JACIR
Cooling for life

KHF and KHFIM

Closed circuit axial fan cooling tower

Technical Documentation

CONTENTS

	Page(s)
Closed circuit cooling tower	2
Closed circuit cooling tower principle	3
Closed circuit hybrid cooling tower principle	4
Manufacturing details – Options	5-10
Technical characteristics – KHF	11
Drawings and dimensions - KHF	12-13
Support KHF	14
Choice of location	15
Water treatment	16
Technical prescription KHF	17-19
Technical prescription KHFIM	20-22

LE FRENCH FAB

JACIR

With more than 60 years' experience, our company:

∞ Has invested in detailed research and development in order to propose technical solutions in accordance with environmental protection through unequalled realizations and patents.
∞ Is today the European leader thanks to its technology beyond market requirements.

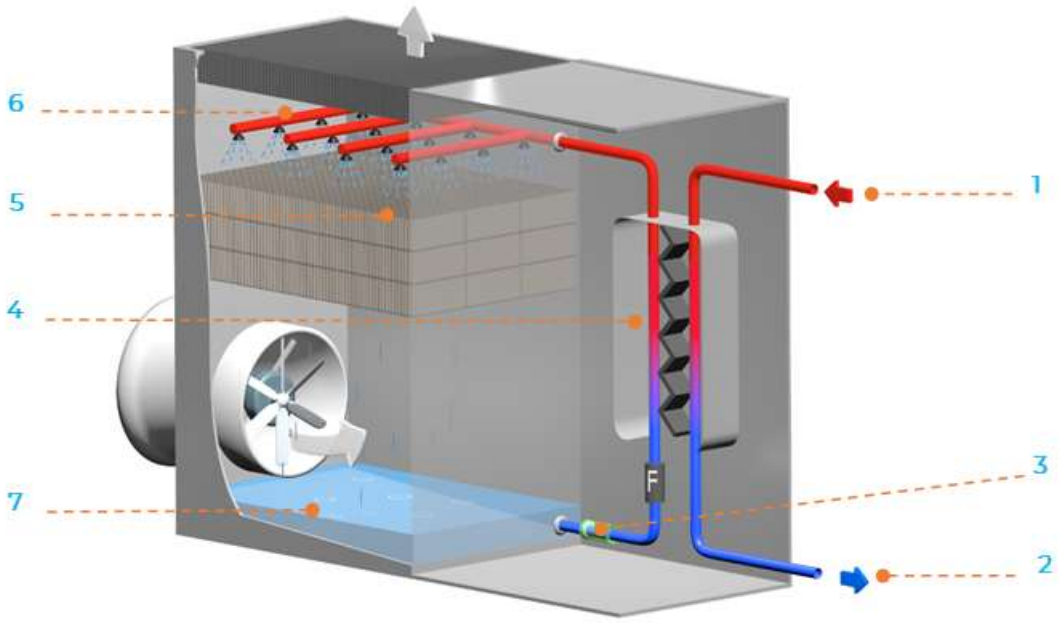
STRONG POINTS KHF – KHFIM SERIES

∞ SAFE and HYGIENIC	In accordance with December 2020 NF E 38-424 standard.
∞ PLATE HEAT EXCHANGER	Made of stainless steel, the plates are removable to ease cleaning and reassembling
∞ NO FREEZING RISK	Glycol free Plate Heat Exchanger: no freezing risk during winter
∞ WATER PROOF	Thanks to our assembling technology, we guaranty no leak equipment
∞ EXCHANGE SURFACE	High efficiency, with low fouling and low pressure drop characteristics thanks to vertical channels. Use up to 55°C as standard.
∞ ANTICORROSION COATING	Casing of the tower is assembled without any welding, also proposed in X-STEEL stainless steel.
∞ EASY MAINTENANCE	Large access doors, fan outside the tower and at man height, inclined and flat basin for a complete drain and cleaning.
∞ EVOLUTIVE TOWER	Possibility to increase the exchanged power by addition of plates. Possibility to add a plume suppression coil further on (KHIM and KHFIM range)
∞ SILENCE	Very silent cooling towers in standard version with very low sound levels. This sound level can be optimized with silencers, without necessarily increase the installed electrical capacity.

Closed circuit cooling tower principle KHF

A cooling tower is a heat exchanger, which enables water to be cooled through direct contact with air. The heat transfer from the water to the air is carried out partly by sensible heat transfer, but mainly by latent heat transfer (evaporation of part of the water into the air), which makes it possible to reach cooling temperatures lower than ambient temperatures.

Open wet air cooling tower operating principle:



Process (primary) side:

The water to be cooled enters into the integrated plate heat exchanger (1) and exits once cooled (2). Primary (user) circuit is closed and is not in contact with the air.

Cooling tower side (evaporation):

Water is sucked up from the basin by a pump (3), circulates through the plate heat exchanger (4) protected by a strainer and FRC centrifugal filter; then it enters the anti-freeze plume suppression battery (Jacir patent) (5); then, via a motorised valve (6), it is sent either to the dispersion ramps (7) to be dispersed over runoff surfaces (8), or directly to the basin if the climatic conditions enable to ensure dry cooling. The water, cooled by the forced ventilation, falls freely into the sloped basin (9) at the bottom of the tower.

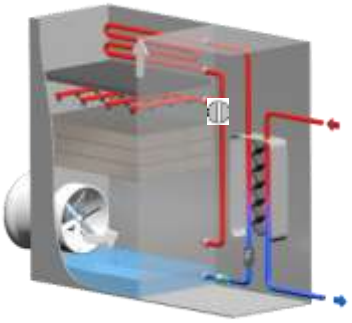
Freeze-free, glycol-free and easy to maintain:

Jacir technology does not require glycol: the heat exchanger's ice cover and all the tower's elements can be cleaned and descaled by a simple maintenance operation.

Closed circuit hybrid cooling tower principle KHFIM

Standard KHF closed circuit cooling tower ranges have originally been designed to receive the plume abatement coil option; these KHF ranges are then referred to as KHFIM closed hybrid Cooler range. Their efficiency is ensured by a finned tube coil combined with a valve for adjusting the water spray on the exchange surface (packing). This water flow regulation over the exchange surface is a market exclusivity, JACIR patent.
Therefore, the combination of the air desaturation by air outlet warming up, and the reduction of the water spray on the packing, ensures the complete plume suppression. Beyond the plume suppression itself, this system can provide significant water savings and is an ultimate obstacle to the drifts.
This technology proposed by JACIR has been deeply researched in partnership with the CETIAT for over 40 years, and has offered the opportunity to file innovating patents.
Their design makes access and cleaning very easy and ensures performance durability.

