OMB F.R.P. COOLING TOWER

1.1 Definition

A wet cooling tower is an enclosed device used to dispose waste heat by evaporation from industrial processes and refrigeration or air conditioning system, where it is operated based on the direct contact of the earth's most common substances: Air and Water

1.2 Classification

The various devices commonly used for cooling water fall into three main groups :

i. Ponds: cooling ponds and spray ponds.

ii. Natural draft towers: atmospheric , chimney or hyperbolic and fan assist natural draft.

iii. Mechanical draft tower: Forced or induced draft, each of which may be either Counter flow or the cross flow type.

1.3 Terminology

It is necessary to define the most common terms in the cooling tower operation.

i. Range is the difference in temperature between the inlet hot water and the outlet cold water. For 40°C inlet and 35°C outlet, the range is 5°C

ii. Approach is the difference in temperature between the outlet cold water and the wet bulb of the entering air. For 35°C water out let and 27°C wet bulb temperature, the approach is 8°C.

iii. Circulating water rate is the quantity of hot water entering the tower

iv. Fill which are placed within the tower to effect heat and mass transfer between the circulating water and the air flowing through the tower

v. Casing is a vertical enclosing sidewall which surrounds the fill and retains the water within the tower.

vi. Distribution system which begin with the inlet connection for distribution the hot circulation water within the tower to the points where it contact the air.

vii. Eliminator is an assembly which serves to remove entained moisture from the discharged air.

2.1 Principle of operation

The automatic rotating sprinkler system distributes the hot water evenly over the entire fill section . Dry air is simultaneously drafted upward causing evaporation and so, the heat is removed. The cooled water falls into the basin and is pumped to the heat source for recirculation.

2.2 Thermal design

The "Omran" cooling towers operate on the counter flow principle which gives the best performances. The air flow through the tower infill is opposed to the water flow. The cold air meets the cooled water at the bottom of the infill providing maximum evaporation and heat transfer in the infill. The PVC infill is corrugated with clear channels between flutes to prevent any blockage and giving a large surace area per unit volume. Water flows through the infill in a thin film exposing the maximum area to the cooling air flow. The flutes of the infill are at an angle and each layer of infill section is reversed, turning the film or water and air over for maximum cooling

2.3 Better Air Flow

The rotating water sprinkler head distributes the hot water within forming a fine spray, and hence does not need the conventional type of moisture eliminator. This is because the water header has large number of holes giving a 'steam' type flow direct into the infill.Towers with fixed nozzles cannot obtain the coverage, which is needed for optimum cooling. We should not overlook that in rectangular type towers, eliminators provide a pressure drop which evens out the flow particularity into the Corner.

The ‘Omran’ tower being round, plus its conical fan inlet can better provide an even air flow through the infill, with a lower pressure drop , and without the additional pressure drop caused by the eliminator needed on other towers.

Fan KW depends on the mass of air delivered, the pressure generated and the blade efficiency. From the available data on other manufacturers tower. "Omran" air volumes are similar to competitor's sizes. The influencing factor for lower power are 'pressure' and 'efficiency'.

tower has large air inlet area, with low air velocity, low pressure drop.

tower is of the induced draft type. The fan is in the ideal position, to discharge the air at a high velocity upwards and allow natural convection to prevent recirculation, as can happen with the forced draft tower arrangement, where air leaves the eliminators at low velocity.

2.4 Pumping head

As seen already, the water distribution by a rotating header, is a significant part of the "Omran" tower design. The large diameter holes in the rotating header give a gentle stream of water at negligible pressure loss. Also, there is no risk of 'clogging', as can easily happen with spray nozzles in other types of towers.

The "Omran" cooling towers pumping head, is the static height of the spray or

header pipe above the water level in the basin, plus the pressure loss through the Rotating header, sprays of balancing valves, according to the type of tower being Considered.
It should be noted that pumping heads quoted for "Omran" towers include both of these as well as the piping inside the pressure loss of the sprays is usually quoted. To this must be added the static lift to the spray header from the basic water level, plus the external piping friction loss. In many cases the pumping head required for an "Omran" tower is about 50% less than for some other towers.

