

LIQUID HEAT TRANSFER EQUIPMENT

1.0 AIR SEPARATOR

- .1 External air separation unit consisting of a steel tank with base ring.
- .2 Construction:
 - .1 ASME boiler and pressure vessel code stamped
 - .1 Section VIII Div. 1
 - .2 61 kPa (125 Psig) design pressure @ minimum 350°F.
- .3 Connections:
 - .1 Flanged inlet and outlet.
 - .2 Strainer removal.
 - .3 Top – Separate fittings for: (1) system expansion tank and (2) air vent.
 - .4 Bottom – Blow down cleaning.
- .4 Removable strainer:
 - .1 Stainless steel with 05 mm (3/16") diameter perforations
 - .2 Free area of not less than five times the cross-sectional area of the connecting pipe.

1.1 EXPANSION TANKS

- .1 Steel/bladder: Full acceptance with base ring.
- .2 Connections:
 - .1 Air charge @ top or side.
 - .2 Water inlet @ top or side.
- .3 Lifting rings.
- .4 Inspection hole.
- .5 Construction:
 - .1 ASME boiler and pressure vessel code stamped
 - .1 Section VIII Div. 1
 - .2 61 kPa (125 Psig) design pressure @ minimum 240°F.
 - .3 Shell:
 - .1 Fabricated Steel.
 - .4 Air chamber:
 - .1 Heavy duty butyl diaphragm bonded with polypropylene liner to steel shell, separating air chamber from water.
 - .2 Suitable for glycol use.
 - .3 Removable for inspection.

1.2 PLATE HEAT EXCHANGER

- .1 Provide factory authorized start up.
- .2 Fully assembled gasketed plates, double wall arrangement, requiring no additional on-site assembly.
 - .1 Supported in a frame capable of being opened and closed
 - .1 Items supplied by others.
 - .1 Anchor bolts
- .3 Performance clean condition: ARI 400-2001.
 - .1 Perform first year testing by an independent ARI approved testing lab.

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- .4 Design
 - .1 Thermal
 - .1 To maintain velocity and reduce fouling: sized to 100% of the area required.
 - .2 Liquid velocity through the inlet and outlet ports: maximum of 25 feet per second, to minimize pressure drop and erosion.
 - .3 Future expansion to accommodate a minimum of twenty (20) percent extra heat transfer surface area.
 - .2 Mechanical
 - .1 Frame, tie bolts,(compression bolts, nuts, and washers:
 - .1 Zinc-plated, low alloy steel (SA-193-B7/SA-194-2H)
 - .2 Material construction: SA-516 or SA-515-70.
 - .3 frame assembly coated with corrosion-resistant polyurethane paint.
 - .4 Fixed and movable end frames constructed as to eliminate any need for adding stiffeners to provide reinforcement for less frame thickness.
 - .1 Supports shall permit the future installation of twenty (20) percent additional plates.
 - .5 Carrier bar.
 - .6 Guide bar.
 - .7 End support frame.
- .5 Plates
 - .1 Minimum thickness: 0.5 mm, 316 stainless steel.
 - .2 Nozzle connections: force each fluid across the plate surface in a diagonal path. Parallel flow paths not permitted.
 - .3 Withstand a hydro test pressure of 1.3 times the design pressure.
 - .1 Each flow channel to be pressurized independently during testing.
 - .4 Metal to metal contact between adjacent plates. Designs which do not have metal to metal contact are not acceptable.
 - .5 Gasket grooves: in the compressed state, the gasket will interlock between adjacent plates.
 - .6 Supported by the carrier bar.
 - .1 Carrier bar surfaces in contact with the heat transfer plates: stainless steel.
 - .7 Guide bar to:
 - .1 Maintain plate alignment. Guide bar shall
 - .2 Not be used for support.
 - .3 Made of stainless steel.
 - .8 First and last plates: designed to prevent fluid contact with the fixed or movable heads.
 - .9 Replacement plate packs to be manufactured by the original equipment manufacturer, and shall come sufficiently packaged and wrapped for long term storage.
- .6 Gaskets
 - .1 Glued design.
 - .1 Elastomeric, compressed asbestos not be used.
 - .1 When plates are tightened, gaskets to be compressed a minimum of 20 to 25 percent.
 - .2 Gasket adhesive: applied to the plate gasket groove, only one side of each gasket is glued.
- .7 Port holes (flanged)
 - .1 In each plate: (1) fully gasketed and (2) vented to the atmosphere.
- .8 Movable Heads

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- .1 Nozzle connections: located on the fixed head for double wall single pass arrangements, unless otherwise specified.