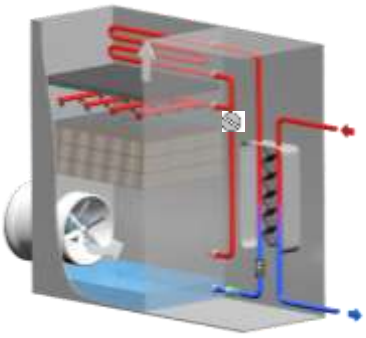
Open hybrid cooling tower operation:



Dry operation: WINTER

The by-pass valve is totally open, so the whole water flow leaves directly the tube coil to the basin: there is no water spray on the packing, no water evaporation, so no water consumption.

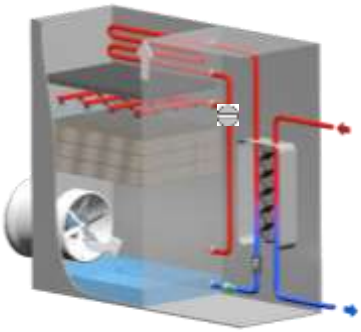
The whole power can be dissipated through the plume suppression coil.



Wet / dry operation: MID SEASON

When the dry cooling in not powerful enough part of the water flow goes to the spraying system thanks to the by-pass valve. A temperature probe (option) located in the water outlet send the information to the regulator monitoring the valve. So only the minimum water quantity is sprayed on the packing. This cooling mode lowers the water / air exchange and optimize the power evacuated in the dry coil.

According to the ambient conditions, 30 to 70% of the power can be dissipated in dry mode



Wet operation: SUMMER

If necessary, the bypass valve is totally closed: the water leaves the tube coil, and can be totally sprayed over the packing.

This water is first cooled by sensitive heat, then by latent heat (evaporation on the exchange surface).

In wet operation, 5 to 10 % of the power is dissipated by the finned tube coil.

Manufacturing details KHF-KHFIM

Casing structure

Self-supporting rigid panels, with 2 or 4 folds on the four sides, (JACIR design) allowing sound attenuation casing addition if required. Thanks to this technology, we can offer cooling towers with an extremely low sound level.
Towers are assembled with waterproof stainless-steel rivets (uniform, high-capacity locking).
There is no welding on assembled panels for the parts in contact with water; a high covering seal ensures the close fit between the panels.
Hydraulic connections are made of the same material as the cooling tower casing

As standard model, the panels are in galvanised steel mm2 thick ZENDZIMIR process 275 gr / m² (galvanised plates are protected by the zinc oxidation on the surface).

X-STEEL stainless steel is proposed as an option (corrosion resistance higher than AISI 316).

Sloped and flat basin

It has a high-water capacity in order to offer a high thermal and water treatment inertia. For example, the volume of a KH 2030 is 10 m3 minimum.

3 types of basins are available:
- standard basin (B)
- high water capacity basin (BGC)
- collecting basin (water passing through): BR.

The sloped and plane basin allows an easy and complete drain.

On the utilities panels of the basin are located:
- An overflow and PP flange,
- Drain below the lower level of the basin and Power-flow access enabling to quickly and completely evacuate all sludge and other accumulated parts in the bottom of the casing using simple water spray
- Make up water by float valve or electro valve as an option,
- Water outlet through a removable strainer (stainless steel or PEHD according DN) with a flange oversized to eliminate cavitation, with a perforated steel plate,
- Large access door(s) to the basin (990 x 540 mm)
- Option: electrical heater of V 230 or V 400 and waterproof thermostat with separate bulb. For automatic resistance control, suitable contactors must be provided.

Exchange surface: FREEFILM

The exchange surface, also called packing or infill is made of vacuum pressed PVC sheets.
This material is non-putrescible, long lasting, also offers the following benefits:

- Very low pressure drop, so low power consumption thanks to the vertical channels,
- High thermal efficiency,
- Highly resistant to fouling thanks to large size channels: 20 mm.
- Can be used up to 58 °C as standard, and up to 80 °C as option with PVC or ABS material
- Is resistant to chemicals.
- Fire classification M2, self-extinguishing.

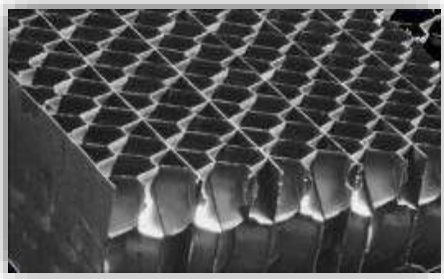
Water distribution

The water nozzles are widely sized to avoid any clogging, even in case of high suspended solids content.
Water distribution is made of PP pipes through highly efficient water distributors.
These nozzles made of PP distribute the water uniformly on the whole exchange surface and operate under low pressure to reduce drifts (0.8 mWC).
The very low drift losses (8 kPa) considerably reduce the risk of bacteriological contamination: indeed, low pressure creates heavier droplets, so less drifts out the cooling tower.

Drifts eliminators

Highly efficient, drift eliminators are made of PP sheets and prevent the water from being sprayed out of the tower: the drift is 0.01 % maximum of the re-circulating water flow. This value has been certified by independent third part.

Ultraviolet resistant, they are easy to remove from the top in order to access to the distributors and to the exchange surface.



Fans

JACIR design, the axial fan is adjustable stand still type. The number of blades and the material (aluminium, FRP option) are selected according to the thermal and sound requirements.

The inlet cones are made of polyester. Their calyx shape drastically improves the fan efficiency. The bearings are self-aligning, lubricated in our factory and to be regularly lubricated.

The shaft is supported by two bearings. A fan bearing lubrication line made of copper is extended on the fan stack and allows a simple and quick maintenance without any removal.

The fan stack is made of X-STEEL stainless steel, 316L AISI stainless steel option, with sloped bottom to avoid water losses and any freezing risk..

The fan stack is warmed by the water inside the cooling tower.

All the mechanical components to be maintained are located at man height, out of the wet air flow.

