1. FACTORY FABRICATED INDUCED DRAFT CLOSED CIRCUIT COOLER

1.1 General

Furnish and install factory assembled closed circuit cooler of induced draft counterflow design with a horizontal multiple side air entry and a vertical air discharge. The unit shall be completely factory assembled and conform to the specifications and schedules.

The total fan power should not exceed _____kW.
The total pump power should not exceed _____ kW.

The total overall unit dimensions should not exceed the following:
Length: _____ mm
Width: _____ mm
Height: _____ mm

The maximum operating weight should not exceed _____ kg.

The unit will be delivered in two parts:
The basin - louver section and the heat transfer - fan section.
The unit (top and bottom section) shall be joined together with elastic sealer and bolted together with corrosion resistant fasteners.

Approved manufacturer Evapco – model ATW _____

1.2 Thermal Performance – Performance Warranty

The closed circuit cooler shall be capable of performing the thermal duties as shown in the schedule and on drawings and its design, thermal rating shall be guaranteed by the manufacturer.

1.3 Applicable Standards

a) Directive 2006/42/EC on Machinery
b) Directive 2014/30/EC Electromagnetic Compatibility
c) CTI STD 201 Standard for Thermal Performance Certification of Evaporative Heat Rejection Equipment.
d) Eurovent Certification operation manual OM-4-2016 CT and Rating Standard RS 9C 001 for Cooling Towers.
e) Directive 201/68/EU Pressure Equipment Directive.

1.4 Submittals

a) The manufacturer shall submit a five year history of the proposed type of evaporative condenser with a minimum of 10 installations for similar sized equipment.
b) Shop drawings: submit shop drawings indicating dimensions, weight loadings and required clearances.
c) Product data: submit manufacturer's technical product data, original selection printouts and clearance requirements.
d) Complete noise data sheet for the selected closed circuit cooler(s).

e) Maintenance data for the closed circuit cooler(s) and accessories.
f) The manufacturer shall provide factory test run certificates of the fans and fan motor.

1.5 Product Delivery – Storage and Handling

a) The contractor shall make the provisions for proper storage at site before installation and handle the product per the instructions of the manufacturer.
b) Once installed provide the necessary measures that the units remain clean and protected from any dust and mechanical damage.

1.6 Quality Assurance

a) The manufacturer shall have a quality assurance system in place which is certified by an accredited registrar and complying with the requirements of ISO 9001:2008. This is to guarantee a consistent level of product and service quality.
b) Manufacturers without ISO 9001:2008 certification are not acceptable.

1.7 Warranty

a) The products will be warranted for a period of minimum two years from the date of shipment.

2. PRODUCT

2.1 Construction – Corrosion Resistance

STANDARD EXECUTION – GALVANIZED STEEL Z725

a) The structure and all steel elements of the pan and casing shall be constructed of Z-725 hot dip galvanized steel for long life and durability. Alternatives with lower zinc layer thickness and external paint or coating are not accepted as equal.
b) The strainer shall be made of stainless steel type 304L.
c) During fabrication all panel edges shall be coated with a 95 % pure zinc compound.
d) Casing materials shall be of non flammable construction.

OPTIONAL EXECUTION – BASIN IN SST 304L or 316L

a) The structure and all steel elements of the Basin and Louver section up to the water level shall be made of stainless steel SST 304L. Cold water basin will be a welded stainless steel construction.
b) Alternatives with hot dip galvanized steel and epoxy coatings in lieu of the stainless steel SST 304L or 316L are not considered to be equal and are not accepted.
c) All other steel components of the casing shall be constructed of Z-725 hot dip galvanized steel for long life and durability. Alternatives with lower zinc layer thickness and external paint or coating or FRP materials are not accepted as equal.
d) The strainer shall be made of stainless steel SST 304L or 316L.
e) During fabrication all galvanized steel panel edges shall be coated with a 95 % pure zinc compound.
f) Casing materials shall be of non flammable construction only.

