

Appendix A – Runaround Loop Component Information



MARSHALL ENGINEERED PRODUCTS CO.

Company: PSU
 Name: Justin
 Date: 3/30/2006

Pump:

Size: RP06-15
 Type: IN-LINE
 Synch speed: 3600 rpm
 Curve: PC1147
 Specific Speeds:
 Dimensions:
 Speed: 3500 rpm
 Dia: 5.25 in
 Impeller:
 Ns: ---
 Nss: ---
 Suction: 1.5 in
 Discharge: 1.5 in

Search Criteria:

Flow: 51 US gpm
 Head: 92.5 ft
 Near miss: 5 % of Head

Fluid:

Water
 Density: 62.25 lb/ft³
 Viscosity: 1.105 cP
 NPSHa: 80 ft
 Temperature: 60 °F
 Vapor pressure: 0.2563 psi a
 Atm pressure: 14.7 psi a

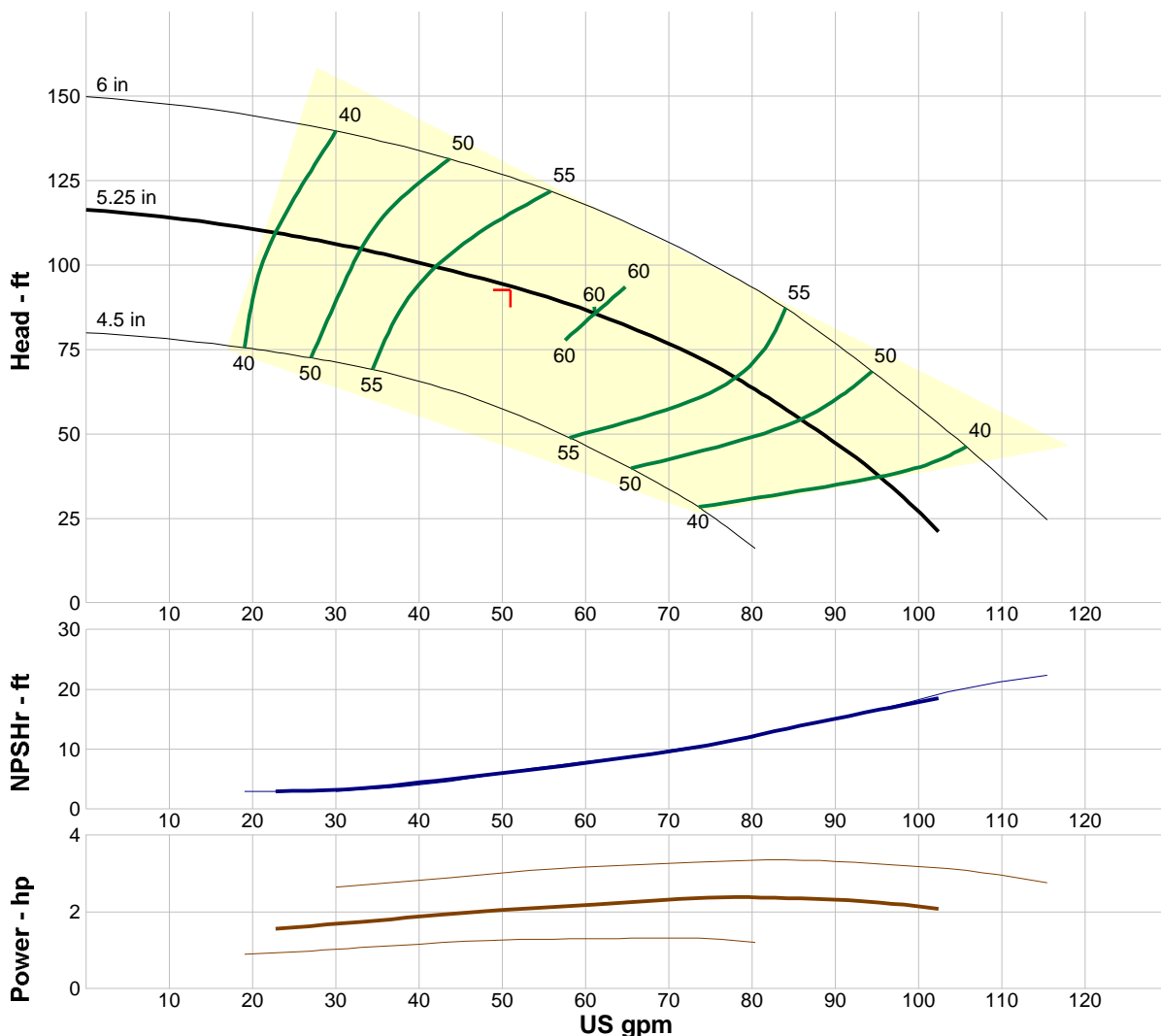
Pump Limits:

Temperature: --- °F
 Pressure: --- psi g
 Sphere size: --- in
 Power: --- hp
 Eye area: --- in²

Motor:

Standard: NEMA
 Enclosure: TEFC
 Sizing criteria: Max Power on Design Curve
 Size: 3 hp
 Speed: 3600
 Frame: 182T

---- Data Point ----	
Flow:	51 US gpm
Head:	93 ft
Eff:	57%
Power:	2.05 hp
NPSHr:	6.25 ft
---- Design Curve ----	
Shutoff head:	116 ft
Shutoff dP:	50.3 psi
Min flow:	--- US gpm
BEP:	60% @ 61.1 US gpm
NOL power:	2.38 hp @ 78 US gpm
-- Max Curve --	
Max power:	3.36 hp @ 84 US gpm



Performance Evaluation:

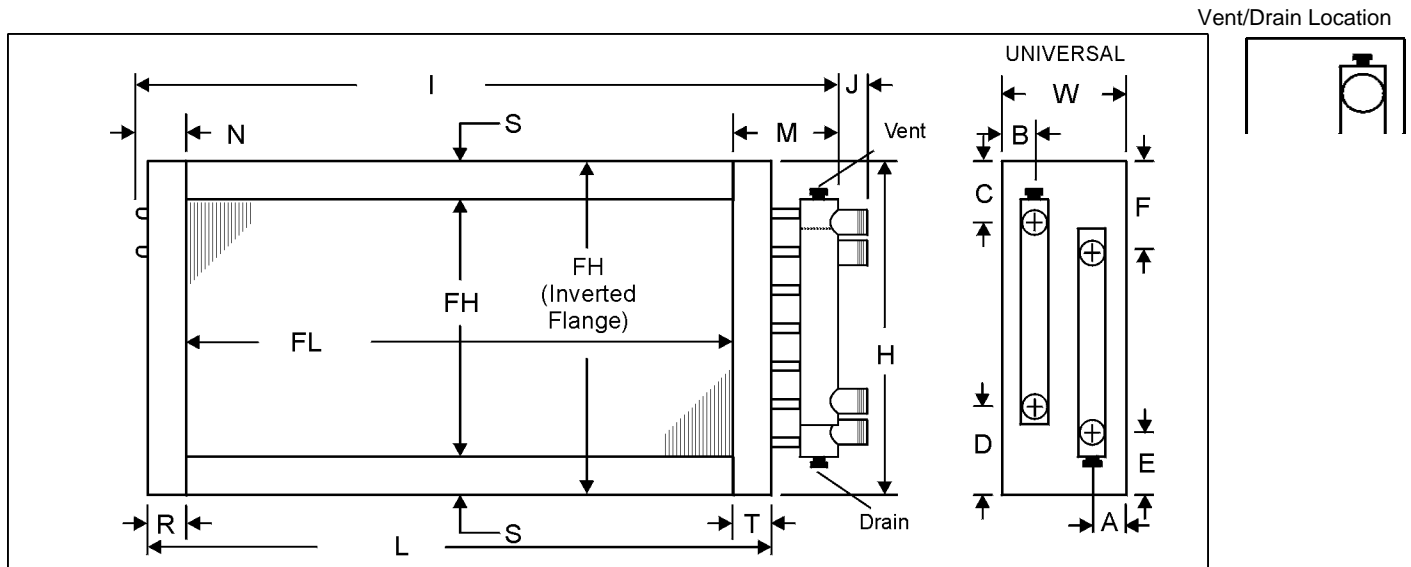
Flow US gpm	Speed rpm	Head ft	Efficiency %	Power hp	NPSHr ft
61.2	3500	85.6	60	2.2	7.93
51	3500	93	57	2.05	6.25
40.8	3500	100	54	1.89	4.59
30.6	3500	106	48	1.7	3.33
20.4	3500	110	38	1.53	2.99

Customer:
 Contact:
 Telephone:
 Fax:
 Job:

Date: 3/29/2006
 From:
 Company:
 Return Tel:
 Return Fax:

ITEM	QTY	MODEL NUMBER						HAND
		TYPE	FPI	ROWS	FIN	FH (IN)	FL (IN)	
Supply	1	5WS	08	06	A	30.00	80.00	Universal

MATERIALS OF CONSTRUCTION		OPTIONS			
Finns	.0075 Aluminum	Casing Type	Flanged	Label Kit	No
Tubes	.020 Copper	Vent/Drain	.50 FPT on End Cap	Corrosion Resistant	Yes
Casing	Galvanized Steel			Mounting Holes	No
Connection	2 MPT Carbon Steel			Turbospirals	No
				Drain Headers	No