2.5 Life Factor

Although we generally refer to the towers as being constructed of fiberglass, we should actually refer to them as being FRP(Fiberglass Reinforced Plastic)
FRP should not be confused with the translucent fiberglass roofing panels, and in particular with the cheaper grades which have given poor results even only in a few years. Without an adequate protective layer, the sun's ultra violet rays draw the fibres upwards so that 'hairs' appear to be growing on the panels as with fiberglass hulls, the "Omran" tower casings have a protective neopentyl glycol gel coat, which apart from containing the pigment colour, entirely resists the sun's rays. As a result, "Omran" towers do not need painting. However, if a client wishes to have a colour scheme changed, painting is possible.
Compared with timber towers which will ultimately rot, or steel towers which will rust despite increased maintenance, the fiberglass tower has a tremendous financial advantages for the wise investor. Unfortunately, many buyers appear to be only concerned to maintenance, running costs or rate of deterioration.

2.6 Smaller Fan Motors

DMD 1680 has an Installed Fan Motor of 10 H.P, whereas other reputed manufacturers offer Cooling Towers with either 15 H.P or 20 H.P motor for the Samecapacity.
The lower H.P rating of the motor used in "Omran" towers therefore leads to a substantial saving in annual energy cost as illustrated below:

	CASE NO : I	CASE NO : II
HP Difference	5 HP	10 HP
K.W.	3.7KW	7.5KW
No. of Working Hours	8640	8640

When you invest in "Omran" Cooling Towers, you are assured of the following :
1. Superior laminate strength , with Isopthalic Resin (ISO) reducing vibration and increasing tower life.
2. Neopentyl glycol (NPG) gelcoat finish for UV protection and color retention with improved surface finish.
3. Auxiliary drain tank totally in corrosion resistant FRP.

4. fans, hubs & sprinklers in gravity die cast aluminum allow LM-6 together with dynamically balanced fan assemblies ensuring smoother operation, longer bearing & motor life.
5. PVC fills made from vacuum formed virgin PVC sheets.
6. Power saving leading to lower annual electric bills due to our direct drive motors With IP-54 or IP-55 protection and 'F' class insulation.
7. Protection against malfunctioning parts including Motors through a 15 months Warranty.

3 PREFACE

This manual is intended for use by erectors , operators and service / maintenance staff to correct installation, proper operation and maintenance of the Cooling tower. This manual should be studied thoroughly and used as an aid to keep your Cooling Tower in good operating condition through timely and proper preventive maintenance practice. Users will also gain an understanding of cooling towers, principles of problems and methods for effectively dealing with them as and when they occur.

4 INTRODUCTION

A Cooling Tower is a direct contact heat exchanger, generally used to dissipate the heat in circulating water. The Heat is dissipated to the ambient air Via a process of heat and mass transfer from the circulating water. The water thus cooled is recirculated through the process, heat exchanger or condenser. The heat is transferred to the water either in a condensor like refrigeration or air-conditioning system or chemical processes or heat exchangers in cooling process, generating sets, engines, furnaces etc.
The cooling tower design has changed over the year to incorporate new materials, as and when available. The purpose being to make the tower.
1. Perform to required specification.
2. More compact
3. Weigh less
4. Consume least power
5. More long lasting , withstand corrosion and have good finish / looks.
With the introduction of Fiberglass Reinforced Plastics the above benefits are achieved in the Counterflow, Bottle shape FRP, induced Draft Cooling Towers.

5 COMPONENTS

The various components of the FRP Tower are as under:

5.1 CASING

The bolt together FRP casing is completely non-corrosive . The casing enclosing the PVC fills services to isolate the air stream, which passes over the fills. The casing is bottle shaped to reduce frictional resistance of air and aid air flow pattern. It is

designed to withstand wind loads upto 75km/hr, and vibrations emanating from the motor and other equipment. FRP casing has a high impact resistance when laminated with Isopthalic Resin and even if damaged is easily repaired at site. The neopentyl glycol gel coat is U.V. inhibited to provide a long lasting finished appearance and service life and imported wax release agents helps retain colours for long periods even when exposed to direct sunlight. The casing is in sections of easy to handle sizes and is assembled at site using bolting joints. The bottle shape of casing is ideal with regard to cooling efficiency and space economy.