OPTIONAL EXECUTION – COMPLETE UNIT IN STAINLESS STEEL SST 304L or 316L (except heat exchange coil(s))

a) The structure and all steel elements shall be made of SST 304L or 316L.
Cold water basin will be a welded stainless steel construction.
b) Alternatives with hot dip galvanized steel and epoxy coatings-in lieu of the SST 304L or 316L are not considered to be equal and are not accepted.
c) The strainer shall be made of stainless steel SST 304L or 316L.
d) Casing materials shall be of non flammable construction only.

2.2 Construction – Seismic and wind load resistance

a) The structural design must be designed in accordance with IBC2015 with and Importance factor (Ip) of ____, a seismic factor (SDS) up to ____g a wind load up to _____kN/m²

2.3 Closed Circuit Cooler Basin

a) Standard basin accessories include: overflow, drain, strainer and brass make up valve with plastic float ball.
b) The entire pan area shall incorporate a sloped basin design to prevent sediment built up, biological film and standing water.
c) Upper and lower basin bottoms shall be sloped to provide drainage of the complete basin section.
d) The basin can be inspected while the unit is in operation with the fan(s) and pump(s) running.

2.4 Air Inlet Louvers

a) The air inlet louvers shall be constructed of UV inhibited polyvinyl chloride (PVC), mounted in easily removable frames for easy access to the basin.
b) The louvers shall be at four sides to provide easy access to the basin interior.
c) The louvers shall have a minimum of two changes in air direction to prevent splash out and block direct sunlight from entering the basin.
d) The louvers will have a 19 mm opening to prevent debris from entering the basin.

2.5 Casing Section

2.5.1 Heat Transfer Coil

a) The closed circuit cooler shall use internally enhanced heat exchange coils of an elliptical tube design to obtain lower air flow resistance and allow higher water loadings around the tubes.
b) The heat transfer coil(s) shall be made of all prime surface, encased in a steel framework and hot dip galvanized after fabrication as a complete assembly.
c) The tubes shall be arranged in a self spacing, staggered pattern in the direction of air flow for maximum heat transfer efficiency and minimum pressure drop.
d) The heat exchange coils shall be air pressure tested under water.
e) The design and manufacturing process shall be approved and in accordance with the "Pressure Equipment Directive" – PED 2014/68/EU.
f) The manufacturer shall be responsible for the manufacturing and performance testing of the entire heat transfer coil. This is to assure single source responsibility.
g) The casing shall totally encase the complete coil section to protect the complete coil from direct atmospheric contact.
h) The pressure drop of the process fluid through the coil shall not exceed ……kPa.

OPTIONAL - Heat Transfer Coil in SST 304L or 316L

a) The closed circuit cooler shall use heat exchange coils of an elliptical tube design to obtain lower air flow resistance and allow higher water loadings around the tubes.
b) The heat transfer coil(s) shall be made of SST 304L or 316L encased in an SST 304L or 316L framework and externally passivated after fabrication as a complete assembly.
c) The tubes shall be arranged in a self spacing, staggered pattern in the direction of air flow for maximum heat transfer efficiency and minimum pressure drop.
d) The heat exchange coils shall be air pressure tested under water.
e) The design and manufacturing process shall be approved and in accordance with the "Pressure Equipment Directive" – PED 2014/68/EU.
f) The manufacturer shall be responsible for the manufacturing and performance testing of the entire heat transfer coil. This is to assure single source responsibility.
g) The casing shall totally encase the complete coil section to protect the complete coil from direct atmospheric contact.
h) The pressure drop of the process fluid through the coil shall not exceed ……kPa.

2.5.2 Water Distribution

a) The water distribution system shall be completely enclosed and protected from sunlight exposure, environmental elements and debris. Water distribution systems with direct exposure to the environment are not allowed.
b) The spray header and branches shall be constructed of Schedule 40, Polyvinyl Chloride (PVC) pipe for corrosion resistance.

c) The water shall be distributed over the coil by precision molded spray nozzles with large minimum 35 mm orifice openings and integral sludge ring to eliminate clogging.
d) The nozzles shall be threaded into the water distribution piping to assure positive positioning and easy removal for maintenance. Snap in or strapped on nozzles are not accepted.