DIMENSIONAL DATA (IN)																
CONNECTION							FLANGES									
SIZE	A	B	C	D	E	F	H	I	J	L	M	N	R	S	T	W
2	1.753	1.75	2.51	4.76	2.51	4.76	33.00	87.50	3.00	83.00	5.00	2.50	1.50	1.50	1.50	10.00

Notes:

GENERAL NOTES

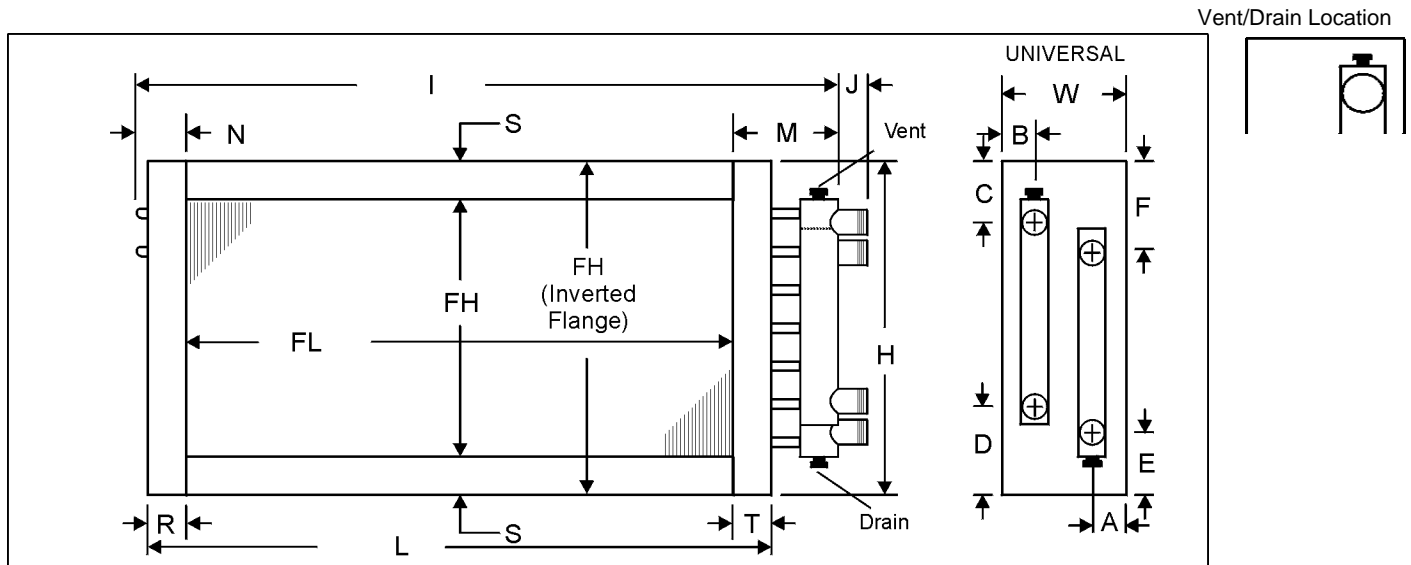
- All dimensions are in inches.
- One intermediate tube support fabricated from heavy gauge stock of the same material as the fins will be provided.
- Cap all unused connections.
- The supply line should be connected to the lower connection on the leaving air side for counterflow operation.
- Coils will vent and drain through factory-installed vent and drain fittings when mounted level for horizontal flow.
- Connection location other than standard could affect vent and drain locations. Consult factory.

Customer:
Contact:
Telephone:
Fax:
Job:

Date: 3/29/2006
From:
Company:
Return Tel:
Return Fax:

ITEM	QTY	MODEL NUMBER						HAND
		TYPE	FPI	ROWS	FIN	FH (IN)	FL (IN)	
Exhaust	1	5WS	08	06	A	30.00	80.00	Universal

MATERIALS OF CONSTRUCTION		OPTIONS			
Finns	.0075 Aluminum	Casing Type	Flanged	Label Kit	No
Tubes	.020 Copper	Vent/Drain	.50 FPT on End Cap	Corrosion Resistant	Yes
Casing	Galvanized Steel			Mounting Holes	No
Connection	2 MPT Carbon Steel			Turbospirals	No
				Drain Headers	No



DIMENSIONAL DATA (IN)																
CONNECTION							FLANGES									
SIZE	A	B	C	D	E	F	H	I	J	L	M	N	R	S	T	W
2	1.753	1.75	2.51	4.76	2.51	4.76	33.00	87.50	3.00	83.00	5.00	2.50	1.50	1.50	1.50	10.00

Notes:

GENERAL NOTES

- All dimensions are in inches.
- One intermediate tube support fabricated from heavy gauge stock of the same material as the fins will be provided.
- Cap all unused connections.
- The supply line should be connected to the lower connection on the leaving air side for counterflow operation.
- Coils will vent and drain through factory-installed vent and drain fittings when mounted level for horizontal flow.
- Connection location other than standard could affect vent and drain locations. Consult factory.

