY NOZZLES:

There is main pipe made of PVC or galvanized-steel, containing branches to distribute the water in a uniform manner. The injectors are attached to this branches, so that all surfaces of filling materials remain wet all the time.

BASIN:

The section of cooling tower that collected the cooled water in , constructed of galvanized steel sheet.

WATER CONSERVATION

Water is one our most precious resources and consumption has reached unprecedented levels. Cooling towers recycle cooling water so it can be used over and over again. Recycling reduces water consumption by 95 % when compared to out dated "once-through" systems thus reducing water and sewage costs.



✓ Maintenance Checklist for:

Cooling Tower

Inspect and clean as necessary:	Start-Up	Monthly	Quarterly	Annually	Shutdown
Inspect general condition of the unit [2] and check unit for unusual noise or vibration	✓	✓			
Inspect cold water basin/Spray nozzles	✓		✓		
Drain basin and piping			✓		✓
Inspect air inlet louvers/Combined inlet shields	✓	✓			
Check and adjust water level in basins	✓	✓			
Check operation of make-up valve	✓	✓			
Check and adjust bleed rate	✓	✓			
Inspect unit finish				✓	
Mechanical equipment system:	Start-Up	Monthly	Quarterly	Annually	Shutdown
Check belt condition	✓	✓			
Adjust belt tension [3]	✓		✓		
Lubricate fan shaft bearings	✓		✓		✓
Lubricate motor base adjusting screw	✓		✓		✓
Check and lubricate optional gear drive	See product specific O&M Manual for detailed instructions and schedule				
Check drive alignment				✓	
Check motor voltage and current	✓		✓		✓
Clean fan motor exterior	✓		✓		
Check fan motor for proper rotation	✓				
Check general condition of the fan			✓		
Check and unplug fan drain holes (hollow blade fans)			✓		
Check fan for uniform pitch			✓		
Check fan for rotation without obstruction	✓		✓		
Check and recoat steel shafts with RUST VETO [®]	✓		✓		✓



WARNING:

Do not perform any service on or near the fans, motors, or drives, or inside the unit without first ensuring that the fans and pumps are disconnected and locked out.



NOTES:

1. Recommended service intervals are the minimum for typical installations. Different environmental conditions may dictate more frequent servicing.
2. When operating in ambient temperatures below freezing, the unit should be inspected more frequently.
3. Tension on new belts must be readjusted after the first 24 hours of operation and quarterly, thereafter.

GENERAL DATA

TABLE- 1 -GENERAL DATA

MODEL NO.	TONS NOM.	GPM NOM.	PUMP HEAD Ft of w	MOTOR NO+HP	BLOWER		WEIGHT(kg)	
					NO.	DIA(IN)	Net	Oper.
1 HCT-10	10	30	22	1x3/4	1	15	310	360
1 HCT-15	15	45	22	1x1	1	15	320	370
1 HCT-20	20	60	22	1x1 1/2	1	15	400	480
1 HCT-25	25	75	22	1x2	1	18	480	500
1 HCT-30	30	90	22	1x2	1	18	470	620
1 HCT-35	35	105	22	1x3	1	18	600	800
1 HCT-40	40	120	22	1x3	1	18	700	1000
1 HCT-50	50	150	23	1x3	1	18	800	1050
1 HCT-60	60	180	23	1x4	1	18	900	1200
1 HCT-75	75	225	23	1x5.5	1	18	1050	1500
1 HCT-90	90	270	23	1x7.5	1	18	1400	1950
1 HCT-105	105	315	23	1x7.5	2	18	1700	2300
1 HCT-120	120	360	23	1x10	2	18	1800	2400
1 HCT-140	14	420	23	1x10	2	18	1900	2600
1 HCT-160	160	480	23	1x10+1x5.5	3	18	2700	3600
1 HCT-180	180	540	23	1x10+1x5.5	3	18	2800	3850
1 HCT-200	200	600	23	1x10+1x5.5	3	18	3000	4300
1 HCT-250	250	750	23	2x10	4	18	3500	5000
1 HCT-300	30	900	23	2x10+1x5.5	5	18	4200	6000
1 HCT-350	350	1050	23	3x10	6	18	5000	7000
1 HCT-400	400	1200	23	3x10	6	18	5400	7500
1 HCT-450	450	1350	23	3x10+1x5.5	7	18	6000	8500
2 HCT-500	500	1500	23	4x10	8	18	7000	9500
2 HCT-600	600	1800	23	4x10+2x5.5	10	18	8500	11500
2 HCT-700	700	2100	23	6x10	12	18	10000	13500
2 HCT-800	800	2400	23	6x10	12	18	11500	16000
2 HCT-900	900	2700	23	6x10+2x5.5	14	18	13000	18000
2 HCT-1000	1000	3000	23	8x10	16	18	13200	18500
2 HCT-1200	1200	3600	23	10x10	20	18	16000	22000