5.2 SUMP

The basin serves the purposes of collecting the water descending from the fills and channelling it to the suction point. Further the basin also acts as a reservoir of water. The basin is also made of FRP and has similar characteristics as the casing.

5.3 SUCTION TANK / AUXILIARY TANK

The suction tank is located below and in the centre of the sump and has all connections for inlet/outlet, drain, filling and overflow. The unit is at the lowest point and is always flooded and thus ensuring no cavitation on the pump suction. The suction tank is fully moulded in FRP to prevent corrosion and subsequent leakage's. A drain is provided to the tank which makes it quite simple to remove the accumulated dirt and to drain out the water, simplifying the cleaning and maintenance of the Tower.

5.4 TOWER STRUCTURALS

The structurals of the tower support the casing, basin and motor mounting the loads to the foundations. These are of MS and are hot dipped galvanised so as to resist corrosion.

5.5 FILLS

The fills section is designed to bring about intimate contact of water and air so as to facilitate heat and mass transfer at the same time aiding in proper and even distribution of air and water over the cross section, while maintaining minimum pressure drop. The fills are of honeycomb section and are vacuum formed from Virgin PVC for excellent resistance to corrosion and give maximum area for wattage.

5.6 SPRINKLER

The gravity die cast aluminium alloy / S.S sprinkler is used to distribute the water evenly over the cross section of the tower. An aluminium alloy / S.S rotary head with radial PVC / PP pipes having drilled holes serves this purpose. The rotation of assembly is accomplished due to reaction of water jet being sprayed from the PVC / PP pipes. The sprinkler head is mounted on top of the central water supply pipe. To reduce frictional resistance and to ensure free rotation even at low flows the sprinkler has 2 sealed prelubricated ball bearings mounted on the central shaft. This sprinkler system is preferred over the fixed nozzle system for various reasons.

5.7 FAN / FAN BLADES

The light weight fan has good corrosion-resistant quality is an axial flow, multiblade version with adjustable blade pitch. The fan is designed to deliver large volumes of air at low power consumption and low noise generation . The fans are dynamically balanced for smooth operation, longer bearing life including that of the supporting Structure. FRP fan blades may also be provided on demand and these have in addition to excellent corrosion-resistance , good noise reduction properties.

5.8 Fan Drive Motor

The fan drive motor is in IP-54 or IP-55 'F' class design. The fan is directly driven by the special extended shaft motor made from steel mounted facing downward on a mounting frame on the top of the Cooling Tower.

5.9 GRILLS

Since Cooling Tower are generally installed on wind swept rooftops or at higher altitude, galvanised MS grills are installed at the air inlet and air outlet (space between the Tower casing and Water Basin) to prevent water splash and contaminants like leaves, birds etc. entering the Cooling Tower.

5.10 DRIFT ELIMINATORS

Units with rotary sprinklers are designed to minimise carry over by judicious choice of air flow velocities. The air distribution is aided by using a centrally located rotating eliminator section to avoid high velocity areas. Further the pipes are covered by aerofoil section eliminators which helps arrest small droplets from escaping and for evenly distributing the sprinkled water. For the towers using stationary sprinkler nozzles a full width eliminator covering the full cross section is used. The shape of the eliminator is chosen to minimise pressure loss of air and to trap the maximum amount Of entrained droplets.

6 PREPARATION FOR INSTALLATION

6.1 Decrate all components, open all packages, and confirm nothing is damaged.

6.2 Check all components received as per packing slip (including fiberglass mat and resin).

6.3 Collect all tools and tackles as needed

-- spanners
-- drill &drill bit
-- pipe wrench
-- screw driver
-- Plier
-- hammer
-- files
-- spirit level / pipe level
-- slitting knife
-- brush
-- roller

6.4 Check concrete foundation , is as per drawing.

6.5 Check level of foundation legs and correct if required.

6.6 Install suction tank on central foundation,, with correct orientation as decided by client.

6.7 Install pipe legs on circumferential pad foundation and slip in foundation bolts. Level top side with level pipe.

6.8 Install basin supporting ring and bolt together, with supporting legs.

6.9 bolt basin FRP section and place on top of Basin Ring.