Standard motors

- IE3 asynchronous three-phases motor,
- 1500 rpm,
- 230 / 400 V up to 5.5 kW,
- 400 / 690 V,
- Hz 50,
- IP55 (possible open sky operating),
- F/B class,
- Direct connection to terminal box

Accessibility

As standard model, the basin is equipped with a large access door mm 990 x 540 mm, and a Power Flow access mm 260x110: located under the bottom level of the basin, it allows a fast complete drain and an easy cleaning of sludge or other accumulated parts of the bottom casing using simple water jet.

Two large access doors in the same material as the cooling tower casing (990 x 540mm) are installed: the first one on the bottom casing, and the second one on the upper part casing. These large access doors allow quickly removing of the drift eliminators, the nozzles, the packing (infill) and the water distribution pipes.

If there are sound baffles or outlet air duct, large access doors (540 x 390 mm) are provided.
In the case a plume suppression coil is installed, an additional middle casing is supplied located between the coil and the drift eliminators, and fitted with at least one access door of 540 x 390 mm.

Integrated exchanger room to the cooling tower

Made of galvanized steel in standard, self-supporting stiff panels equipped with an access door (2100 x 600 mm) with key lockers. The panels can be disassembled, and all components are designed for easy access and maintenance. As a standard, the exchanger room is equipped with automatic presence detection lightening.

Plate heat exchanger

It is protected from weather conditions inside its dedicated room.

User's connection is directly fixed outside the room to facilitate connection with primary circuit, with only two connections: inlet and outlet located either in the cooling tower axe or perpendicularly.

It does not require antifreeze protection: in case of electrical stop, the water-cooling tower circuit automatically drains by gravity down the basin, protecting by the way plates and gaskets of the plate heat exchanger.

For easy re-assembly, Jacir selects with symmetrical plates and clipped gaskets.

Heat exchanger pump

Protected against freezing by a patented thermostatic valve: no electrical tracing need. A water level switch is included and a pump frequency drive is also proposed as an option.

Pressure manometers

Installed before and after the pump, and also before water distribution piping.

FRC centrifugal filter

Located at the basin outlet, a 5 mm filtration strainer is installed. A FRC centrifugal filter chosen in the same material as the piping (galvanized or 304 – 316L stainless steel options) is located at the plate exchanger inlet.

It offers the following characteristics:

∞ 100 % of the cooling tower flow is filtered continuously every minute: very high efficiency at 60 µm for all elements with density superior to 1,

∞ Automatic cleaning inductive blow down of water circuit.

The evaporative circuit remains clean and avoids Legionella growth

Non-freezing plume suppression coil - JACIR patent

As a standard model, the stainless-steel headers are totally removable for access and complete cleaning of both tubes and headers. This “cover” type configuration protects the coil from accidental damage related to possible freeze-over. Two air vents secure the freezing risk. The tubes are assembled in a triangular pitch, in copper (Stainless steel option), outside diameter 16 mm, and 0.5 mm thick. The fins are in copper.

The fin pitch is 3 mm in standard. A monitored valve adjusting the water flow sprays over the infill, associated to the plume coil.

As soon as ambient conditions are met, this system makes it possible to operate significant water saving by cooling the water in the dry mode, rather than spraying and evaporating it.

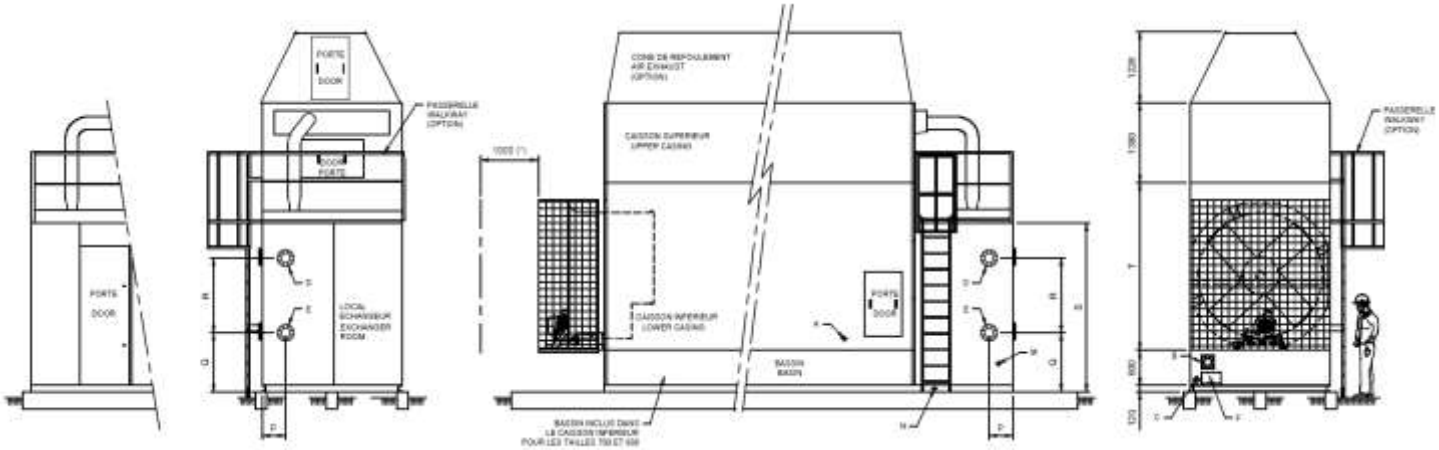
OPTIONS

- Non-freezing plume suppression coil system (see KHFIM series),
- X-STEEL stainless steel (resistance to corrosion superior to AISI 316L),
- Non-freezing heater with thermostat
- Fan frequency drive,
- Water level control with electric-valve and input filter,
- Automatic Inductive BLOW DOWN,
- All accessories made of stainless steel (wheel, plume suppression coil, etc.),
- Discharge cone (increase of air outlet speed with lower sound radiation and recycling),
- Available air pressure for connection to the duct,
- Equipment delivered in parts, ready to be assembled,
- Assembly on site by our experimented technicians,
- Ladders and walkways