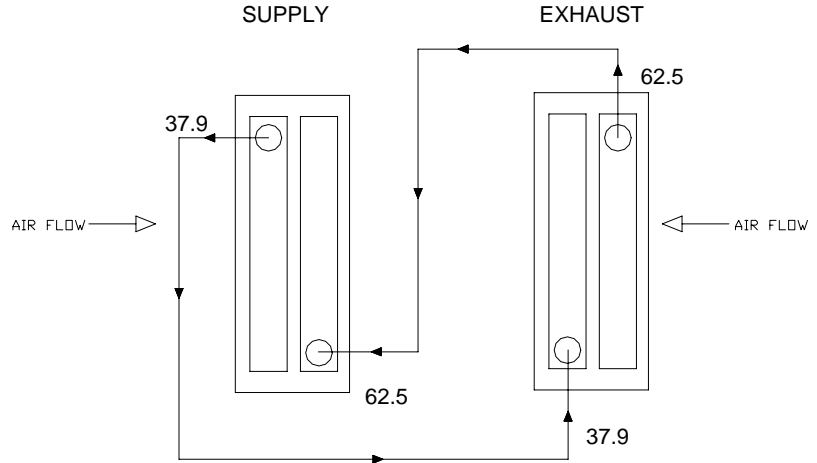
Customer:	Date:	3/29/2006
Contact:	From:	
Telephone:	Company:	
Fax:	Return Tel:	
Job:	Return Fax:	

CP 1063same_end_universal																					
Item	Qty	Model	FH x FL	Hand	Conn Size	A	B	C	D	E	F	H	I	J	L	M	N	R	S	T	W
Supply	1	5WS0806A	30.00x80.00	U	2.00	1.75	1.75	2.51	4.76	2.51	4.76	33.00	87.50	3.00	83.00	5.00	2.50	1.50	1.50	1.50	10.00
Exhaust	1	5WS0806A	30.00x80.00	U	2.00	1.75	1.75	2.51	4.76	2.51	4.76	33.00	87.50	3.00	83.00	5.00	2.50	1.50	1.50	1.50	10.00

Customer:
Contact:
Telephone:
Fax:
Job:

Date: 3/29/2006
From:
Company:
Return Tel:
Return Fax:

Season: Winter
Three Way Valve Required: No



	UOM	SUPPLY COIL	EXHAUST COIL
Item		Supply	Exhaust
Coils per Bank		3	3
Allow Opposite End		No	No
Tube OD		5/8	5/8
Coil Duty		Heat-Return Bend	Cool-Standard
Fins Per Inch		8	8
Rows		6	6
Circuiting		Single	Single
Fin Surface		A	A
Fin Height x Finned Length	IN	30.00 x 80.00	30.00 x 80.00
Turbospirals		No	No
Tube wall thickness & Material		0.020 Copper	0.020 Copper
Fin thickness & Material		0.0075 Aluminum	0.0075 Aluminum
Connection Quantity & Size	IN	(1) 2	(1) 2
Fluid Type		Ethylene	Ethylene
Percent Glycol		30	30
Entering Fluid Temp.	°F	62.46	37.93
Fluid Flow Rate	GPM	51.00	51.00
Altitude	FT	.00	.00
Air Flow Rate	SCFM/SCFM	95,000.00	95,000.00
Face Velocity	FPM	1,900.00	1,900.00
Entering Air Temp. DB / WB	°F	20.00 / N/A	75.00 / 63.94
Model Number		5WS0806A	5WS0806A
Total / Sensible Capacity	MBH	573.48 / N/A	572.81 / 497.80
Leaving Air Temp. DB / WB	°F	25.57 / N/A	70.21 / 62.06
Air Pressure Drop	IN WG	3.10	3.10
Leaving Fluid Temp.	°F	37.91	62.46
Fluid Pressure Drop	FT H2O	.98	.99
Fluid Flow Rate	GPM	51.00	51.00
Fluid Velocity	FPS	.92	.92
Weight - (Dry) / (w/Fluid)	LB	302.16 / 432.44	302.16 / 432.47
Notes		BCEL	BEL

- B) Rated In Compliance With ARI 410.
- C) Coil Not Within Certified ARI Directory.
- E) Specified Condition(s) Out Of ARI Range.
- L) Coil rating valid for Heatcraft coils only.