1.3 PUMPS

- .1 Provide factory authorized start up.
- .2 Provide coupling guards on all pumps.
- .3 Vertical In-Line Circulating Pump:
 - .1 Pump volute or casings shall be constructed of class 30 cast iron
 - .1 Equal suction and discharge ports
 - .2 Drilled and tapped for gauge ports at both the suction and discharge flanges and for drain port at the bottom of the casing
 - .2 Impeller:
 - .1 Bronze
 - .2 Hydraulically balanced by the back impeller hub and balancing holes.
 - .3 Dynamically balanced fitted to the shaft with a key.
 - .3 Pump cover:
 - .1 Machined balanced chamber between the back impeller hub and the cover.
 - .2 Maximum flexibility of mechanical shaft seals and flush glands.
 - .4 Seat/seal materials:
 - .1 Suitable for glycol: 250°F
 - .5 Shaft:
 - .1 Dry shaft design.
 - .2 Covered with a replaceable stainless steel shaft sleeve.
 - .6 Motor
 - .1 High efficiency "NEMA Premium® Induction Motors CBIP, Powersmart and LEED approved (30 RPS maximum speed unless noted otherwise)
 - .1 Suitable for variable frequency drive. Coordinate with Johnson Controls.
- .4 Factory installed vent/flush line.
- .5 Suitable to accept Variable Frequency Drive control.

1.4 BOILERS

- .1 Up to 94% Thermal Efficiency at Full Rate
 - .1 Provide factory authorized start up.
- .2 Construction
 - .1 Indoor
 - .2 Front Controls Enclosed
 - .3 PolyTuf Powder Coat Finish
 - .4 Rear Connections (Electrical, Gas, Vent, Combustion Air)
 - .5 Top Connections (Water)
 - .6 Design Certified ANSI Z21.13/CSA 4.9
- .3 Control
 - .1 120V, 60Hz, 1Ø, Power Supply
 - .2 Digital Operating Control with LCD display.
 - .3 Outdoor reset with Indirect Priority with aquastat for DHW/Pool.
 - .4 0-10 VDC input for BMS to match Johnson Controls.
 - .5 Spark Ignition (IID)
 - .6 Remote Flame Sensor

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- .7 High Limit, Manual Reset, Fixed, 200°F
- .8 Auto Limit, Fixed, 210°F
- .9 Alarm Dry Contact Connection
- .10 On/Off Power Switch
- .11 Blocked Vent Pressure Switch
- .12 Boiler, DHW/Pool & System Pump Contacts
- .13 Water Temperature Sensors (3)
 - .1 B-36 TempTracker Mod+ Digital Controller, 2-4 Boilers, OA Reset
 - .2 S-1 Low Gas Pressure Switch, Manual Reset
 - .3 S-2 High Gas Pressure Switch, Manual Reset
 - .4 Z-12 Condensate Neutralizer Kit

- .4 Burner
 - .1 Ultra-Low NOx: Less than 20 PPM

- .5 Gas Train
 - .1 Fuel: Natural gas
 - .2 Zero Governor Regulator
 - .3 Dual-Seat Combination Valve
 - .4 Electronic Modulating Firing Mode (H7) 5:1 turndown

TABLE 1 - AIR SEPARATOR

Mark	Mfrs.	Model	Strainer	Strainer Face Area	Max. Flow GPM	Remarks
AIR.S.-1 Building system	ITT/B+G	R8F	✓	325 Sq. inches	1500	
AIR.S.-2 Envelope	ITT/B+G	R5F	✓	165 Sq. inches	550	
AIR.S.-3 Domestic	ITT/B+G	R5F	✓	165 Sq. inches	550	
AIR.S.-4 Preheat	ITT/B+G	R4F	✓	120 Sq. inches	330	
AIR.S.-5 Pool	ITT/B+G	R4F	✓	120 Sq. inches	330	

TABLE 2 - EXPANSION TANKS

Mark	Mfrs.	Model	Pneumatic	Bladder	Volume	Dia.	Remarks
EXP.T.-1A Building system	ITT/B+G	B600		✓	158 GAL.	30"X81"H	
EXP.T.-1B Building System	ITT/B+G	B600		✓	158 GAL.	30"X81"H	
EXP.T.-2 Envelope	ITT/B+G	B500		✓	132 GAL.	24"X78"H	
EXP.T.-3 Domestic	ITT/B+G	B500		✓	132 GAL.	24"X78"H	
EXP.T.-4 Preheat	ITT/B+G	B300		✓	80 GAL.	24"X50"H	
EXP.T.-5 Pool	ITT/B+G	B300		✓	80 GAL.	24"X50"H	