2.5.3 Water Circulation Pump

a) The pump(s) shall be a close coupled, centrifugal type with mechanical seal, installed vertically at the factory to allow free drainage on shut down.
b) A ____ kW totally enclosed motor(s) suitable for outdoor service shall be furnished.
c) The motor shall be suitable for the following power supply:
____volts, ____hertz and ____ phase.

2.5.4 Drift Eliminators

a) The drift eliminators shall be constructed of entirely inert polyvinyl chloride (PVC) that has been specially treated to resist ultra violet light.
b) Assembled in easily handled sections, the eliminator blades shall be spaced on 25 mm centers and shall incorporate three changes in air direction to assure efficient removal of entrained moisture from the discharge air stream.
c) The maximum drift rate shall not exceed 0,001 % of the circulating water rate.
d) The Drift Eliminators shall be certified according to Eurovent Standard OM-14-2014.

2.5.5 Access Door

a) A large hinged access door shall provide access to the fan section for maintenance.

2.6 Mechanical Equipment

2.6.1 Axial Propeller Fan(s) (standard)

a) Fan shall be heavy duty wide chord axial propeller type, statically balanced and constructed of extruded aluminum alloy blades.
b) Fans shall be installed in a closely fitted cowl with venturi air inlet for maximum fan efficiency.
c) Each fan blade shall be individually adjustable.
d) The fan cowl shall be covered with a heavy gauge hot dip galvanized steel wire fan guard.
e) The fan – drive system (fan – drive – motor) shall be factory mounted, adjusted and undergo a trial run in the factory before shipment.

2.6.2 Axial Propeller Fan(s) - Low Sound Fan (optional)

a) Fan shall be heavy duty wide chord axial propeller type, statically balanced and constructed of extruded aluminum alloy blades.
b) Fans shall be installed in a closely fitted cowl with venturi air inlet for maximum fan efficiency.
c) Each fan blade shall be individually adjustable.
d) The fan cowl shall be covered with a heavy gauge hot dip galvanized wire fan guard.
e) The fan – drive system (fan – drive – motor) shall be factory mounted, adjusted and undergo a trial run in the factory before shipment.

2.6.3 Axial Propeller Fan(s) - Super Low Sound Fan (optional)

a) Fan shall be extremely wide chord axial, heavy duty propeller type, statically balanced and made of FRP.
b) Fans will be installed in a closely fitted cowl with venture air inlet for maximum fan efficiency.
c) The fan cowl shall be covered with a heavy gauge hot dip galvanized steel wire fan guard.
d) The fan – drive system (fan – drive – motor) shall be factory mounted, adjusted and undergo a trial run in the factory before shipment.

2.6.4 Bearings and Drive

a) The fan shaft (s) shall be supported by heavy duty, self aligning ball type bearings with cast iron housings and lubrication fittings for maintenance.
b) The grease fittings shall be extended to the outside of the unit.
c) The bearings shall be rated for an L-10 life of 75,000 hours.
d) The fan drive sheaves shall be aluminum alloy.
e) The belt shall be a multigroove belt system, constructed of neoprene with polyester cords and designed for 150% of the motor nameplate horsepower.

2.6.5 Motor (0.9, 1.2 and 2.4 meter wide Cells)

a) The fan motor shall be Totally Enclosed Fan Cooled (TEFC), squirrel cage, ball bearing type motor.
b) The motor shall be specially designed for cooling tower use with moisture protection on the winding, shaft and bearings.
c) The motor shall be minimum IP 55 degree of protection, Class F insulation, Service Factor 1 and selected for the appropriate cooling tower duty and the correct ambient temperature but minimum 40 °C.
d) Motors bearings shall be double sealed non-relubricable or external grease nipples shall be provided.
e) The motor shall be mounted on an adjustable heavy duty steel motor base.
f) A hinged protective cover shall shield the motor and sheave from the weather.
g) The motor power supply shall be …… volts, ….. hertz and ….. phase.