Technical characteristics KHF

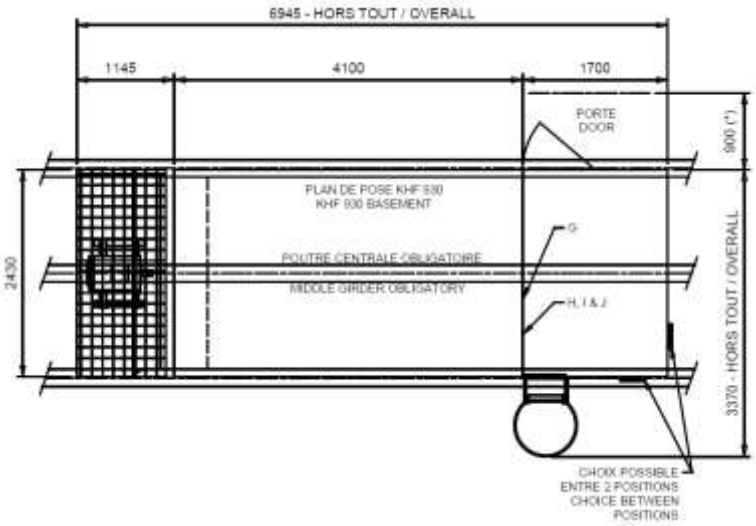
KHF Range	CLOSED COOLING TOWER KHF WITH BASIN							
	Heat power ref. (1) average [kW]	Fans Qty	Outlet air flow rate [m3/h]	Heat power [kW]	Sound level (2) at 20 m [dB(A)]	Weight Empty (incl casings, air exhaust and PHE) [kg]	Weight full (incl casings, air exhaust and PHE) [kg]	Overall dimensions [mm]
KHF 700	770	1	100 000	15	65	4815	9140	H = 5 000 L = 5 945 l = 2 430
KHF 930	1100	1	130 000	22	66	5345	10 985	H = 5 000 L = 6 945 l = 2 430
KHF 1165	1400	1	160 000	30	66	6095	13 200	H = 5 000 L = 7 945 l = 2 430
KHF 1450	1700	1	205 000	30	67	6650	13 200	H = 5 000 L = 8 140 l = 3 000
KHF 1740	2000	1	250 000	37	67	7175	17 950	H = 5 200 L = 9 140 l = 3 000
KHF 2030	2400	1	290 000	45	67	7875	20 435	H = 5 200 L = 10 140 l = 3 000
KHF 2320	2800	1	330 000	55	67	8860	23 220	H = 5 200 L = 11 140 l = 3 000

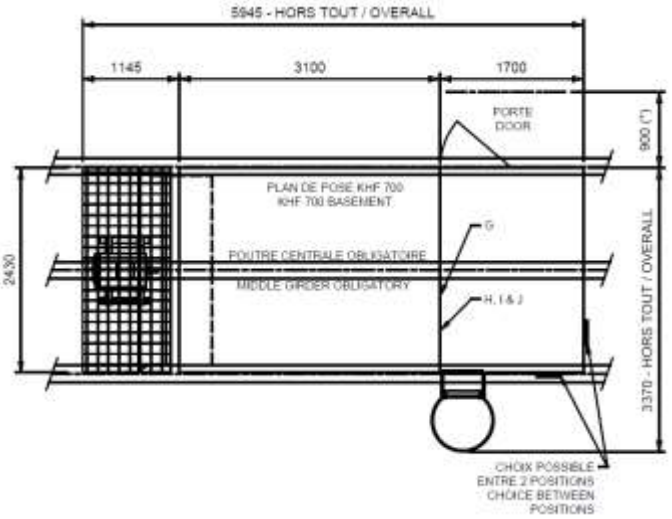
(1): Reference power is based on thermal data 32 / 27 / 21°C.
(2): sound level: average pressure level (Lp) in free field in 4 directions at 1.5m high.
Note: for higher power, towers can be added side by side.