6.10 Install Grill (Jali) support upper Ring support legs on top of Basin on edges.

6.11 Install upper ring and bolt to legs.

6.12 Install casing sections piece by piece and bolt together to next piece to form complete cylindrical shape.

6.13 Install motor supporting ring / bracket

6.14 Install ladder

6.15 Install motor and fan assembly (for large towers, for smaller tower these may be installed after fills)

6.16 Connect inlet stand pipe.

6.17 Bolt on sprinkler mounting pipe.

6.18 Install sprinkler head, by screwing on the pipe.

6.19 Screw in pipes and end caps and lock with locknut (for large towers turn buckles are to be used for maintaining PVC pipes horizontal).

6.20 Install clamp on central pipe.

6.21 Install cross member for fill support.

6.22 Place fill support grid and bolt in place to form ring.

6.23 Install fills down on grid, starting with diametrically placed packs, fill up rest of grid.

6.24 Install next fill pack layer at right angles to 1st layer.
6.25 Seal Basin flanges and suction tank with fiberglass mat and resin, and allow to set before disturbing.
6.26 Install motor / fan protection grid with hinged portion in alignment with ladder.
6.27 Install grill (screen) for air inlet.
6.28 brush coat bolt heads with resin for additional protection.
6.29 Provide bottom support for ladder.

6.30 SPRINKLER ASSEMBLY

a. Sprinkler Pipes

The sprinkler pipes must be clean to prevent any blockage in holes. When cleaning the sprinkler pipes , loosen the lock nut showen in fig to unscrew and remove the sprinkler pipes. On reassembling , be sure the alignment screws (round head) are positioned at the top centre.

b. Sprinkler hand

Scale or sludge attached to the narrow space impedes revolution. IF the sprinkler rotation slows down or even stops despite normal water flow the sprinkler pipes or , at the beginning of the season , if the head does not rotate even though the water is flowing at the same rate as last season , dismantle the rotary head for cleaning and Checking.

When reassembling, do not wet the bearing potion with water and apply ample anti-corrosion lubricant (Water proof, Lithium soap- radical grease, on bearings and oil seal position . Also pay particular attention when passing the oil seal over the centre pole to not to damage the lips of the oil seal. Since oil seal is effective for a limited Period, it is desirable to dismantle and replace it every two or three years.

7 "NORMAL" CONDITIONS

Water quality and environmental conditions on the vast majority of HVAC Cooling tower applications permit acceptable service life from standard Cooling Tower construction using the materials previously described. Significant deviation from these "normal" conditions often demands alternate materials choices.

For most purposes, the following criteria define "normal" conditions :

Standard tower design assumes a maximum of 120 °F hot water to the tower, including system upset conditions. Temperatures over 120 °F , even for short duration, may impose damaging effects on PVC fill, many thermoplastic components, galvanizing and plywood. Those rare applications demanding hot water in excess of 120 °F usually benefit from careful review with the tower manufacturer to assure that appropriate materials changes from the standard configuration are included in the initial purchase specification.