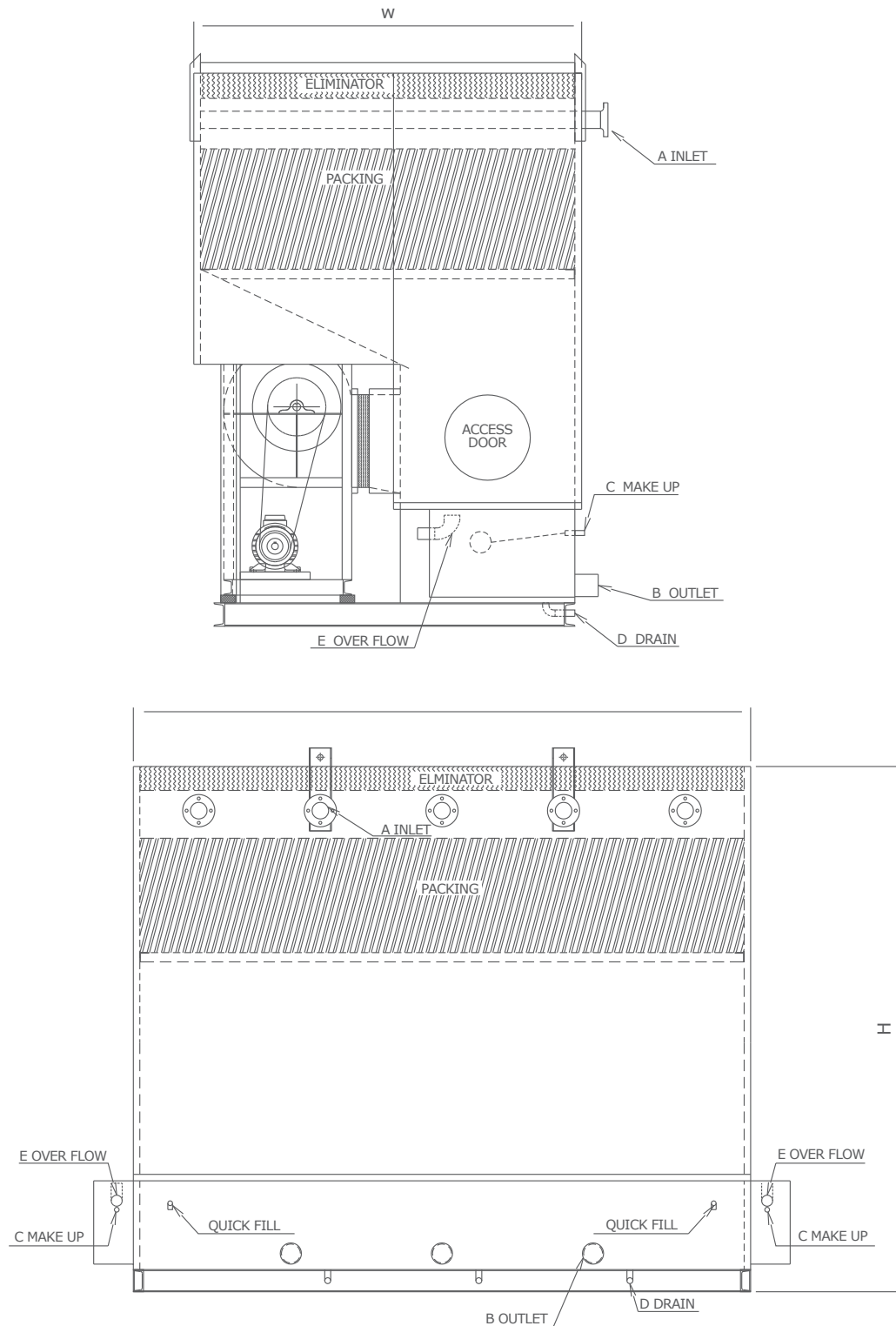
DIMENSIONS & CONECTION

TABLE2- - DIMENSIONS & CONNECTIONS

MODEL NO.	DIMENSIONS (mm)			CONNECTIONS (in)					
	L	W	H	NOxA	NOxB	NOxC	NOxD	NOxE	NOxQ
1 HCT-10	500	100 0	1900	1x11/2	1x11/2	1x11/2	1x3/4	1x2	1x11/2
1 HCT-15	750	100 0	1900	1x11/2	1x11/2	1x11/2	1x3/4	1x2	1x11/2
1 HCT-20	950	100 0	1960	1x2	1x2	1x11/2	1x3/4	1x2	1x11/2
1 HCT-25	950	125 0	1960	1x2	1x2	1x11/2	1x3/4	1x2	1x11/2
1 HCT-30	950	150 0	2000	1x3	1x3	1x3/4	1x1	1x2	1x3/4
1 HCT-35	950	150 0	2700	1x3	1x3	1x3/4	1x1	1x2	1x3/4
1 HCT-40	950	150 0	2850	1x3	1x3	1x3/4	1x1	1x2	1x3/4
1 HCT-50	950	1750	2850	1x3	1x3	1x3/4	1x1	1x2	1x3/4
1 HCT-60	950	2000	2850	1x3	1x4	1x3/4	1x1	1x2	1x3/4
1 HCT-75	1200	2000	2850	1x3	1x4	1x1	1x1	1x2	1x1
1 HCT-90	1750	2000	2850	2x3	1x4	1x1	1x1	1x2	1x1
1 HCT-105	1900	2000	2850	3x3	1x4	1x1	1x1	1x2	1x1
1 HCT-120	1950	2000	2850	3x3	1x5	1x1	1x1	1x2	1x1
1 HCT-140	2150	2000	2850	4x3	1x5	1x1	1x1	1x2	1x1
1 HCT-160	2950	2000	2850	4x3	2x4	2x1	2x1	2x2	2x1
1 HCT-180	3000	2000	2850	5x3	2x4	2x1	2x1	2x2	2x1
1 HCT-200	3350	2000	2850	5x3	3x4	2x1	3x1	2x2	2x1
1 HCT-250	3950	2000	2850	6x3	3x4	2x1	3x1	2x2	2x1
1 HCT-300	4950	2000	2850	7x3	3x5	2x1	3x1	2x2	2x1
1 HCT-350	5950	2000	2850	8x3	3x5	2x1	3x1	2x2	2x1
1 HCT-400	6800	2000	2850	10x3	4x5	2x1	4x1	2x2	2x1
1 HCT-450	7400	2000	2850	12x3	4x5	2x1	4x1	2x2	2x1
2 HCT-500	3950	3800	2850	12x3	4x5	4x1	4x1	4x2	4x1
2 HCT-600	4950	3800	2850	14x3	4x5	4x1	4x1	4x2	4x1
2 HCT-700	5950	3800	2850	16x3	4x5	4x1	4x1	4x2	4x1
2 HCT-800	6800	3800	2850	18x3	6x5	4x1	6x1 1/2	4x2	4x1
2 HCT-900	7400	3800	2850	22x3	6x5	4x1	6x1 1/2	4x2	4x1
2 HCT-1000	8000	3800	2850	24x3	6x5	4x1	6x1 1/2	4x2	4x1
2 HCT-1200	9950	3800	2850	28x3	6x5	4x1	6x1 1/2	4x2	4x1