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TABLE 3 - PLATE HEAT EXCHANGER

Description	PHX -1 Envelope		PHX -2 Domestic		PHX -3 Preheat		PHX -4 Pool	
	Side 1	Side 2	Side 1	Side 2	Side 1	Side 2	Side 1	Side 2
Mfr. Bell & Gossett	P21		P21		P47		P21	
Model Code Designation (ASME Stamp Required)	√		√		√		√	
Heat Exchanger Coating	CS Epoxy Painted		CS Epoxy Painted		CS Epoxy Painted		CS Epoxy Painted	
Plate Material	SS 316		SS 316		SS 316		SS 316	
Plate Thickness	0.4mm		0.4mm		0.4mm		0.4mm	
Type of Fluid	Water	Water	Water	Water	Water	P.Gly. 50%	Water	Water
Flow Rate: gpm	264.17	263.54	408.10	407.14	203.33	221.27	194.30	192.73
Specific Heat Btu/(lb) °F	1.00	1.00	1.00	1.00	1.00	0.88	1.00	1.00
Thermal Conductivity Btu/(hr) (ft) °F	0.38	0.38	0.38	0.38	0.38	0.22	0.37	0.36
Viscosity Cp (Average)	0.39	0.42	0.44	0.47	0.49	1.96	0.52	0.71
Temperature in T1, °F	180	150	160	140	150	120	140	90
Temperature out T2, °F	160	170	150	150	130	140	126	104
Test Pressure Psig	195	195	195	195	195	195	195	195
Heat exchanged BTU/hr	2,580,000		2,000,000		2,000,000		1,340,000	
Design Pressure psig	150	150	150	150	150	150	150	150
Design Temperature °F	257	257	257	257	257	257	257	257
Pressure Drop, psi	4.94	4.92	4.95	4.93	4.04	4.96	4.34	4.85
HTC Clean Service, Btu/ft ²	1,490.58	1,490.58	1,248.68	1,248.68	743.21	743.21	1,121.15	514.58
LMTD, °F	10.00		10.00		10.00		36.00	
Number of Plates	69	70	64	70	52	70	30	70
Connections, in.	4		4		4		4	
Total Heat Transfer Surface Area, ft ²	173.08		160.17		269.10		72.33	
Replacement Plate Packs	1		1		1		1	

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TABLE 4 – PUMPS

Mark	Mfrs.	Model	Motor	Rpm	Gpm	Hd (Ft)	Impeller	Remarks
PU-1 A Building system	ITT/B+G	4x4x9½	15 Hp	1760	439	65	9	A, B
PU-1B Building System	ITT/B+G	4x4x9½	15 Hp	1760	439	65	9	A, B
PU-2A Envelope Building Side	ITT/B+G	3x3x9½B	10 Hp	1760	265	69	9	A, B
PU-2B Envelope Exchanger Side	ITT/B+G	3x3x9½B	10 Hp	1760	265	69	9	A, B
PU-3A Domestic Building Side	ITT/B+G	4x4x9½B	15 Hp	1760	408	69	9	A, B
PU-3B Domestic Exchanger Side	ITT/B+G	4x4x9½B	15 Hp	1760	408	69	9	A, B
PU-4A Preheat Building Side	ITT/B+G	3x3x9½B	10 Hp	1760	203	50	9	A, B
PU-4B Preheat Exchanger Side	ITT/B+G	3x3x9½B	10 Hp	1760	225	50	9	A, B, C
PU-5A Pool Building Side	ITT/B+G	3x3x9½B	10 Hp	1760	194	60	9	A, B
PU-5B Pool Exchanger Side	ITT/B+G	3x3x9½B	10 Hp	1760	192	60	9	A, B

Remarks:

- A** Motor to be high efficiency type. Must qualify for Manitoba Hydro Power Smart Rebate Program.
- B** Pump supplier shall meet horsepower requirements stated and “not” submit based only on “HD”/“GPM” listed above.
- C** Glycol corrected.

TABLE 5 – CONDENSING BOILER

Mark	Mfrs.	Model	Gross <small>Input/Output (MBH)</small>	Thermal <small>Efficiency</small>	Remarks
B-BLR-1 to 11	Raypak	XFyre – Type H	850/799	94%	A, B, C, D

Remarks:

- A** Boiler supplier to provide computer run for final chimney arrangement sizing to the approval of Department of Labour using
- B** Full modulation.
- C** Condensing.
- D** The boiler supplier shall coordinate all interfacing with Johnson Controls,

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Bid Opportunity: 889-2009 – Addendum #1
Specification 15600

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