"Normal" circulating water chemistry falls within the following limits (note the distinction between circulating water and make-up water):
-- ph between 6.5 and 8.0 , although ph down to 5.0 is acceptable if no galvanized steel is present. Low ph attacks galvanized steeel, concrete and cement products, fiberglass and aluminium. high ph attack wood, fiberglass and aluminium.
-- CHlorides (expressed as NaCl) below 750 ppm.
-- Calcium (as CaCO3) below 1,200 ppm-except in arid climates where the critical level for scale formation may be much lower
-- Sulfates below 5,000 ppm - if calcium exceeds 1,200 ppm, sulfates should be limited to 800 pp, (less in arid climates) to prevent scale formation.
-- Sulfides below 1 ppm.
-- Silica (as SiO2) below 150 ppm .
-- iron below 3 ppm .
-- Manganese below 0.1 ppm.
-- Langelier saturation index between -0.5 and +0.5 -negative LSI indicates corrosion likely ; positive indicates CaCo3 scaling likely.
-- Suspended solids below 150 ppm if slids are abrasive-avoid film - type fills, if solids are fibrous, greasy, fatty or tarry-wood, PVC, Polypropylene or ABS fills can be used, but PVC usually is the material of choice.
-- oil and grease below 10 ppm or loss of thermal performance will occur.
-- No organic solvents.
-- No organic nutrients, which could promote growth of algae or slime,
-- Chlorine (from water tratment 0below 1ppm free residual for intermittent treatment; below 0.4 ppm free residual for continuous chlorination.
These conditions define normal circulating water, including the chemical concentrating effects caused by recirculating the water to some predetermined number of Concentration.

8 WATER QUALITY CONTROL

Cooling towers are very effective air washers. Atmospheric dust able to pass through the air inlet will enter the circulating water or air pollution, such cases as corrosion, scale and algae growth which impeded the performance of air conditioning equipments are suprisingly increasing

To prevent such trouble , it is not enough to depend entirely upon chemicals or equipments. Check the water quality and also on environment factors as well.

1. Make quality analysis of circulating water and supplementing water and take appropriate action to control the quality.
2. If when the troble is anticipated owing to the condensed circultion water , we recommend the use of chemicals, periodic blow sown to keep the operation within the regulate water quality.
3. For scale and alhae, clean with chemicals.
4. Use strainer or filter depending on quality and mixture of the water.

Operating Hours and Condensation of Circulating Water

Conditin

R : Circulating water quality 30 m3/h
E : Evaporation Loss quality 1% (0.3 m3 /h)
C : Carry over loss 0.1% (0.003 3 m/h)
B : Forced low 0%, 0.1%, 0.4%
H : maintaining water 2m3 (c.t pit, piping and condenser incl.)
NMax : condensation ration

Note : Normal condensatin is about 3 fold

Condensation Multiple , Blow-down Volume and Suply Water Volume

Condensation Multiple : N	2	3	4	5	oe
Blow-down volume : B(i/h/RT)	5.7	2.5	1.4	0.84	0
Supply water Volume : M(i/h/RT)	13	9.8	8.7	8.1	6.5

Note : Above table indicates in case of packaged. chilling unit and turbo type compressor (131/min/RT. 37°C-32°C-27°C) For general calculation method, refer to 7.5 Relationship between Condensation Multiple (N) and Supply Water Volume (M)

WARNING :
Water treatment must be supplied and / or applied by a professional in the field in order to avoid fill damage. It is the user's/ owner/s responsibility to treat the water in order to stop biological contaminants and avoid among other bacterium, the Legionnella bacteria, which is known to cause legionnaire disease.

9 Post Erection checks / Pre-commissioning checks

9.1 Check level of sump, and fan ensure they are parallel to ground.

9.2 Check center pipe is vertical and sprinkler arms are all levelled, at right angles to center pipe.

9.3 Ensure no dirt/other foreign particles are present in sump, suction tank etc. Sweep clean/wash clean.

9.4 Rotate sprinkler with hand and ensure it is free

9.5 Ensure fill top is even.

9.6 Ensure sprinkler arms are at a contrant level above the fills and that the arms do not rub agains/ uneven fills, casing etc.

9.7 Ensure fan and motor assembly is free.

9.8 Check all bolts are tight and no loose parts noticed.

9.9 Fill water in sump and check and eliminate water leaks , if any.

9.10 Connect correct power (i.e 380V, 50Hz 3PH. AC) supply to fan and check.

a) direction of rotation of fan is correct and air is being sucked through screen above sump and discharged vertically upwards.

b) Vibrations are negligible.

c) Fan cable connection are made with lugs, & terminal cover gasket, is tight.