CENTRIFUGAL FAN

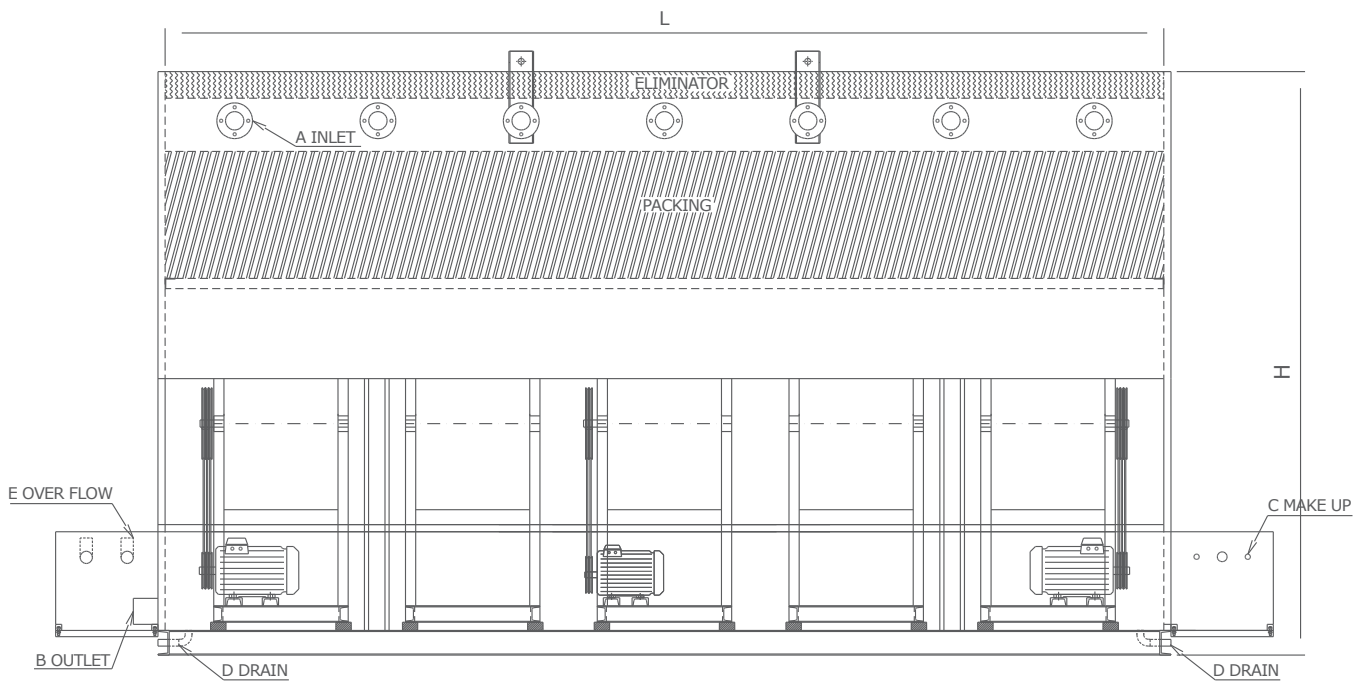
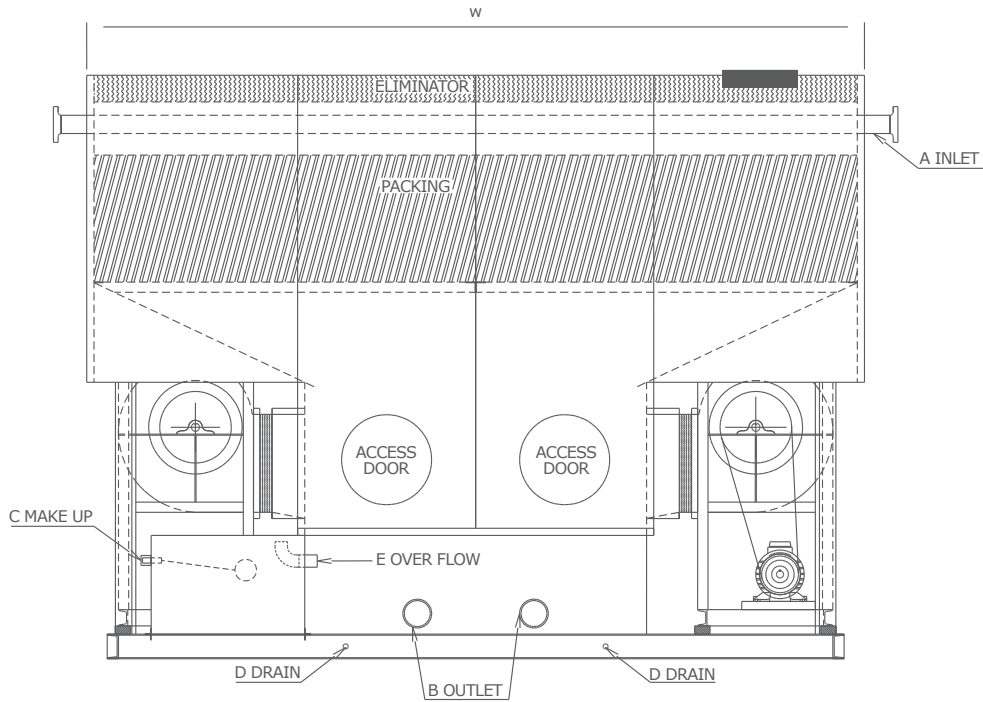
SERIES 1 (FANS ON ONE SIDE) MODEL 1HCT-10 TO 1HCT-450