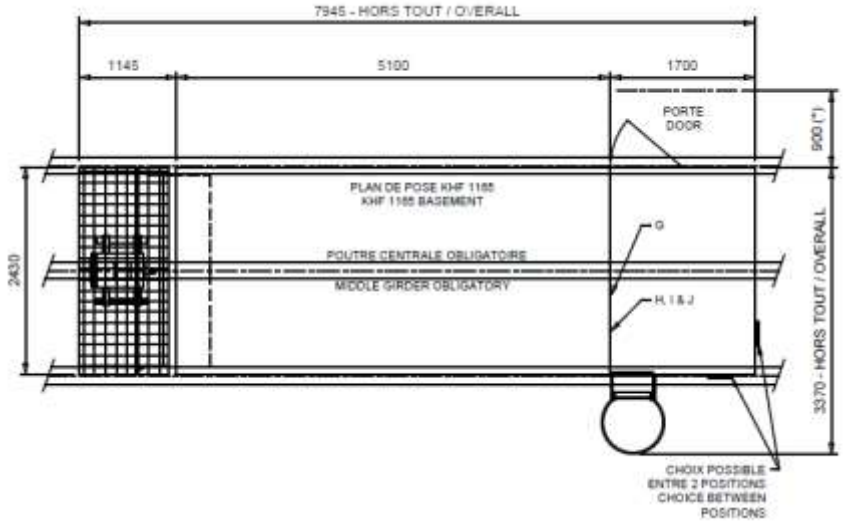


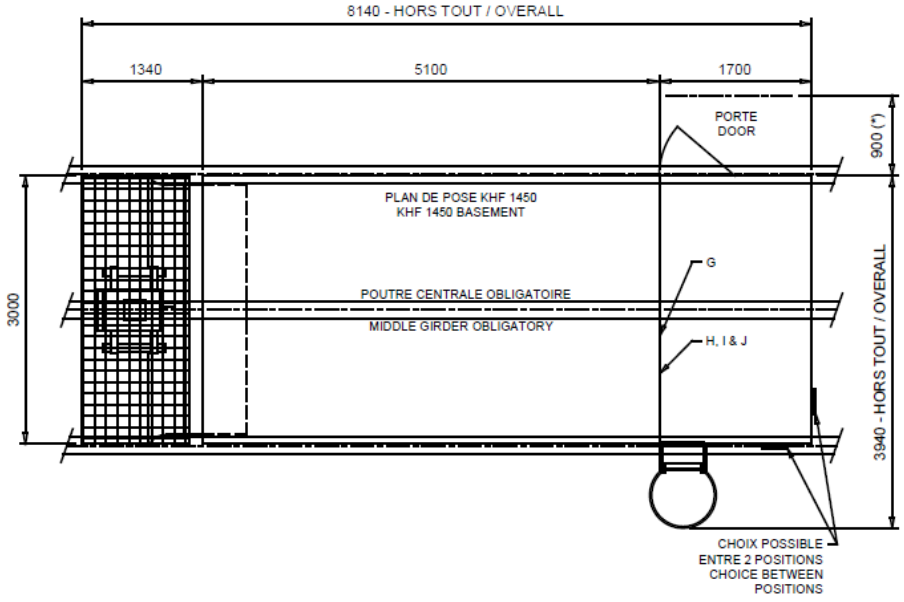
A APPOINT D'EAU - ROBINET A FLOTTEUR OU ELECTROVANNE (OPTION)
MAKE UP WATER - FLOAT VALVE OR ELECTROVALVE (OPTION)
B TROP-PLEIN - BRIDE DN 100
OVERFLOW - FLANGE DN 100
C VIDANGE - G 2" FEMELLE
DRAIN - G2" FEMALE
D ENTREE EAU CHAUDE - BRIDES DN 150 (SELON DEBIT)
HOT INLET WATER - FLANGES DN 150 (ACCORDING TO WATER FLOW)
E SORTIE EAU FROIDE - BRIDES DN 150 (SELON DEBIT)
COLD OUTLET WATER - FLANGES DN 150 (ACCORDING TO WATER FLOW)
F TRAPPE DE VIDANGE BASSIN "POWER FLOW"
DRAIN BASIN DOOR "POWER FLOW"
G RESISTANCE ANTI-GEL AVEC THERMOSTAT (DANS LOCAL ECHANGEUR)
WATER HEATER WITH THERMOSTAT (INSIDE ROOM EXCHANGER)
H, I 2 CONTACTEURS (NIVEAU HAUT / BAS) (OPTION - DANS LOCAL ECHANGEUR)
2 SWITCHS (LEVEL HIGH / LOW) (OPTION - INSIDE ROOM EXCHANGER)
J 1 CONTACTEUR (SECURITE MANQUE D'EAU) (OPTION - DANS LOCAL ECHANGEUR)
1 SWITCH (WATER LEVEL SECURITY) (OPTION - INSIDE ROOM EXCHANGER)
M SORTIE DECONCENTRATION
OUTLET DECONCENTRATION
N SORTIE EXOGEL + VIDANGE POMPE
EXOGEL + PUMP DRAIN OUTLET