9.11 Establish water flow and check sprinkler rotates and check any unregulated by pass from sprinkler pipes.

Check after commissioning

1. Check motor speed to be as specified in technical data for particular model.
2. Check air flow rate is as per specification
3. Check water flow rate is as per specification.
4. Check Power/current drawn by fan motor is within limits and as specified.
5. Check for abnormal noise / vibration during operation.
6. Check sprinkler rotates freely at 5 to 8 rpm or adjust holes to angle so as to achive correct rpm.
7. Ensure water is being distributed evenly over the FRP eliminator plates and there is no carry over from below the eliminator plate water must fall down below evenly, and not pass out.
8. Eliminator plate adjustment to be checked to ensure equal distance between fill top and plate bottom.
9. Measure Temperature at following locations:
   i. water inlet
   ii. water outlet/sump
   iii. make up water inlet
   iv. wet bulb/ dry bulb temperature of air at inlet to tower at 4 locations equally spaced around tower.
   v. wet bulb/ dry bulb temperature at outlet of tower above fan.
10. Adjust drain valve to give adequate blow down.
11. Set float to ensure proper operation and to avoid over flow when plant stops.

10 MAINTENANCE Schedule

Every Day

Check if --

1. Vibrations are normal / Noise normal
2. Water distribution proper.
3. Fan Motor current normal and is all phases
4. Inlet / outlet temperature of water normal.

Every Week :

1. Clean inlet jali to remove entrained matter.
2. Clean inlet water filter.
3. Clean sprinklers / nozzles if choked.
4. Check growth of Algae etc. and remove from sump.

Every Month :

1. Drain Tank , flush out and remove any sediment
2. Check fills if clogged due to Algae, sediment / salts, etc.
3. Check structural / FRP casing and Basin damage and rep
4. Clean from outside with soap and water.
5. Check and tighten all bolts.
6. Smear Bolts with grease to facilitate easy opening the next time.

Every Two Months :

1. Grease all bearings of motors.
2. Grease all bearings of sprinklers.
3. Check runout on fan motor shafer.
4. Clean blades of foreign matter.
5. Check fills if damaged and replace.
   Replace bearings of sprinkler assembly after 2 years and fill with grease.

PROBLEAMS

TROUBLE	CAUSE	REMEDY
Lowering of Cooling capacity 1. Motor stoppage Top	1. Electric blackout 1.	1. Contact power company
	2. Fuse burnout due to damaged Contacts	2. Get proper fuse
	3. Insufficient switch capacity	3. Change to proper switch
	4. Bad switch contact	4. Adjust / Clean Contacts.
2. Sudden lowering of motor speed(rotations per minute) Top	1. Defective starter	1. Check starter for defects
	2. Too heavy load	2. Reduce the load by checking motor current
	3. Low supply voltage	3. Consult power company
3. Cannot rev up motor speed (rotations per minute) Top	1. Defective starter / starter connections	1. a. Correct connection according to name plate b. Check supply voltage across all 3 phases c. Check current in all 3 phases
	2. Connection of rotary and fixed section	2. Send out to repair shop
	3. Motor winding damaged	3. Send out to repair shop
4. Fan Stoppage	1. Jammed Bearing	1. Replace bearing
Temperature rise 1. Motor getting over heated Top	1. Too heavy load	1. Lighten load proper level
	2. a. Lowering of voltage supply b. Unbalanced voltage supply	2. a. Consult power company b. Consult power company
	3. High surrounding temp	3. Consult "Omran"
	4. Contact between rotary and fixed section	4. Change bearing or supplement grease
Oil Leaking , others 1. In case of gear speed reducer oil leakage Top	1. Too much oil	1. Lower the oil face to proper level
	2. Loose bolt	2. Tighten properly