MARSHALL ENGINEERED PRODUCTS CO.

Company: PSU
 Name: Justin
 Date: 3/30/2006

Pump:

Size: RB06-15
 Type: BASE-MOUNTED
 Synch speed: 3600 rpm
 Curve: PC1103
 Specific Speeds:
 Dimensions:
 Speed: 3500 rpm
 Dia: 5 in
 Impeller:
 Ns: ---
 Nss: ---
 Suction: 2 in
 Discharge: 1.5 in

Search Criteria:

Flow: 85 US gpm
 Head: 92.5 ft
 Near miss: 5 % of Head

Fluid:

Water
 Density: 62.25 lb/ft³
 Viscosity: 1.105 cP
 NPSHa: 80 ft
 Temperature: 60 °F
 Vapor pressure: 0.2563 psi a
 Atm pressure: 14.7 psi a

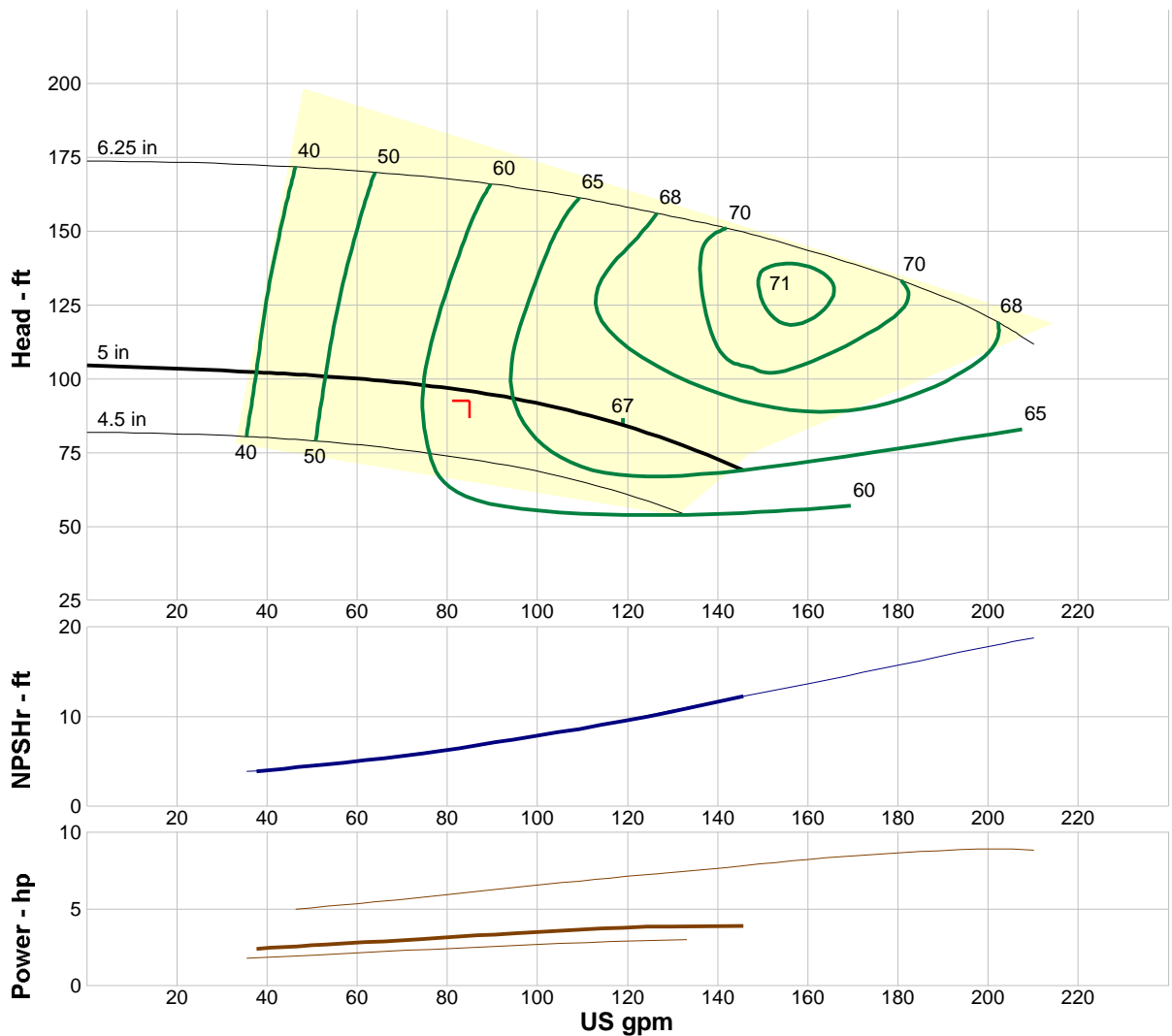
Pump Limits:

Temperature: --- °F
 Pressure: --- psi g
 Sphere size: --- in
 Power: --- hp
 Eye area: --- in²

Motor:

Standard: NEMA
 Enclosure: TEFC
 Sizing criteria: Max Power on Design Curve
 Size: 5 hp
 Speed: 3600
 Frame: 184T

---- Data Point ----	
Flow:	85 US gpm
Head:	95.5 ft
Eff:	63%
Power:	3.25 hp
NPSHr:	6.71 ft
---- Design Curve ----	
Shutoff head:	105 ft
Shutoff dP:	45.2 psi
Min flow:	--- US gpm
BEP:	67% @ 119 US gpm
NOL power:	3.9 hp @ 146 US gpm
-- Max Curve --	
Max power:	8.93 hp @ 202 US gpm



Performance Evaluation:

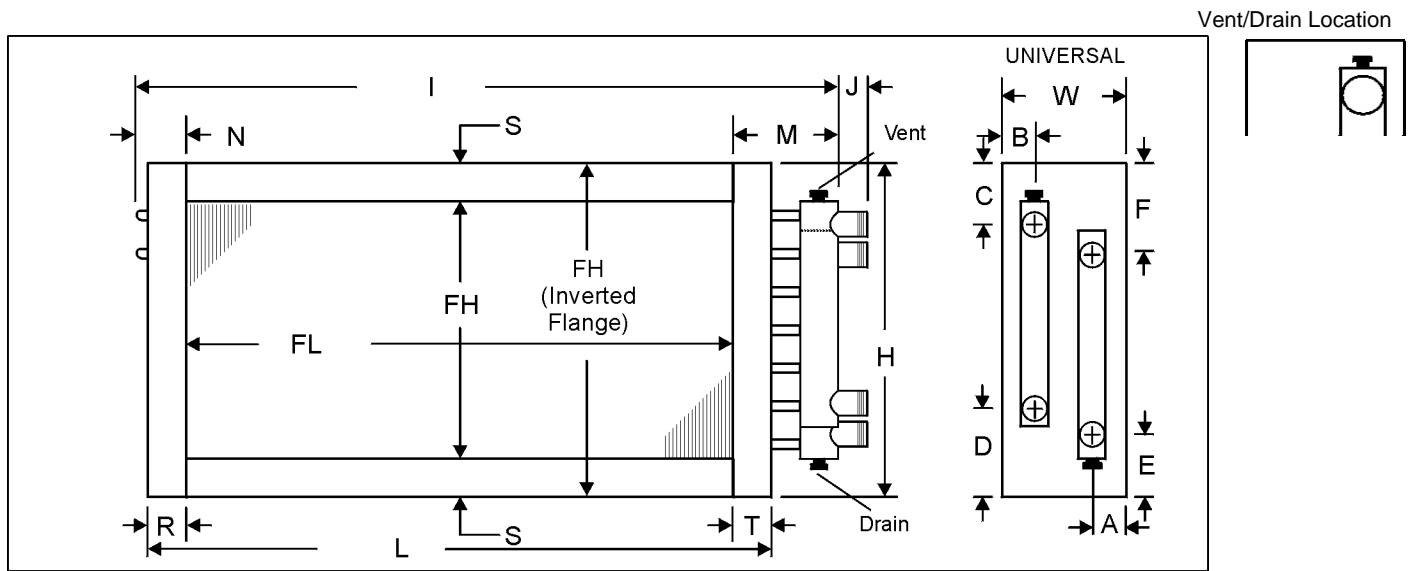
Flow US gpm	Speed rpm	Head ft	Efficiency %	Power hp	NPSHr ft
102	3500	90.6	65	3.54	8.09
85	3500	95.5	63	3.25	6.71
68	3500	98.8	57	2.95	5.53
51	3500	101	49	2.65	4.6
34	3500	102	38	2.35	3.92

Customer: BCM
 Contact:
 Telephone:
 Fax:
 Job: Thesis

Date: 3/29/2006
 From:
 Company:
 Return Tel:
 Return Fax:

ITEM	QTY	MODEL NUMBER						HAND
		TYPE	FPI	ROWS	FIN	FH (IN)	FL (IN)	
Supply	1	5WS	08	06	A	30.00	60.00	Universal

MATERIALS OF CONSTRUCTION		OPTIONS			
Fin	.0075 Aluminum	Casing Type	Flanged	Label Kit	No
Tube	.020 Copper	Vent/Drain	.50 FPT on End Cap	Corrosion Resistant	Yes
Casing	Galvanized Steel			Mounting Holes	No
Connection	2.000 MPT Carbon Steel			Turbospirals	No
				Drain Headers	No



