SERIES CF3

CTI-CERTIFIED INDUCED DRAUGHT COUNTERFLOW PULTRUDED FRP COOLING TOWER

PAHARPUR

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PAHARPUR SERIES CF3 PULTRUDED FRP COUNTERFLOW COOLING TOWER

Paharpur's Series CF3 induced draught cooling tower represents the culmination of more than 50 years of cooling tower design experience. With polyvinyl chloride fill, pultruded FRP structure, moulded FRP basin and casing, the series CF3 continues a tradition of excellence.

Improvements and innovations in structure and component designs produce in the series CF3 a heavy-duty, energy efficient and dependable cooling tower unrivalled in the industry. Perhaps most importantly, all major components responsible for this breakthrough have been developed, manufactured, applied and guaranteed by one single source - Paharpur. Without question, the series CF3 establishes a new state of the art in counter flow cooling tower design.

The Paharpur Series CF3 is certified for thermal performance by the Cooling Technology Institute (CTI), Houston, USA as per CTI certification standard STD-201. Details are available at www.cti.org.

PAHARPUR'S INTEGRATED SYSTEM DESIGN

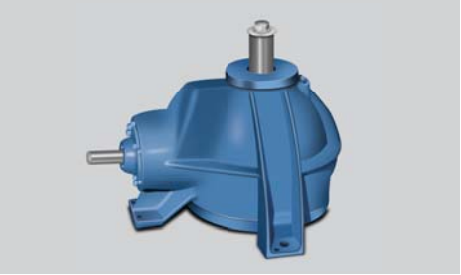
Although Paharpur's original motivation in the design and manufacture of all major cooling tower components was to assure dependability and longevity, a secondary benefit quickly became of prime importance. That benefit was the ability to coordinate a variety of components of known design characteristics into a cooling tower of assured thermal performance predictability.

Paharpur's philosophy of component design has been and continues to be to assess the value of a development only in terms of its effect upon the total cooling tower system. Particular fills, fans, fan cylinders, etc., tend to optimize within a very narrow range of tower configurations and design parameters. Consequently, a considerable variety of individual components is required in order to achieve a near-ideal combination for any operating circumstance. And it is imperative that these components be designed and rated within a cooling tower system context.

SERIES
CF3
CORROSION FREE

FILL
Vacuum formed polyvinyl chloride (PVC) sheets are solvent welded into a cross corrugated configuration to provide maximum heat transfer surface with minimum pressure drop.

ELIMINATOR
Drift eliminators are formed from PVC sheets into a cellular configuration which forces exhaust air into three complete directional changes to eliminate water droplets from the air stream. The 3-pass eliminator provides maximum efficiency in drift elimination at minimum power consumption.



SPEED REDUCER
Designed and manufactured to furnish extended service life, the Paharpur Series 20T and 22.2 gear reducers used in CF3 towers have an overall mechanical efficiency of 94 - 97%. Their rugged design has been proven by years of field operational experience worldwide.

FAN
Designed, tested and manufactured by Paharpur, fan blade material is cast aluminium alloy. Fan sizes and materials are selected to provide the most efficient solution to any cooling tower application requirement. The entire fan assembly is statically balanced prior to shipment.

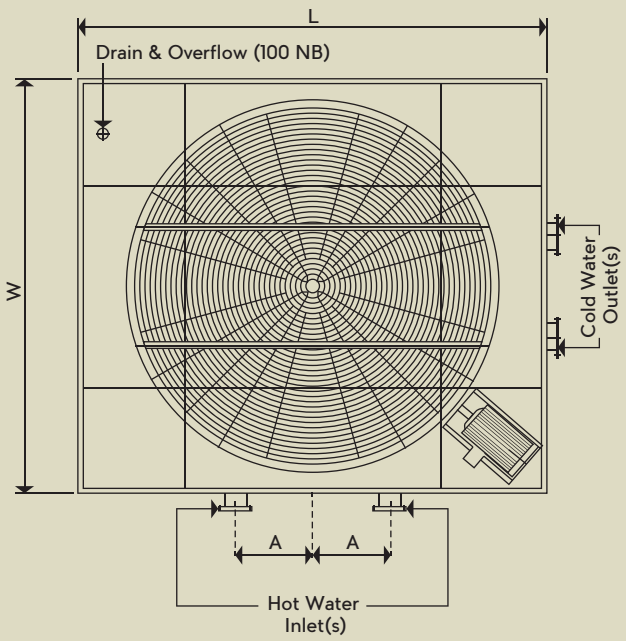
DRIVE SHAFT

Utilizing floating tubular shafts and neoprene flexible elements. Paharpur designed and manufactured drive shafts do not require lubrication and are dynamically balanced prior to shipment.