Drawings and Dimensions KHF

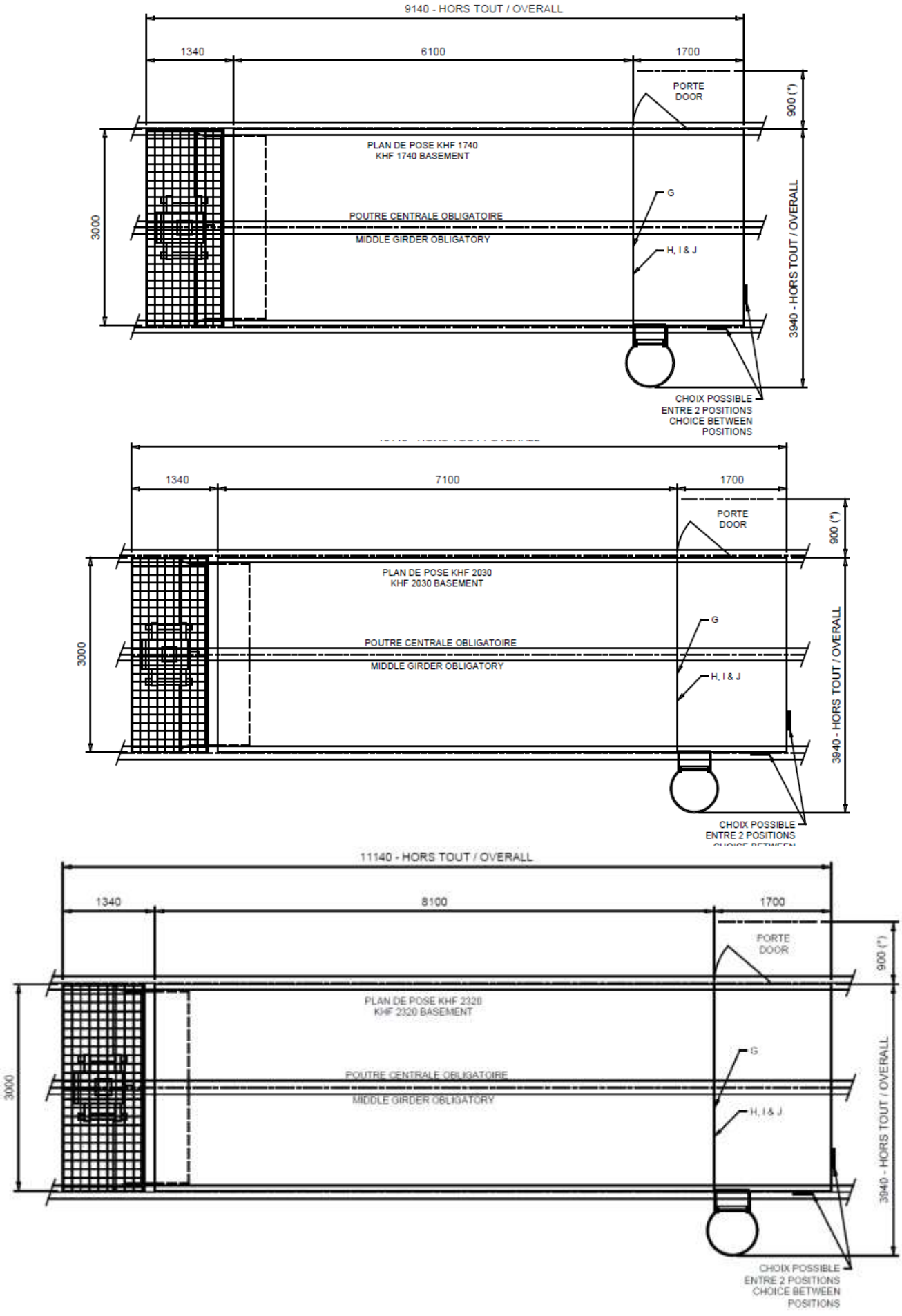








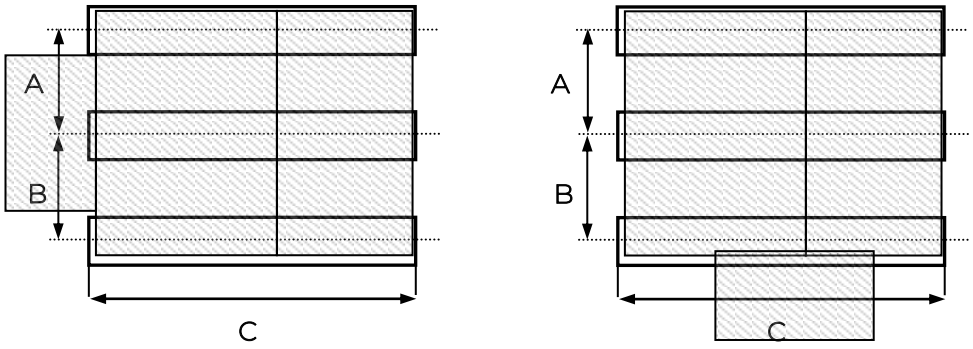
Drawings and Dimensions KHF



Support KHF and KHFIM

KHF and KHFIM cooling tower ranges can stand on a concrete base or on steel frame beams (customer supply).
Check that the ground can stand the operating load, and that surface or supports are flat and horizontal.

Quantity and position of concrete or metallic beams (customer supply) for cooling towers with basin



	Concrete beams of steel frame support[qty]	Distance between beams under basin A & B [mm]	Length superior to C [mm]
KHF 700	3	1 190	5 950
KHF 930		1 190	6 950
KHF 1175		1 190	7 950
KHF 1450		1 475	8 150
KHF 1740		1 475	9 150
KHF 2030		1 475	10 150
KHF 2320		1 475	11 150

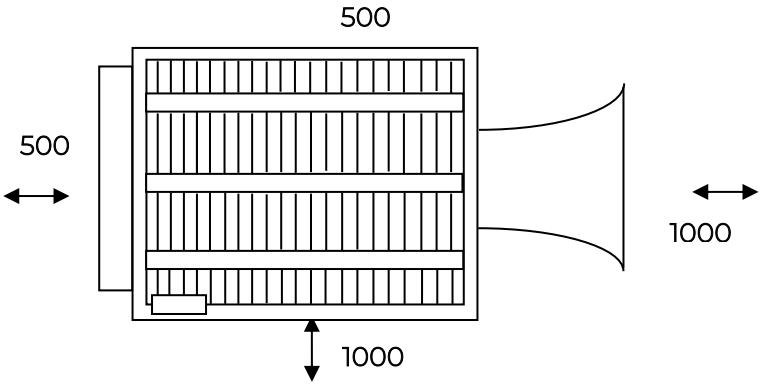
Choice of location KHF and KHFIM

Walls, higher or equal to the tower must not surround on all sides a cooling tower, furthermore without any openings. This could create a risk of a « re-circulation »; the air discharged (hot and saturated) may be recycled into the unit and significantly reduces the thermal efficiency of the tower.

In any case, the free access on the four sides of the tower must be secured to ensure that the fans are supplied correctly with air and that there is proper access for installation and maintenance.

If these rules are not applied, it is inevitable that the cooling tower will not operate properly

Recommended minimum free access (mm) for standard cooling towers: Top view

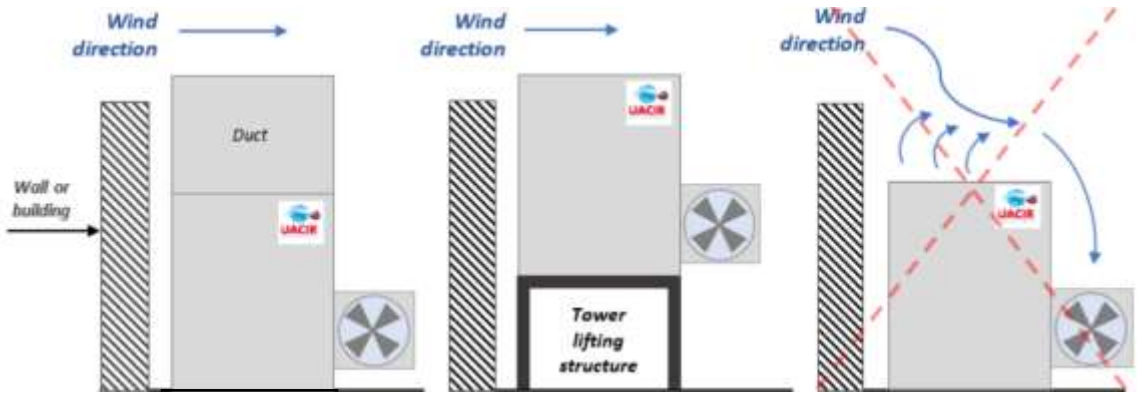


Do not hesitate to consult JACIR for advice.

Layout example:

The location choice for tower installation must follow these recommendations:

- The air intake area must always be kept free of any major obstruction.
  => The obstacle-free distance to be kept around each air inlet is shown on the overall plan and is approximately 1 metre (unless otherwise stated).
- The air discharge must not be disturbed either by direct obstacles.
  =>The installation of acoustic baffles or ducts must be approved by JACIR's Technical Department.
- The risk of hot air being blown back (at tower outlet) to the air intake area must be prevented.
  => The direction of the prevailing wind and the proximity of surrounding buildings (possibly generating risks of back-flow) are elements to be considered.



WATER EVAPORATION

Consumption by evaporation is approximately 1.7 kg/h per 1 000 kcal/h.

DECONCENTRATION

Due to the evaporation and to the water recycling, impurities or salts in the water are concentrated. To make sure that this concentration is not too high, drain must be carried out.
If not, concentration rates of 10, 100 or even 1,000 would occur over time.
In order to pre-determine the installation requirements, consider drain value twice the evaporation level. In operation, with an efficient water treatment, this figure may decrease, especially in the case of a stainless-steel cooling tower (concentration rate of 3 to 5 possible).
There are three available solutions according to the case:

1- Continuous blow down

Connection piece to be installed at the pump discharge just before the tower, if possible, at the level of the water distribution pipes so that the purge only takes place when the circulation pump is operating.