DIMENSIONAL DATA (IN)																	
CONNECTION											FLANGES						
SIZE	A	B	C	D	E	F	H	I	J	L	M	N	R	S	T	W	
2.00	1.753	1.75	2.51	4.76	2.51	4.76	33.00	67.50	3.00	63.00	5.00	2.50	1.50	1.50	1.50	10.00	

GENERAL NOTES

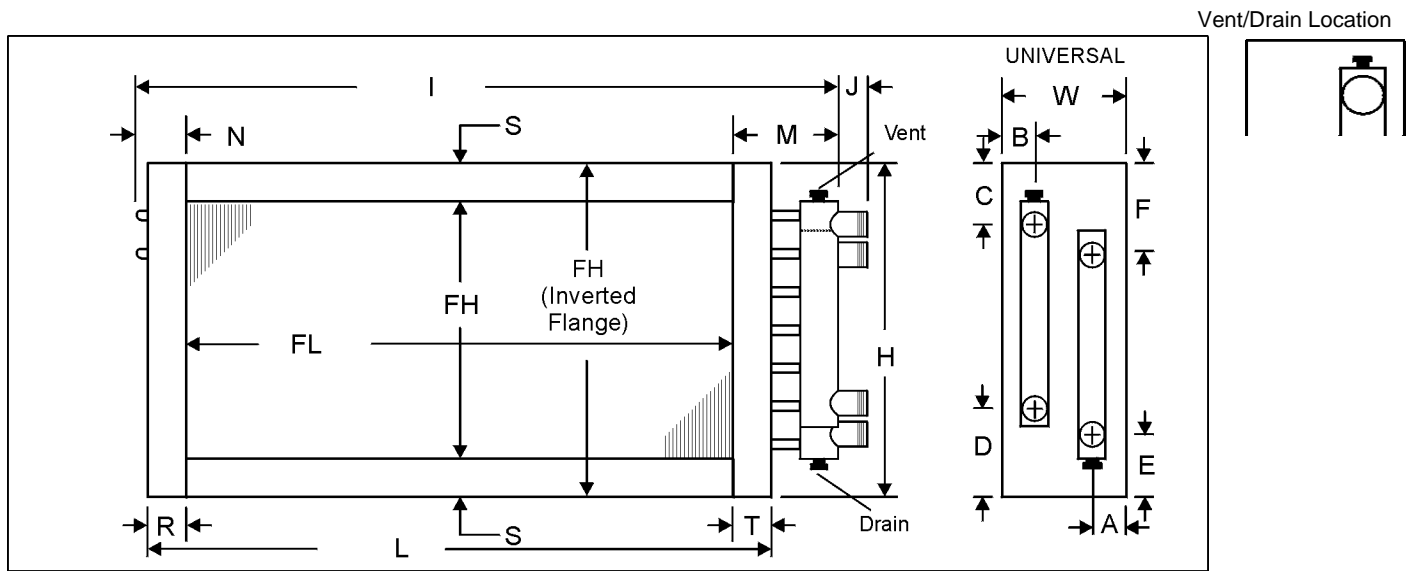
- All dimensions are in inches.
- Corrosion Resistant coated coils require a longer lead-time since they must be re-tested after coating.
- One intermediate tube support fabricated from heavy gauge stock of the same material as the fins will be provided.
- Cap all unused connections.
- The supply line should be connected to the lower connection on the leaving air side for counterflow operation.
- Coils will vent and drain through factory-installed vent and drain fittings when mounted level for horizontal flow.
- Connection location other than standard could affect vent and drain locations. Consult factory.

Customer: BCM
 Contact:
 Telephone:
 Fax:
 Job: Thesis

Date: 3/29/2006
 From:
 Company:
 Return Tel:
 Return Fax:

ITEM	QTY	MODEL NUMBER						HAND
		TYPE	FPI	ROWS	FIN	FH (IN)	FL (IN)	
Exhaust	1	5WS	08	06	A	30.00	60.00	Universal

MATERIALS OF CONSTRUCTION		OPTIONS			
Finns	.0075 Aluminum	Casing Type	Flanged	Label Kit	No
Tubes	.020 Copper	Vent/Drain	.50 FPT on End Cap	Corrosion Resistant	Yes
Casing	Galvanized Steel			Mounting Holes	No
Connection	2 MPT Carbon Steel			Turbospirals	No
				Drain Headers	No



DIMENSIONAL DATA (IN)																
CONNECTION							FLANGES									
SIZE	A	B	C	D	E	F	H	I	J	L	M	N	R	S	T	W
2	1.753	1.75	2.51	4.76	2.51	4.76	33.00	67.50	3.00	63.00	5.00	2.50	1.50	1.50	1.50	10.00