2.6.6 Motor (3 and 3.6 meter wide Cells)

a) The fan motor shall be Totally Enclosed Air Over (TEAO), squirrel cage, ball bearing type motor.
b) The motor shall be specially designed for cooling tower use with moisture protection on the windings, shaft and bearings.
c) The motor shall be minimum IP 55 degree of protection, Class F insulation, Service Factor 1 and selected for the appropriate cooling tower duty and the correct ambient temperature but minimum 40°C.
d) Motor bearings shall be double sealed non-relubricable or external grease nipples shall be provided.
e) The motor shall be mounted on an adjustable heavy duty steel motor base.
f) The motor base shall be able to swing to the outside of the unit for repair or removal.
g) The motor power supply shall be …… volts, ….. hertz and ….. phase.

2.7 Sound Levels

The maximum sound pressure levels (dB) measured 15m from the closed circuit cooler operating at full fan speed shall not exceed the sound levels detailed below.

Location	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz	dB(A) Hz
Fan Discharge									
Air inlet/end									

Measurement in accordance with ISO3744.

3. ACCESSORIES (optional)

3.1 Electric Heaters

a) The closed circuit cooler cold water basin shall be provided with an electric heater package to prevent freezing of the water in the cold water basin, when the pump is shut down.
b) The electric heater package includes: electric heater element(s), thermostat and low water level cutoff.
c) The heaters shall be selected to maintain 4°C basin water temperature at …..°C ambient
d) The heater(s) shall be ……V / …… phase / ….. Hz electric power supply.

3.2 Five Probe Electric Water Level Control Package

a) The closed circuit cooler manufacturer shall provide an electric water level control package instead of the mechanical float valve arrangement.
b) The package consist of the following elements :

- Multiple heavy duty stainless steel SST-316 static probes mounted in a stilling chamber outside the unit. Electrodes or sensors mounted inside the unit are not accepted as their operation will be disturbed by the moving water in the basin.
- An ABS, IP 56 case contains all the contactors for the different level probes and will provide an output signal of a relay for automatic filling and two relays for alarm levels.
- The power supply to the control package is 24 Vac / 230 Vac - ….. Hz.
- A weather protected solenoid valve for the water make up ready for piping to a water supply with pressure between 140 kPa and 340 kPa.

3.3 Vibration switch

a) A vibration limit switch shall be installed on the mechanical equipment support and wired into the control panel. The purpose of this switch is to interrupt power to the motor in the event of excessive vibration.
b) The switch shall be adjustable for sensitivity, and shall require manual reset.

3.4 Vertical Access Ladders

a) A vertical type ladder arrangement which provides easy access to the water distribution system and drive components shall be provided with the closed circuit cooler.
b) The ladder will be complete with a safety cage for safety purposes.
c) Ladder shall meet CE requirements.
d) Ladders shall be made of aluminum.

3.5 External Service Platform

a) The closed circuit cooler shall be supplied with an external service platform.
b) The external service platform shall be self-supporting and includes access ladders with safety cage to the platform and handrailing.
c) The external service platform will be installed in front of the fan access doors.
d) The platform shall meet CE requirements.

3.6 Multipurpose Davit

a) The closed circuit cooler shall be supplied with a davit to facilitate the removal of fan(s) and fan motor(s).
b) The davit and bracket are constructed of aluminum and are mounted on the side of the unit.
c) The fan motor davit ships loose with the unit and is installed in the field.

3.7 Water Silencer

a) The water silencers are located in the falling water area of the cold water basin.
b) The water silencers will reduce the overall sound levels 4 dB (A) to 7 dB (A) measured at 1.5m from the side or end of the unit; when the fans are running and 9 dB (A) to 12 dB (A) when fans are off.
c) The water silencers are constructed of lightweight PVC sections and can be easily removed for access to the basin area.
d) The water silencers will have no impact on the unit's thermal performance.