WATER FILTRATION SYSTEM SEPARATOR & BASIN SWEEPER PIPING SPECIFICATION

PART 1 – GENERAL

1.01 Summary

Furnish and install the hydro cyclone separator with basin sweeper piping system as specified herein.

Primary Purpose: To remove unwanted solids from the cooling tower water by utilizing a hydro cyclone separator in combination with a basin sweeper piping system.
The complete suitably sized filtration system (separator + basin sweeping piping) will be delivered as a package by the cooling tower manufacturer in order to ensure optimal filtration efficiency and guarantee single source responsibility.
The Basin Sweeper piping system will be designed, and factory installed by the Cooling Tower Manufacturer to ensure maximum sweeping efficiency (layout optimized towards the internal shape of the cooling tower basin)
The flow of water through the separator package shall be continuous and without interruption during the periodic purging of separated solids.

The liquid-solids separation system will: help prevent particle fouling of the cooling system's components, reduce maintenance and servicing routines, maintain optimum energy efficiency of the heat exchange process, reduce chemical usage, and aid in the control of harmful bacterial growth (incl legionella).

1.02 Separator Performance Requirements

A. Independent Testing Laboratory – Performance of the separator must be verified by published results from an independent third-party testing laboratory. Standard test protocol of upstream injection, downstream capture, and separator purge recovery is allowed with 50-200 mesh particles to enable effective, repeatable results. Single pass test performance must not be less than 95% removal.

B. All Systems – In a single pass through the separator, given solids with a specific gravity of 2.6 and water at 1.0, performance is expected to be 98% of 74 microns and larger. Additionally, particles as fine as 5 microns, heavier by specific gravity and some lighter by specific gravity will also be removed.

C. In Recirculating Systems - 98% performance is predictable to as fine as 40 microns (given solids with a specific gravity of heavier than the carrying fluid). Additionally, particles as fine as 5 microns, heavier by specific gravity and some lighter by specific gravity will also be removed.

PART 2 – EQUIPMENT

2.01 Design Criteria

A. Identification – Hydro cyclone separator package is a model PF-64M- __ ***(Refer to table 1)*** and is manufactured, assembled, and tested exclusively for Baltimore Aircoil Company.
   a. Flow rate shall be _____ ***(Refer to table 1)*** (m^3/h) @ 230kPa
   b. Pressure loss shall be between 3-12 psi (.2 to .8 bar) remaining constant and only varying when the flow rate changes.
   c. Maximum working pressure: 150 psi (10.3 bar).
   d. Maximum operating temperature: 100°F (38º C).

2.02 Construction

Package - A complete factory assembled cooling tower basin sweeping system and pump package with: Centrifugal Cyclone Separator, high head pump and motor, skid, interconnecting face piping, control panel, and automatic purge.

A. **Separator** - The hydro cyclone separator shall incorporate a true tangential inlet and dumbbell body design. As the pressurized process carrying fluid enters tangentially into the entrance chamber of the separator, it starts a downward helical flow. This downward spiral motion, in conjunction with the reduced body diameter, causes high centrifugal forces to act on the carrying fluid. The solids in suspension are forced to the wall of the separator body, and then downward into the accumulation chamber at the bottom of the separator. The clean process fluid (inner vortex) then reverses its axial direction and moves upward in a helical flow exiting via the separator outlet.
   Purging is necessary to eliminate the high concentration of solids build-up in the separator's accumulation chamber and can be performed while the separator remains on-line. The level of solids contamination in the system will dictate the purge frequency.

   a. The separator body will be made of carbon steel vessel with fusion bond polyester powder coat exterior, rated for 10 bar pressure, with DIN inlet and outlet flanges and including (2) inlet/outlet liquid filled pressure gauges.
   b. The separator's design shall not require additional devices, such as external pressure lines or accelerating slots, to ensure maximum particle removal at any flow.
      Separators with accelerating slots, which increase the pressure drop inside the separator and increase risk of clogging, will not be allowed.
   c. The separator's design shall allow for passage of (at a minimum) 1/2" diameter particles to the accumulation chamber without the need for physical access to the separator interior.
   d. The separator's design shall allow for self-ventilation of air. Manual air vent shall be included for timely start-up.
   e. All separators with inlet/outlet connections 4" and larger shall feature a hand-hole at the collection chamber access for either inspection or the removal of unusual debris.
   f. To prevent the buildup of unnecessary particulate within the separator, purge location shall be at the lowest point of the separator accumulation chamber.