DISTRIBUTION SYSTEM

Uniform hot water distribution is guaranteed by Paharpur's injection moulded polypropylene nozzles, incorporating a unique diffusion ring for spray development distribution. This nozzle system is specially designed to function under low operating heads for greater energy efficiency. Large diameter orifices contribute to overall reduced maintenance costs.

PLAN VIEW



FAN CYLINDER

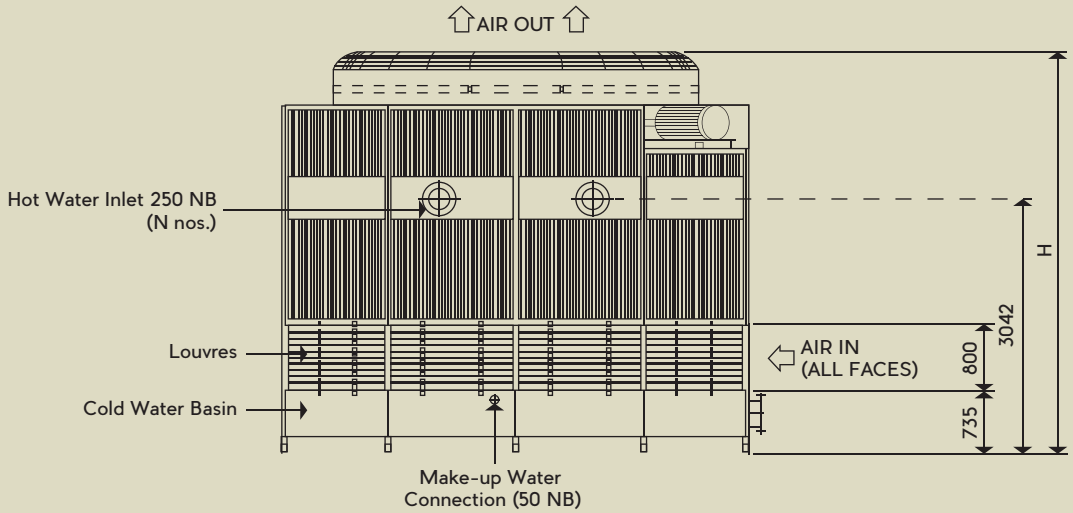
Fan cylinders are Paharpur designed and manufactured fibre reinforced plastic (FRP), moulded to provide a large entrance flair, smooth approach to the fan and close tip clearances for maximum efficiency and reduced operating costs.

STRUCTURE

Structural components are pultruded FRP composites. Columns are 65 mm X 65 mm nominal box section with minimum 5 mm wall thickness and carry loads to anchor castings. Columns are spaced on no greater than 1520 mm centres both longitudinally and transversely. Diagonal and other structural connectors are through-bolted.

ELEVATION

All dimensions are in mm.