CENTRIFUGAL FAN

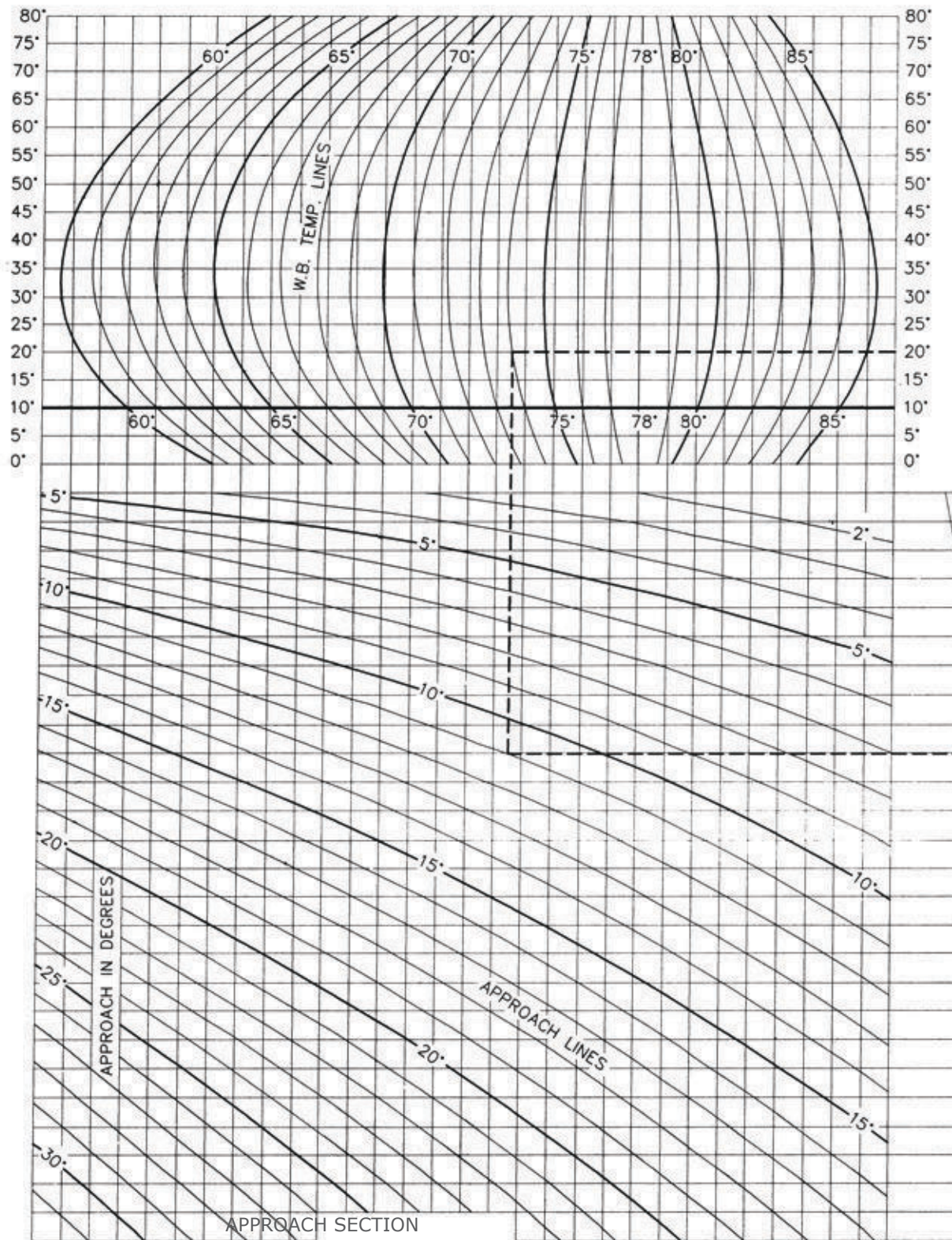
SERIES 2 (FANS ON BOTH SIDE)

MODEL 2HCT-500 TO 2HCT-1200





COUNTERFLOW COOLING TOWER SELECTION AND PERFORMANCE CHART



WET BULB CORRECTION

Selection example:

Given: to cool 1050 gpm from 105 °F to 85 °F with 74 °F wet bulb.
SOLUTION:

$$\text{Range} = 105^{\circ} - 85^{\circ} = 20^{\circ} \text{ load} = \frac{1050 \times 500 \times 20}{15000} = 700 \text{ TONS}$$

$$\text{Approach} = 85^{\circ} \text{F} - 74^{\circ} \text{F} = 11^{\circ}$$

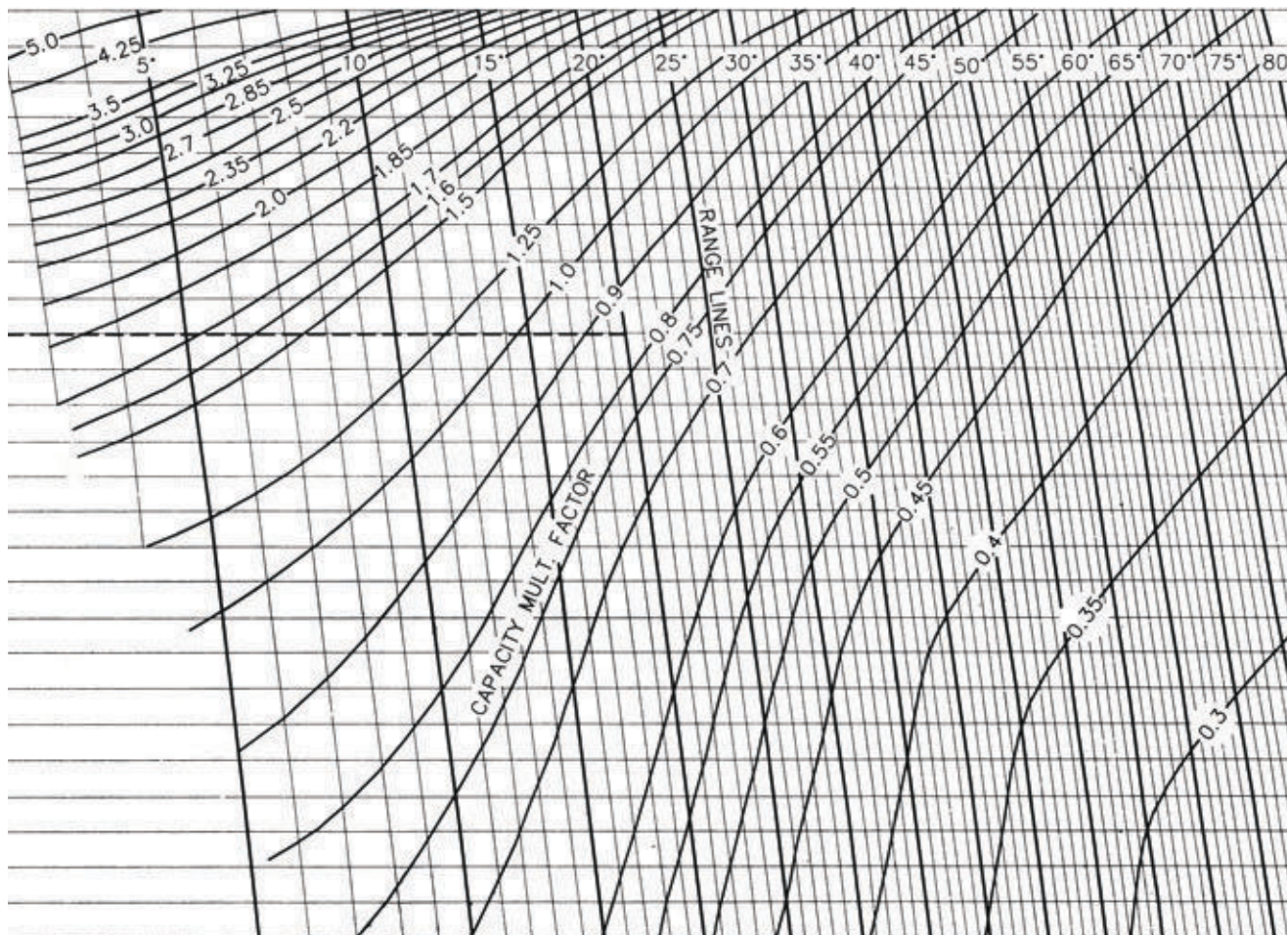
The multiplier factor is 0.85

$$700 \times 0.85 = 595 \text{ corrected tons.}$$

Therefore : from physical data hct - 600 is selected.