B. **Pump & Motor -** Cast iron bronze fitted, close coupled end-suction (flooded suction required).
   a. Design conditions: _____ ***(Refer to table 1)*** m^3/hr @ 230 kPa Total Head (Nominal)
   b. ___ ***(Refer to table 1)*** kW, TEFC motor, IP54, IE3 norm as per European standard.
   c. (OPTIONAL) Pre-strainer: flanged fabricated carbon steel housing; 1/8-inch minimum perforated stainless-steel basket, and flange removable lid.

C. **Connections**
   _____ ***(Refer to table 1)*** mm DIN flange inlet and
   ------- ***(Refer to table 1)*** mm DIN Flange outlet.

D. **Automatic purge** – The system will comprise an automatic purge complete with industrial grade two-way brass purge valve with direct mount 100-240VAC electric actuator and adjustable purge timer, to minimize maintenance. (Factory purge settings: 30-seconds every six hours.)
   Recovery vessel, cartridge filter and recovery bags that increase maintenance works and do not allow effective water savings will not be accepted.

E. **Piping** – Carbon steel with fusion bonded polyester powder coated finish.

F. **Electrical Control** – CE Labeled with an IP65 polycarbonate enclosure with door disconnect switch, motor starter with short-circuit/overload protection, pump and purge Hand-Off-Auto (H-O-A) switches, and purge timer, all build with CE compliant electrical components.
   a. Power requirement: 400V, 3-phase, 50 Hz.
   b. Consult factory for voltages not listed.

G. **Structural Skid** - Structural steel framework shall be constructed of carbon steel with fusion bonded polyester powder coated finish for maximum rigidity and durability. (Channel or plate skids are not acceptable.)

H. **Coating** - UV resistant fusion bonded polyester coated separator body and skid. (Enamel based paint is not acceptable.**)**

I. **CE** certification: the PF64 will be CE labeled. A CE certification file will be available from the manufacturer on request from officials.

J. **Options -** Available upon request
   a. Pre-strainer shipped loose for field installation.

K. **Basin Sweeping Piping system -** The Sump Sweeper piping will be designed and factory.
   installed by the Cooling Tower Manufacturer to provide optimal basin sweeping. This design will result in the required nominal flow rate at an inlet pressure to the sweeping system of 70 to 140 kPa (10 to 20 PSI) per cooling tower, which will match the selected filtration system.
   The Factory installed sump sweeper piping comprises a number of specific eductor nozzles fitted into pipework located in the cooling tower basin. The eductors generate higher flow volume and hence increase water circulation and agitation inside the cooling tower basin.

The piping and eductors shall be laid out on the bottom of the basin in a manner that will enhance the natural flow of water while keeping debris in suspension and directed to the filtration suction connection(s).
Sweeper piping inlet and outlet connections will be indicated on the cooling tower manufacturer certified drawing.

2.03 Manufacturers

A. Baltimore Aircoil Int
B. _____
C. _____

PART 3 – EXECUTION

3.01 Installation

A. Coordinate with the installing contractor to ensure equipment is installed in conformance with manufacturer's recommendations and those found in the specification.

B. The start- up and commissioning will be done by the cooling tower manufacturer, jointly with the commissioning works of the cooling tower.

Table 1 - Technical data

Model	Nominal flow (m^3/hr)	Pump motor (kW)	Connection size Inlet (mm) (w/o optional prestainer)	Connection size Outlet (mm)
PF64M 015-AP	17.0	2.2	40	40
PF64M 020-AP	22.7	3.0	80	50
PF64M 025-AP	34.1	4.0	80	65
PF64M 030-AP	54.5	5.5	80	80
PF64M 040A-AP	75.0	7.5	80	100
PF64M 040B-AP	90.0	7.5	100	100
PF64M 050-AP	125.0	11	125	125
PF64M060-AP	204.0	18.5	125	150