The blow down flow rate can be calculated using the formula: [100 S / (M - S)] % of the make-up water in which:
S: Salinity of the make-up water compensating for evaporation.
M: Maximum acceptable salinity level of water in circuits.

Example:
Salinity of make-up water = HT 20°
Maximum acceptable salinity = HT 40°

100 x 20 / (40 - 20) = 100 % make-up water flow rate

Therefore, the continuous blow down must be equal to the evaporated make-up water flow rate (rate=2).
Consequently, the real water consumption is twice the theoretical evaporated water flow.

2- Discontinuous blow down

The conductivity of the water in the circuit is controlled and the device is purged while not exceeding the TH value.

3- JACIR Automated Inductive Blow down

Once water conductivity level has been reached, a motorised valve can be activated to drain the required quantity of water to maintain the right concentration level. See separate documentation. (see separate documentation).

WATER TREATMENT

It is essential that good quality water is available to ensure that the closed-circuit cooling network operates correctly. If the water contains a significant amount of impurities, it is recommended that a filtration device to be installed in parallel for 5 to 10 % of the recycled water flow.
If the water contains salts that form deposits, iron or corrosive chemical elements, a make-up water treatment system must be installed to obtain purer water, which is close to being chemically neutral, and which can supply the cooling devices without causing damage.
In some cases, algae, moss, fungus or permanent shells can tend to grow in cooling towers. There are products that can be added periodically to the water circuit to prevent these organisms from developing.
Water treatment should be undertaken by a specialized Company.
PREVENTS THE RISK OF LEGIONNAIRES' DISEASE (See separate documentation).

Technical prescription KHF

Evaporative cooling tower, high efficiency closed circuit with forced axial fans, KHF ..... JACIR type, designed for a glycol free operation during freezing period.....

Thermal characteristics

The dissipated power will be..... kW, with a temperature range from .....°C to .....°C, an ambient air temperature of ...°C, and a wet bulb temperature of..... °C.

Tower casing, sloped and plane bottom basin

The cooling tower casing will be made of self-supporting steel panels, twice or 4 times folded on the 4 sides. Side panels will be designed to receive, if necessary, a double casing later on.
Stainless steel rivets with uniform and high-capacity locking will be used for assembly.

The cooling tower casing will be assembled without any bolting or welding for the parts in contact with water; a special designed high covering seal ensure waterproofing between the panels.
The basin will be equipped with a rectangular access door (990 x 540 mm), with a floating valve that can easily be adjusted, a drain, an overflow and an anti-cavitation strainer.
The sloped bottom of the basin will allow a complete and easy drain thanks to the POWER FLOW drain hole located under the lowest part of the basin in order to ease the cleaning. The size of this opening will be 260x110 mm.

3 types of basins will be available in option:

- Standard basin (B) or,
- High water capacity basin (BGC) or,
- Collecting basin: water passing through (BR).

The high capacity will increase inertia and water treatment system efficiency.

Casing

The cooling tower panels casing will be made of:

- As a standard, galvanized steel 2 mm thick ZENDZIMIR process 275 gr/m² (galvanized plates are protected by the zinc oxidation on the surface) or,
- Option, X-STEEL stainless steel for its long-lasting properties, water saving and easy cleaning.

Accessibility

As a standard, the basin will be delivered with access door(s) sized 990 x 540 mm, and a POWER FLOW access 260 x 110 mm allowing express draining and cleaning of sludge or other accumulated parts of the bottom casing using simple water jet.

Two large doors sized 990 x 540 mm in the same material as the cooling tower casing will also be provided: the first one will be located on the bottom casing, and the second one on the upper part casing. These large access doors will allow quick removing of the drift eliminators, the nozzles, the packing (infill) and the water distribution pipes.

Fans

The axial fans will be adjustable stand still type. The number of blades and the material will be selected according to the thermal and sound requirements. The inlet cones will be made of polyester. Their calyx shape drastically will improve the fan efficiency. The fan stack will be made of X-STEEL stainless steel. All the mechanical components to be maintained will be located at man height, out of the wet air flow. A fan guard, installed with hinges will make the access to the tower safe.

As an option, a blade non-freezing device may be installed, economical and maintenance free. A fan bearing lubrication line (Rilsan) will be extended on the fan stack.

Motor(s) and transmission(s)

IE3 asynchronous three-phases motor(s) closed type with ventilated case with a power maximum of kW....., rpm ....., IP55 protected, class F/B.
V-belts, selected for 150 % of nominal power, will be used for transmission.

Water distribution

Water distribution will be made of PP pipes through highly efficient water distributors. These nozzles made of PP will distribute the water uniformly on the whole exchange surface and will operate under low pressure to reduce drifts (0.8 mWC). They will be widely sized to avoid any clogging, even in the case of high suspended solids content.

Exchange surface

The exchange surface FREEFILM will be made of vacuum pressed PVC sheets for a water temperature up to 58 °C as a standard. Highly resistant to fouling thanks to large size 20 mm vertical channels the FREEFILM will offer a low pressure drop.

Drift eliminators

Highly efficient certified, the PP sheets drift eliminators will prevent the water from being sprayed out at the outlet tower. Ultraviolet resistant, they will be easy to remove from the top in order to access to the distributors and to the exchange surface if needed. The drift will be 0.01 % maximum of the re-circulating water flow.

Integrated exchanger room

The stainless-steel plate heat exchanger will be imperatively protected from bad weather in its dedicated room: self-supporting galvanized structure (20/10e minimum) paint coating as a standard. This integrated exchanger room with removable panels for easy maintenance will be equipped with a large access door sized 2100 x 600 mm as a standard.
The plate heat exchanger connection will be provided outside the room by 2 flanges.

The plate heat exchanger will be equipped with gaskets and symmetric plates.

Connections

A stainless-steel strainer and a cleanable filter (on large size exchanger room only) will secure the proper water filtration before the inlet to the plate heat exchanger. The water circulation inside the system will be secured by a pump. This pump will be protected against freeze by a thermostatic valve.

All the connection pipes will be hot dip galvanized or in stainless steel option for optimized inside and outside protection. As standard, a low-level switch will avoid the start of the pump and will protect the water heaters in case of “too low” water level.

Pressure meters for control will be located before and after the pump, and before the water distribution header. They will secure a constant control of the system. A blow down hole with setting valve will be provided, and an electro valve as an option.