RANGE IN DEGREES

CAPACITY MULTIPLIER FACTOR SECTION



SOUND POWER LEVEL

TABLE - 3 -SOUND (dB)

MODEL	1.5	10	20
1 HCT-10	75	64	48
1 HCT-15	75	64	48
1 HCT-20	76	65	49
1 HCT-25	79	65	49
1 HCT-30	77	66	50
1 HCT-35	78	67	51
1 HCT-40	78	67	51
1 HCT-50	79	78	62
1 HCT-60	77	66	50
1 HCT-75	80	69	53
1 HCT-90	80	69	53
1 HCT-105	77	66	50
1 HCT-120	78	67	51
1 HCT-140	79	68	52
1 HCT-160	78	67	51
1 HCT-180	78	67	51
1 HCT-200	80	69	53
1 HCT-250	78	67	51
1 HCT-300	78	67	51
1 HCT-350	78	67	51
1 HCT-400	80	69	53
1 HCT-450	79	68	52
2 HCT-500	78	67	51
2 HCT-600	78	67	51
2 HCT-700	78	67	51
2 HCT-800	82	71	55
2 HCT-900	79	69	53
2 HCT-1000	78	67	51
2 HCT-1200	78	67	51

COOLING TOWER WITH PROPELLER FAN

TABLE-4-GENERAL DATA

MODEL	TONS NUM	GPM NOM	NOZZLE HEAD Ft.OFW.	FANS		MOTORS			DIMENSIONS			WEIGHT(kg)	
				NO.	DIA.	NO	R.P.M	$\frac{kw}{220/380}$ 50HZ	L	W	W	NET	OPER
HCT-10-P	10	30	23	1	500	1	1450	0.45	650	1000	2000	160	290
HCT-15-P	15	45	23	1	500	1	1450	0.45	700	1000	2000	170	340
HCT-20-P	20	60	23	1	560	1	1450	0.75	750	1000	2300	185	355
HCT-25-P	25	75	23	1	630	1	1450	1.5	800	1000	2350	200	395
HCT-30-P	30	90	23	1	630	1	1450	1.5	850	1000	2400	220	440
HCT-35-P	35	105	23	1	630	1	1450	1.5	950	1000	2400	250	520
HCT-40-P	40	120	23	1	630	1	1450	1.5	1000	1000	2400	320	620
HCT-50-P	50	150	23	1	710	1	1450	2.2	1200	1000	2450	400	760
HCT-60-P	60	180	23	1	800	1	1450	2.2	1450	1000	2500	435	870
HCT-70-P	70	210	23	1	800	1	1450	2.2	1700	1000	2550	520	1050
HCT-80-P	80	240	23	1	800	1	1450	3	1950	1000	2600	680	1265
HCT-90-P	90	270	23	1	630	2	1450	1.5	1950	1150	2600	730	1400
HCT-100-P	100	300	23	1	710	2	1450	2.2	1950	1250	2650	770	1500
HCT-1200-P	120	360	23	1	800	2	1450	2.2	1950	1500	2650	900	1800

TABLE-5-CONNECTIONS

MODEL	CONNECTIONS					
	NO x A	NO x B	NO x C	NO x D	NO x E	NO x Q
HCT-10-P	1x1 1/2"	1x1 1/2"	1x 1/2"	1x 3/4"	1 x 2"	1 x 1/2"
HCT-15-P	1x1 1/2"	1x1 1/2"	1x 1/2"	1x 3/4"	1 x 2"	1 x 1/2"
HCT-20-P	1x2"	1x2"	1x 1/2"	1x 3/4"	1 x 2"	1 x 1/2"
HCT-25-P	1x2"	1x2"	1x 1/2"	1x 3/4"	1 x 2"	1 x 1/2"
HCT-30-P	1x4"	1x4"	1x 3/4"	1 x 1"	1 x 2"	1 x 3/4"
HCT-35-P	1x4"	1x4"	1x 3/4"	1 x 1"	1 x 2"	1 x 3/4"
HCT-40-P	1x4"	1x4"	1x 3/4"	1 x 1"	1 x 2"	1 x 3/4"
HCT-50-P	1x4"	1x4"	1x 3/4"	1 x 1"	1 x 2"	1 x 3/4"
HCT-60-P	1x4"	1x4"	1x 3/4"	1 x 1"	1 x 2"	1 x 3/4"
HCT-70-P	1x4"	1x4"	1 X 1"	1 x 1"	1 x 2"	1 x 1"
HCT-80-P	1x4"	1x4"	1 X 1"	1 X 1"	1 x 2"	1 x 1"
HCT-90-P	1x4"	1x4"	1 X 1"	1 X 1"	1 x 2"	1 x 1"
HCT-100-P	2x4"	2x5"	1 X 1"	1 X 1"	1 x 2"	1 x 1"
HCT-120-P	2x4"	2x5"	1 X 1"	1 X 1"	1 x 2"	1 x 1"