TYPICAL TOWER SCHEMATICS - PLAN VIEW AND ELEVATION (SINGLE CELL)
FOR DETAILED ENGINEERING DATA SEE TABLE 1 ON NEXT PAGE

TABLE 1
TOWER ENGINEERING DATA

Model No.	Nominal Tons*	Overall Length L (mm)	Overall Width W (mm)	Total Height H (mm)	A** (mm)	No. of HW Inlets/ CW Outlets (N)	Fan Type/Dia. (“)	Fan RPM	Motor HP	Gearbox Series	Gearbox Ratio	Drive Shaft Series
31441	109	2546	2546	4702	610	1/1	H-3-6 / 72	535	7.5	20T	2.71:1	6Q
31442	119						H-3-8 / 72		10			
31443	135								15			
3145S/7.5 HP	138	3146	2546	4702	305	1/1	H-3-8 / 72	535	7.5	20T	2.71:1	6Q
31451	152								10			
31452	171								15			
31453	188								20			
3155S/10 HP	184	3146	3146	4733	305	1/1	H-3-8 / 96	444	10	20T	3.27:1	6Q
31551	211								15			
31552	231								20			
31553	248								25			
3156S/10HP	198	3766	3146	4733	0	1/1	H-3-8 / 96	444	10	20T	3.27:1	6Q
3156S/15HP	227								15			
31561	250								20			
31562	273								25			
31563	290								30			
3166S/10 HP	230	3766	3766	4733	0	1/1	H-3-9 / 120	266	10	22.2	5.50:1	6Q
3166S/15 HP	263								15			
3166S/20 HP	290								20			
31661	312								25			
31662	332							320	30		4.56:1	
31663	366								40			
3167S/10 HP	252	4366	3766	4733	915	2/2	H-3-9 / 120	266	10	22.2	5.50:1	6Q
3167S/15 HP	288								15			
3167S/20 HP	317								20			
31671	342								25			
31672	362							320	30		4.56:1	
31673	401								40			
3177S/10 HP	288	4366	4366	4812	915	2/2	H-3-9 / 144	320	10	22.2	4.56:1	6Q
3177S/15 HP	329								15			
3177S/20 HP	363								20			
3177S/25 HP	391								25			
31771	415								30			
31772	455								40			
31773	493								50			

TABLE 1
TOWER ENGINEERING DATA

Model No.	Nominal Tons*	Overall Length L (mm)	Overall Width W (mm)	Total Height H (mm)	A** (mm)	No. of HW Inlets/ CW Outlets (N)	Fan Type/Dia. (“)	Fan RPM	Motor HP	Gearbox Series	Gearbox Ratio	Drive Shaft Series
3178S/10 HP	310	4986	4366	4812	610	2/2	H-3-9 / 144	320	10	22.2	4.56:1	6Q
3178S/15 HP	355								15			
3178S/20 HP	390								20			
3178S/25 HP	421								25			
31781	447								30			
31782	493								40			
31783	531								50			
3188S/10 HP	345	4986	4986	4812	610	2/2	H-3-9 / 168	320	10	22.2	4.56:1	175
3188S/15 HP	395								15			
3188S/20 HP	435								20			
3188S/25 HP	467								25			
3188S/30 HP	496								30			
31881	546								40			
31882	587								50			
31883	626								60			
3189S/10 HP	370	5586	4986	4812	915	2/2	H-3-9 / 168	320	10	22.2	4.56:1	175
3189S/15 HP	423								15			
3189S/20 HP	466								20			
3189S/25 HP	502								25			
3189S/30 HP	533								30			
31891	587								40			
31892	630								50			
31893	668								60			
3199S/10 HP	392	5586	5586	4812	915	2/2	H-3-9 / 168	320	10	22.2	4.56:1	175
3199S/15 HP	449								15			
3199S/20 HP	494								20			
3199S/25 HP	532								25			
3199S/30 HP	565								30			
31991	622								40			
31992	672								50			
31993	715								60			

* Nominal tons are based on 95°F hot water, 85°F cold water, 78°F wet bulb and 3 USGPM per ton. Multi-cell models also available. Details available on request.

** For models with 1 hot water inlet, the inlet flange is to the right of tower centre.

OPERATIONAL AND ENVIRONMENTAL CONSIDERATIONS

ENCLOSURES

Occasionally, cooling towers are located inside architectural enclosures for aesthetic reasons. Although Paharpur cooling towers adapt well to enclosures, the designer must realise 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 minimum distance specified should be observed.

NOISE LEVEL

Sound produced by a series CF3 tower operating in an unobstructed environment will meet all but the most restrictive noise limitations and will react favourably to natural attenuation. Where the tower has been designed to operate within an enclosure, the enclosure itself will usually 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, you have several options listed below in ascending order of cost impact:

- In many cases, noise concerns are limited to night-time, when ambient noise levels are lower. Such situations are tackled by using two (2) speed motors in either 1500/1000 or 1500/750 rpm configuration; and operating the fans at reduced speed instead of 'cycling' at full speed. Typical sound reductions are 9 dBA at two-third fan speed or 13 dBA at half-speed. This is a relatively inexpensive solution and pays 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 motor horse power.
- 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 significant cost impact and because of obstruction to normal maintenance procedures.