Notes:

GENERAL NOTES

- All dimensions are in inches.
- One intermediate tube support fabricated from heavy gauge stock of the same material as the fins will be provided.
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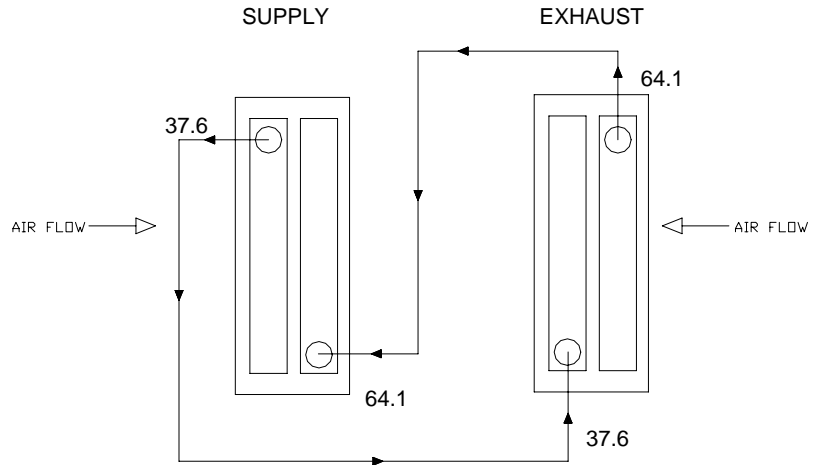
Customer:	BCM	Date:	3/29/2006
Contact:		From:	
Telephone:		Company:	
Fax:		Return Tel:	
Job:	Thesis	Return Fax:	

CP 1063same_end_universal																					
Item	Qty	Model	FH x FL	Hand	Conn Size	A	B	C	D	E	F	H	I	J	L	M	N	R	S	T	W
Supply	1	5WS0806A	30.00x60.00	U	2.00	1.75	1.75	2.51	4.76	2.51	4.76	33.00	67.50	3.00	63.00	5.00	2.50	1.50	1.50	1.50	10.00
Exhaust	1	5WS0806A	30.00x60.00	U	2.00	1.75	1.75	2.51	4.76	2.51	4.76	33.00	67.50	3.00	63.00	5.00	2.50	1.50	1.50	1.50	10.00

Customer: BCM
 Contact:
 Telephone:
 Fax:
 Job: Thesis

Date: 3/29/2006
 From:
 Company:
 Return Tel:
 Return Fax:

Season: Winter
 Three Way Valve Required: No



	UOM	SUPPLY COIL	EXHAUST COIL
Item		Supply	Exhaust
Coils per Bank		3	3
Allow Opposite End		No	No
Tube OD		5/8	5/8
Coil Duty		Heat-Return Bend	Cool-Standard
Fins Per Inch		8	8
Rows		6	6
Circuiting		Single	Single
Fin Surface		A	A
Fin Height x Finned Length	IN	30.00 x 80.00	30.00 x 80.00
Turbospirals		No	No
Tube wall thickness & Material		0.020 Copper	0.020 Copper
Fin thickness & Material		0.0075 Aluminum	0.0075 Aluminum
Connection Quantity & Size	IN	(1) 2	(1) 2
Fluid Type		Ethylene	Ethylene
Percent Glycol		30	30
Entering Fluid Temp.	°F	64.12	37.60
Fluid Flow Rate	GPM	85.00	85.00
Altitude	FT	.00	.00
Air Flow Rate	SCFM/SCFM	163,000.00	163,000.00
Face Velocity	FPM	3,260.00	3,260.00
Entering Air Temp. DB / WB	°F	20.00 / N/A	76.00 / 64.79
Model Number		5WS0806A	5WS0806A
Total / Sensible Capacity	MBH	1,031.82 / N/A	1,032.04 / 882.79
Leaving Air Temp. DB / WB	°F	25.84 / N/A	71.05 / 62.85
Air Pressure Drop	IN WG	7.71	7.71
Leaving Fluid Temp.	°F	37.62	64.12
Fluid Pressure Drop	FT H2O	2.44	2.47
Fluid Flow Rate	GPM	85.00	85.00
Fluid Velocity	FPS	1.54	1.54
Weight - (Dry) / (w/Fluid)	LB	302.16 / 432.42	302.16 / 432.46
Notes		BCEL	BEL

- B) Rated In Compliance With ARI 410.
- C) Coil Not Within Certified ARI Directory.
- E) Specified Condition(s) Out Of ARI Range.
- L) Coil rating valid for Heatcraft coils only.