COOLING TOWER

PROPELLER FAN

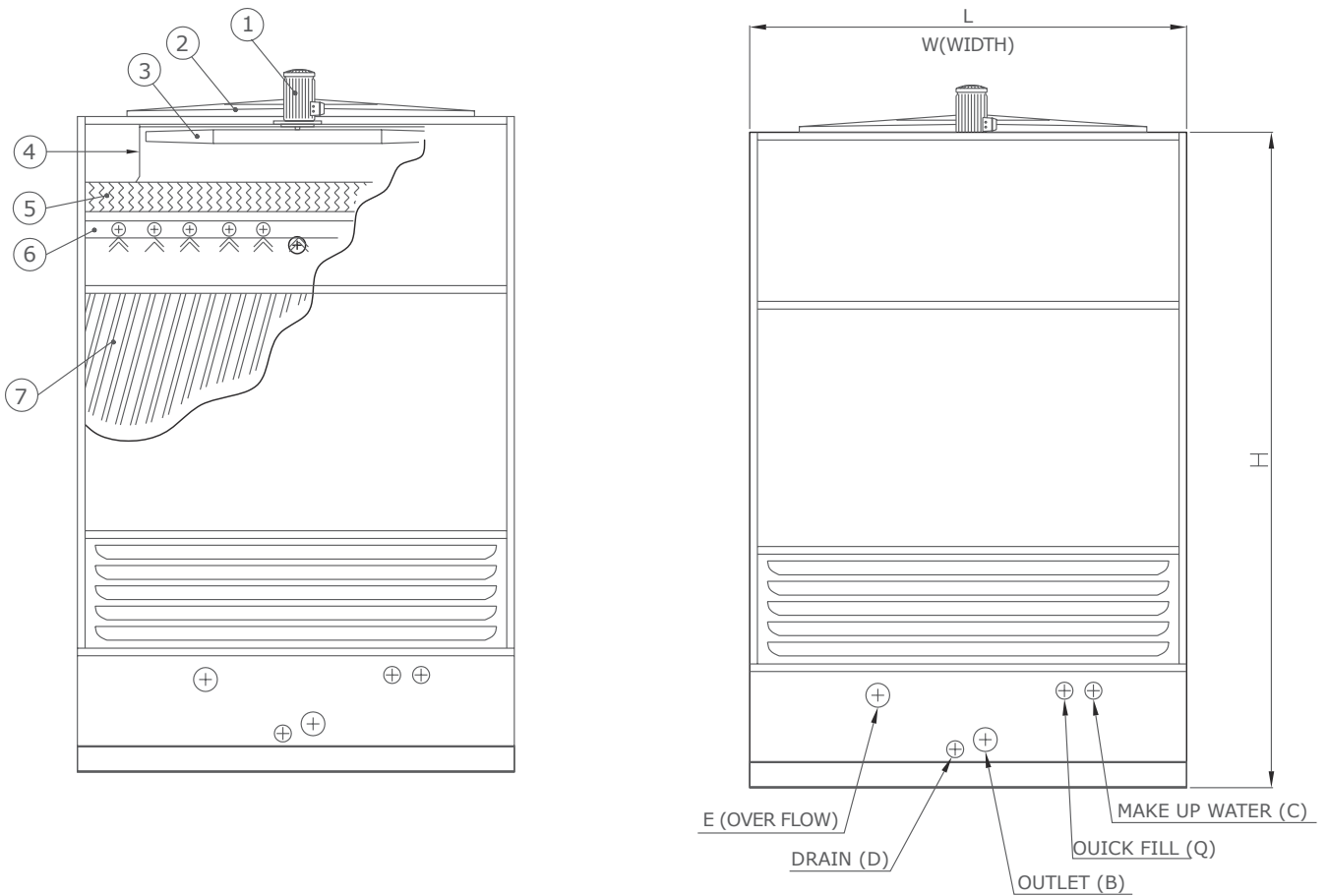


FIGURE -3-

- 1 - MOTOR
- 2 - FAN GUARD
- 3 - AXIAL FAN
- 4 - FAN HOUSING
- 5 - DRIFT ELIMINATOR
- 6 - FILL

PIPING DIAGRAM

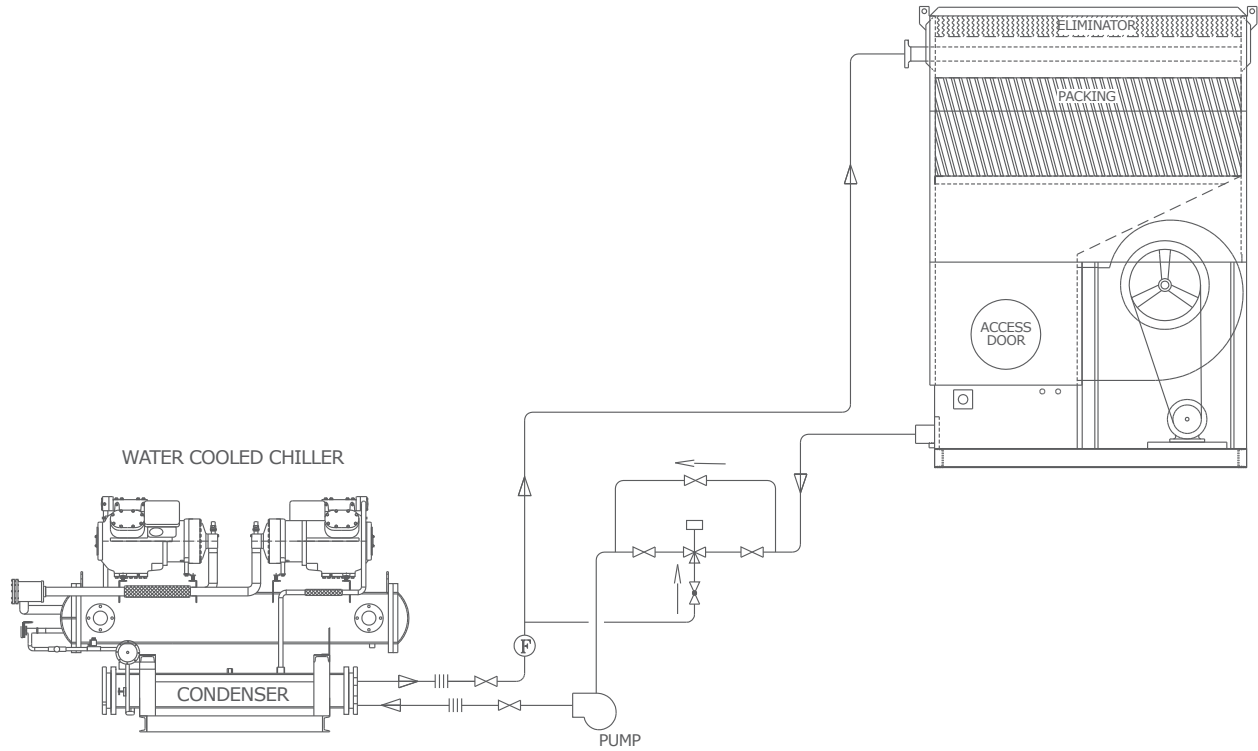


FIGURE- 3 - 4 Way Motorized Valve

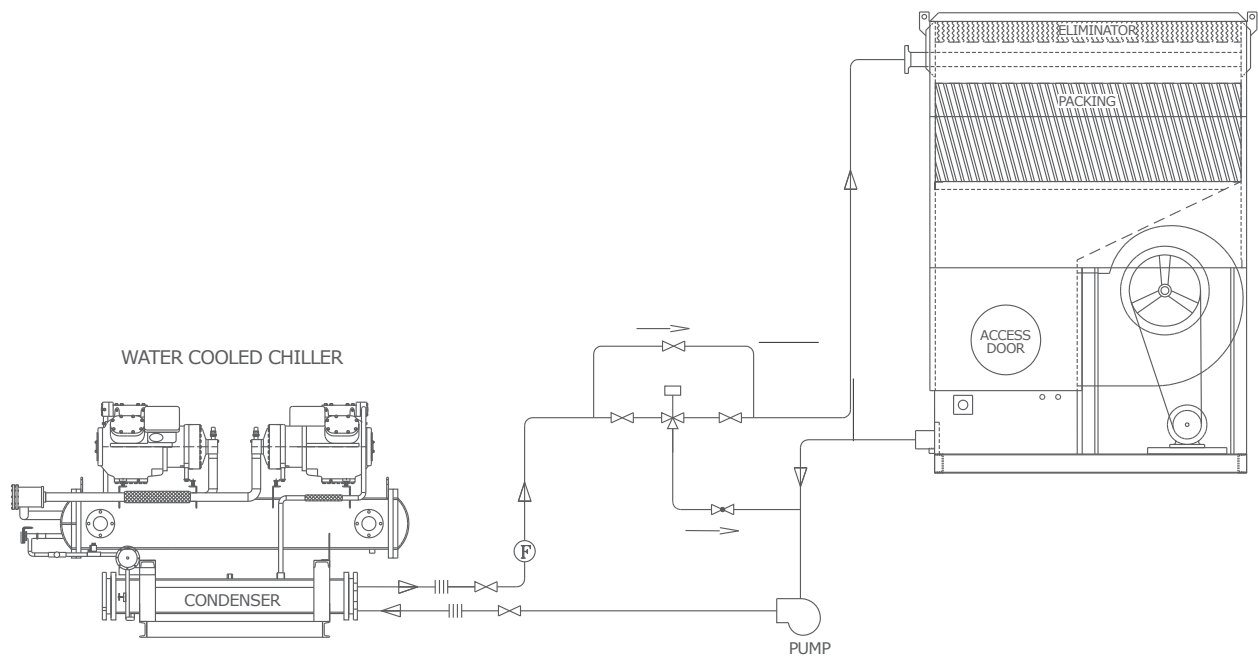


FIGURE - 5 - Diverting 3 Way Motorized Valve

ENGINEERING SPECIFICATIONS

HAVASAZ cooling tower designed for many cooling process with high efficiency. The unit shall include droplet eliminator, spray nozzles, heat exchanger plate, basin, fan- motor assemblies.

FAN:

The fans shall be forward curved, double width-double inlet, centrifugal type. All fans shall be balanced statically and dynamically and constructed of galvanized steel sheet. The fans and