TROUBLE	CAUSE	REMEDY
Rise in water temperature	1. Water flow above specified flow	1. Regulate to correct flow rate.
	2. Air flow below specified flow	2. Adjust blade angle check and clean jail.
	3. Load higher than design	3. Adjust load to correct level.
	4. Fill checked or coated	4. Clean / replace fills. Use proper water (Make up) quality
	5. Fresh air intake not sufficient or area sufficient or area around tower not as specified.	5. Improve ventilation and ensure exhaust air does not get recycled.
	6. WBT high	6. Check design condition and ensure no recycling of exhaust air.
	7. Water bypassing fills	7. check sprinkler head and pipe leakages.
Top	8. Sprinkler jammed/water not being sprinkled and Distributed	8. Repair sprinkler and distribution system.
Water flow Less	1. Filter chocked	1. Clean water filter.
	2. Sprinkler pipes chocked	2. Clean pipes and holes
	3. Level of water low in pump	3. Adjust float/ inlet flow ensure proper make-up
Top	4. Pump small	4. Replace for correct flow volume
Air flow low	1. Fan speed low	1. Check bearings/motor
	2. Fan blade angle incorrect	2. Correct blade angle to required setting
Top	3. Inlet jali chocked	3. Clean air path

TROUBLE	CAUSE	REMEDY
Noise & Vibration	1. Fan mounting loose	1. Tighten mounting bolt and correct/ replace if needed.
	2. Fan blocks loose	2. Tighten blade in hub
	3. Fan unbalanced	3. Rebalance and adjust
	4. Motor bearing faulty	4. Check and grease or replace bearing on motor.
	5. Hub mounting on motor shaft loose	5. Tighten and use end plate and shims if required.
	6. Many parts rubbing against tower components	6. Give proper clearances and adjust/ align components
Top		
Water carry over	1. Sprinkler rotation too faster	1. Adjust sprinkler angle as to match the specified rotation
	2. Blocking of filter	2. Clean up any blocked part
	3. Defective eliminator	3. Replace eliminator
	4. Sprinkler too high above filter	4. Adjust as specified. 25mm - DMA 2116 to DMB 4116 50mm - DMA 6616 to DMB 8416 75mm - DMA 1260 and above
Top		

Model	Motor Power	Fan Dim	Dimension							
			High	Dim	Inlet	Outlet	Over Flow	Drain	Make Up	Quick Full
MB-40	1	0.9	2	1.78	3	3	1	1	½	-
MB-50	1.5	0.9	2.48	2.1	3	3	1	1	¾	-
MB-60	2	1.2	2.48	2.1	4	4	1 ½	1 ½	¾	-
MB-80	2	1.2	2.48	2.1	4	4	1 ½	1 ½	¾	-
MB-90	2	1.2	2.35	2.59	4	4	1 ½	1 ½	¾	-
MB-100	2	1.2	2.57	2.59	4	4	1 ½	1 ½	¾	-
MB-125	3	1.5	2.62	2.95	5	5	1 ½	1 ½	¾	¾
MB-150	5	1.5	2.62	2.95	5	5	1 ½	1 ½	¾	¾
MB-175	5	1.8	2.92	3.71	6	6	1 ½	1 ½	¾	¾
MB-200	5	1.8	2.92	3.71	6	6	1 ½	1 ½	1	1
MB-225	7.5	1.8	3.66	4.39	6	6	1 ½	1 ½	1	1
MB-250	7.5	1.8	3.66	4.39	6	6	1 ½	1 ½	1	1
MB-300	7.5	2.4	3.66	4.39	8	8	3	1 ½	1	1
MB-350	10	2.4	3.68	4.85	8	8	3	1 ½	1	1
MB-400	15	2.4	3.68	4.85	8	8	3	1 ½	1	1
MB-450	15	3	4.04	5.51	10	10	4	3	2	2
MB-500	15	3	4.27	5.51	10	10	4	3	2	2
MB-600	15	3.3	4.83	6.53	10	10	4	3	2	2
MB-700	20	3.3	4.83	6.53	10	10	4	3	2	2
MB-800	25	3.6	4.83	7.59	12	12	4	3	3	3
MB-1000	30	3.6	5.23	7.59	12	12	4	3	3	3
MB-1250	30	4.2	5.56	8.79	12	12	4	3	3	3

OMRAN TAHVIEH

OMRAN TAHVIEH

OMRAN TAHVIEH

Heating , Ventilation And Air Conditioning

Central Office : # 1.2 , 1st floor , No . 108 , Iranshahr Ave., Tehran - Iran , Tel : (98 - 21) 8847372 - 3 , 8318850 - 2Tel & Fax : (98 - 21) 8318852.