The servitudes panels will include a high-level switch, a drain hole and a water make up.

Exchanger pump

Protected from freezing thanks to a patented thermostatic valve, the pump will not need any electrical tracing. A safety level switch will be provided to protect from cavitation.

Connections

All the connection pipes will be hot dip galvanized or in stainless steel option for optimized inside and outside protection.
The servitudes panels will include a high-level switch, a drain hole and water make up.

Options

A water treatment may be integrated, as an option, as well as an integrated blow down inside in the exchanger room (see separate documentation), pump or / and fan frequency drive, a non-freezing heater with thermostat, Water level control with electric-valve and input filter, EFFI-SILENT sound abatement for basin, and all accessories made of stainless steel (fan casing, wheel, plume suppression coil, etc.).
The cooling tower will be delivered in parts, ready to be assembled, or assembled on site by our experimented technicians.

Technical prescription KHFIM

Evaporative cooling tower, high efficiency closed circuit with forced axial fans, KHFIM ..... JACIR type, designed for a glycol free operation during freezing period.....

Thermal characteristics

The dissipated power will be..... kW, with a temperature range from .....°C to .....°C, an ambient air temperature of ...°C, and a wet bulb temperature of..... °C.

Tower casing, sloped and plane bottom basin

The cooling tower casing will be made of self-supporting steel panels, twice or 4 times folded on the 4 sides. Side panels will be designed to receive, if necessary, a double casing later on.
Stainless steel rivets with uniform and high-capacity locking will be used for assembly.

The cooling tower casing will be assembled without any bolting or welding for the parts in contact with water; a special designed high covering seal ensure waterproofing between the panels.
The basin will be equipped with a rectangular access door (990 x 540 mm), with a floating valve that can easily be adjusted, a drain, an overflow and an anti-cavitation strainer.
The sloped bottom of the basin will allow a complete and easy drain thanks to the POWER FLOW drain hole located under the lowest part of the basin in order to ease the cleaning. The size of this opening will be 260x110 mm.

3 types of basin will be available in option:
- Standard basin (B) or,
- High water capacity basin (BGC) or,
- Collecting basin: water passing through (BR).

The high capacity will increase inertia and water treatment system efficiency.

Casing

The cooling tower panels casing will be made of:
- As a standard, galvanized steel 2 mm thick ZENDZIMIR process 275 gr/m² (galvanized plates are protected by the zinc oxidation on the surface) or,
- Option, X-STEEL stainless steel for its long-lasting properties, water saving and easy cleaning.

Accessibility

As a standard, the basin will be delivered with access door(s) sized 990 x 540 mm, and a POWER FLOW access 260 x 110 mm allowing express draining and cleaning of sludge or other accumulated parts of the bottom casing using simple water jet.

Two large doors sized 990 x 540 mm in the same material as the cooling tower casing will also be provided: the first one will be located on the bottom casing, and the second one on the upper part casing. These large access doors will allow quick removing of the drift eliminators, the nozzles, the packing (infill) and the water distribution pipes.

Fans

The axial fans will be adjustable stand still type. The number of blades and the material will be selected according to the thermal and sound requirements. The inlet cones will be made of polyester. Their calyx shape drastically will improve the fan efficiency. The fan stack will be made of X-STEEL stainless steel. All the mechanical components to be maintained will be located at man height, out of the wet air flow. A fan guard, installed with hinges will make the access to the tower safe.

As an option, a blade non-freezing device may be installed, economical and maintenance free. A fan bearing lubrication line (Rilsan) will be extended on the fan stack.

Motor(s) and transmission(s)

IE3 asynchronous three-phases motor(s) closed type with ventilated case with a power maximum of kW....., rpm ....., IP55 protected, class F/B.
V-belts, selected for 150 % of nominal power, will be used for transmission.

Water distribution

Water distribution will be made of PP pipes through highly efficient water distributors. These nozzles made of PP will distribute the water uniformly on the whole exchange surface and will operate under low pressure to reduce drifts (0.8 mWC). They will be widely sized to avoid any clogging, even in the case of high suspended solids content.

Exchange surface

The exchange surface FREEFILM will be made of vacuum pressed PVC sheets for a water temperature up to 58 °C as a standard. Highly resistant to fouling thanks to large size 20 mm vertical channels the FREEFILM will offer a low pressure drop.
This exchange surface will be integrated into a self-supporting 20/10th galvanised sheet metal in double fold on the 4 sides.

Drift eliminators

Highly efficient certified, the PP sheets drift eliminators will prevent the water from being sprayed out at the outlet tower. Ultraviolet resistant, they will be easy to remove from the top in order to access to the distributors and to the exchange surface if needed. The drift will be 0.01 % maximum of the re-circulating water flow.

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The servitudes panels will include a high-level switch, a drain hole and a water make up.

Exchanger pump

Protected from freezing thanks to a patented thermostatic valve, the pump will not need any electrical tracing. A safety level switch will be provided to protect from cavitation.

Plume suppression battery and modulating valve (Jacir patent)

As standard, the stainless-steel headers will be fully removable for full access and cleaning. This "covered" configuration will protect the battery from accidental damage due to possible freezing. Two air vents will ensure frost control. The tubes, arranged in a triangular pitch, will be made of copper, 0.5mm thick, 16mm diameter. As an option, they can be made of stainless steel. The fins shall be of epoxy coated aluminium, copper or stainless-steel option. The pitch shall be 3mm as standard. A motorised valve to regulate the watering of the packing will be associated with the battery. As soon as climatic conditions permit, the installation will generate substantial water savings by evacuating the heat in the dry battery rather than by evaporation. The battery will allow the nominal power to be evacuated without plume up to 2°C and 80% humidity.

Connections

All the connection pipes will be hot dip galvanized or in stainless steel option for optimized inside and outside protection.
The servitudes panels will include a high-level switch, a drain hole and water make up.

Options

A water treatment may be integrated, as an option, as well as an integrated blow down inside in the exchanger room (see separate documentation), pump or / and fan frequency drive, a non-freezing heater with thermostat, Water level control with electric-valve and input filter, EFFI-SILENT sound abatement for basin, and all accessories made of stainless steel (fan casing, wheel, plume suppression coil, etc.).
The cooling tower will be delivered in parts, ready to be assembled, or assembled on site by our experimented technicians.