motors shall be located in dry cabinet in bottom part of the unit . All motors are 380 V 3-Ø 50-Hz and operate at 1450 rpm. The class of protection of motors offered IP54-.

CASING:

The casing, basin and other parts of unit of galvanized steel sheet with proper thickness according to their applications.

Casing shall be completely painted with zinc-achromatized Aluminum. For create resistance against of rot, all of the basin shall be covered with pitch. A removable, man -size access door shall be provided.

SPRAY NOZZLES:

The nozzles constructed of PVC or Galvanized

steel sheet .The nozzles designed to distribute water monotonously to cool better and prevented to waste of the water and no remain sediment.

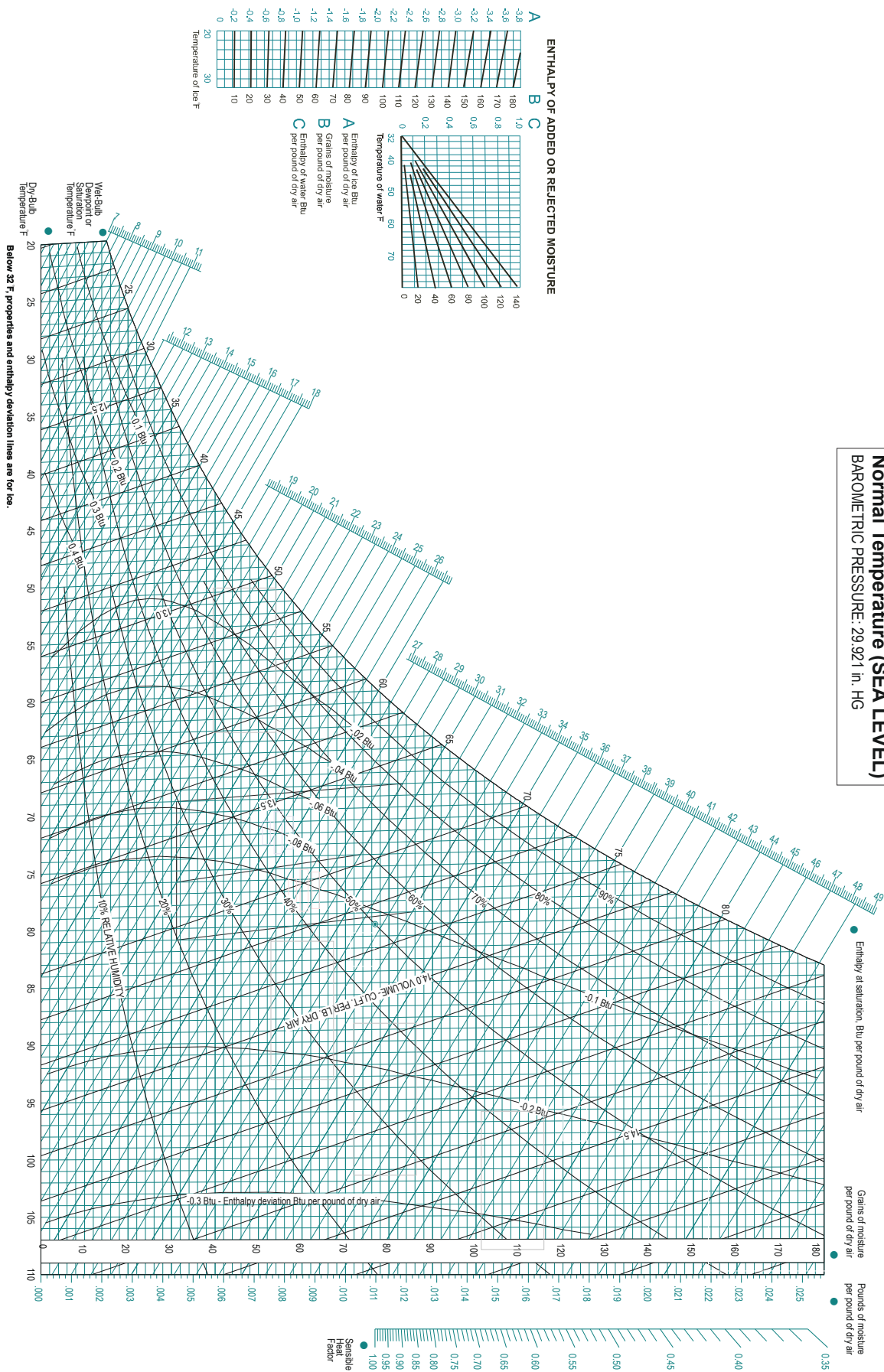
DRIFT ELIMINATOR:

The eliminator constructed of galvanized steel sheet and removed the heat both fill and drift eliminator assemblies shall be removable.

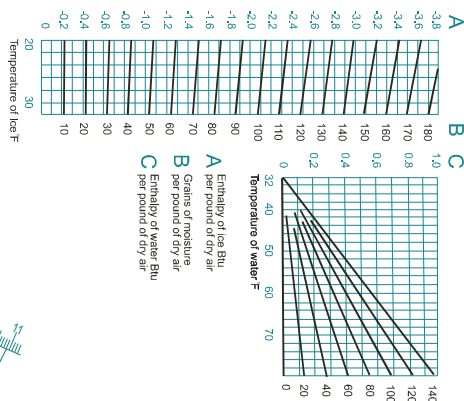
CONVERSION TABLE

LENGTH 1 inch = 25.4 mm 1 foot = 0.3048 m 1 yard = 0.9144 m 1 mile = 1.609 km	AREA 1 sq inch = 645.2 mm ² 1 sq foot = 0.0929 m ² 1 sq yard = 0.8361 m ² 1 sq km = 0.3861 sq mile	VELOCITY 1 ft/min = 0.00508 m/s 1 ft/sec = 0.3048 m/s 1 ft/sec = 1.097 km/hr 1 mile/hr = 0.4470 m/s
VOLUME 1 in ³ = 16.39 cm ³ 1 ft. ³ = 0.02832 m ³ 1 ft. ³ = 28.32 liters 1 yd ³ = 0.7646 m ³ 1 gallon (US) = 3.7853 liters 1 gallon (UK) = 4.546 liters	MASS 1 gm = 15.4324 grains 1 oz = 0.02835 kg 1 oz = 28.35 gm 1 lb = 0.4536 kg 1 ton = 1016.0 kg 1 cwt = 50.80 kg	HYDROSTATIC TABLE 1 litre of water weights 1 kg 1 cubic meter = 1000 liters 1 bar = 100k pa 1 gallon (UK) = 10 lbs 1 cu. ft = 6.25 gallons (UK) 1 bar = 10.20 m
PRESSURE 1 in wg = 249.1 N/m ² (Pa) 1 bar = 33.45 ft head H ₂ O 1 bar = 14.50 lb/in ² (psi) 1 bar = 0.9872 atmosphere 1 kPa = 4.015 in H ₂ O 1 kPa = 0.2953 in Hg	ENERGY 1 btu = 1055 J 1 MJ = 0.2778 kW-hr 1 therm = 29.31 kW-hr 1 therm = 105.5 MJ 1 therm = 100,000 btu 1 btu = 0.2520 kcal	POWER 1 HP = 745.7 W 1 btu/hr = 0.2931 W 1 btu/hr- ft ² = 3.155 W/m 1 btu in/ft ³ hr °F = 0.1442 W/m °C (Thermal Conductivity = K) 1 btu/hr ft ³ °F = 0.1442 W/m °C (Thermal Transmittance) = U
TEMPERATURE °C = 5/9 (°F - 32) ° = 9/5 °C + 32 ° K = °C + 273 °R = °F + 460 °R = 9/5 °K	FLOW RATE 1 m ³ /s = 2119 cfm 1 m ³ /hr = 0.5886 cfm 1 m ³ /hr = 16.67 l/min 1 l/s = 2.119 cfm 1 l/s = 15.85 usgpm	REFRIGERATING CAPACITY 1 Ton = 12000 btu/hr 1 Ton = 3.517 kW 1 W = 3.414 btu/hr 1 Btu = 1.055 kJ 1 kCal/h = 3.968 btu/hr 1 HP = 2545 btu/hr

PSYCHROMETRIC CHART **Normal Temperature (SEA LEVEL)** BAROMETRIC PRESSURE: 29.921 in. Hg



ENTHALPY OF ADDED OR REJECTED MOISTURE





شرکت هوا ساز همیشه سعی بر آن دارد با استفاده از قطعات و متريال مرغوب نیاز مشتریان خود را برآورده سازد که در ذیل به معرفی برخی از مشارکت کنندگان در تامین قطعات این شرکت می پردازیم :

مرغوب ترین قطعات و اجزاء :

انواع کویل های Cu/Cu , Cu/hydrophilic Al Heresite Coating
کمپرسورهای Scroll , Screw , Reciprocating از نوع Frasscold,bitzer,copeland , Carrier,refcomp
مبدلهای Shell & Tube مارک رادیران و Compact Plate Heat Exchanger مارک Danfoss



دفتر فروش : تهران - خیابان شهید بهشتی - خیابان سرافراز - پلاک ۵۵ - مجتمع دریای نور
تلفن : ۸۸۷۵۴۹۱۰ فکس : ۸۸۷۵۴۹۱۱
کارخانه : کیلومتر ۱۹ جاده قدیم کرج - منطقه صنعتی اسماعیل آباد - خیابان اول - پلاک ۶
تلفن : ۴۶۸۱۱۹۶۵-۷۵ فکس : ۴۶۸۴۲۲۹۲