APPROPRIATE CF3 APPLICATIONS

TYPICAL APPLICATIONS

Although CF3 is a premium-value cooling tower targeted for those applications that demand a high degree of corrosion resistance as well as an aesthetically pleasing appearance, it is routinely applied in virtually all normal systems requiring cold water for the dissipation of heat. Some common applications include:

- Condenser water service for air conditioning and refrigeration systems. (They are especially adaptable to Free Cooling applications).
- Jacket water cooling for engines and air compressors.
- Chemical and industrial processes.
- Batch cooling.
- Welder cooling.
- Plastic industry processes.
- Dairy, citrus, and other food industry processing where water contamination is not likely to occur.

PAHARPUR SERIES CF3 COOLING TOWER SPECIFICATIONS

DESCRIPTION

Supply and install a CTI Certified (as per CTI STD-201) induced draught, counterflow, field-erected cooling tower of ..... cells, as shown on plans. Tower shall be similar and equal in all respect to Paharpur Series CF3 model .....

PERFORMANCE

The tower shall be capable of cooling ..... CMH of water from .....°C to .....°C at a design wet bulb temperature of .....°C. The cooling tower manufacturer shall guarantee the performance of the tower as installed according to plans.

CONSTRUCTION

The cold water basin, fan deck and fan cylinder shall be formed of inert fibre-reinforced plastic (FRP). All hardware shall be fabricated of HDG Steel. Structural columns will be of pultruded FRP. Mechanical equipment support structure, fan guards will be of HDG steel.

MECHANICAL EQUIPMENT

Fan(s) shall be axial propeller type, incorporating heavy duty blades of cast aluminium alloy. Blade pitch angle shall be individually adjustable. Fan(s) shall be driven through a right angle, industrial-duty, oil-lubricated, geared speed reducer. Speed reducers employing pulleys and belts shall not be acceptable. Motor(s) shall be..... HP, TEFC weather proof, squirrel cage induction type. Speed and electrical characteristics shall be ..... RPM, single winding, 3 phase, ... hertz ..... volts. Motor shall be located outside the humid interior of tower, in a corner on the fan deck. The motor shall be connected to the gear reducer by a dynamically balanced HDG steel driveshaft equipped with neoprene flexible coupling elements. A neoprene oil gauge and drain line shall extend from the gear reducer to the motor enclosure, and shall be equipped with an easily visible oil sight glass. The mechanical equipment for each cell shall rest on a rigid HDG steel support that resists misalignment between the motor and the gear reducer.

FILL & DRIFT ELIMINATORS

Fill shall be film type vacuum-formed PVC sheets with a flute size of 12 mm, solvent welded into a cross corrugated configuration to provide maximum heat transfer surface with minimum pressure

drop. Air inlet faces of the tower shall be free of water splash-out, and guaranteed drift losses shall not exceed 0.005% of the design water flow rate. Drift eliminators shall be formed from PVC sheets into a cellular configuration which forces exhaust air into three complete directional changes i.e. 3-pass to eliminate water droplets from the air stream. Louvres shall be of FRP.

HOT WATER DISTRIBUTION SYSTEM

Hot water shall be distributed over the fill by injection moulded polypropylene nozzles and diffuser rings. Nozzles shall have a threaded connection to PVC distribution pipes. Distribution piping rests on transverse beams.

COLD WATER BASIN & ACCESSORIES

The FRP cold water basin shall be sealed watertight and shall include a float-operated mechanical make-up valve, a 100 NB diameter drain-cum-overflow connection and an HDG steel debris screen with side outlet for cold water.

WARRANTY

The manufacturer shall warrant the entire tower (including the motor) against deficiency in performance and failure due to defects in materials and workmanship for a period of atleast eighteen (18) months following shipment to the site or 12 months after the date of startup, whichever is sooner.

SCOPE OF WORK

The cooling tower manufacturer shall be responsible for the design, fabrication, and delivery of materials to the project site, and for the erection of the tower over RCC foundation provided by others.

Note: FRP cold water basin can be substituted by an extended concrete basin (by purchaser). In this case, basin accessories will also be deleted from Paharpur's scope and louvres will not be required.

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Paharpur Cooling Towers Ltd

(ISO 9001:2008, ISO 14001:2004, OHSAS 18001:2007 Certified)

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Our sales representatives are located in several countries and Indian cities.
Contact information shall be made available on request.

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