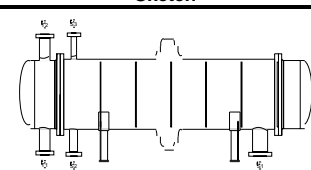




## HEAT EXCHANGER SPECIFICATION SHEET

1			Job No.:	
2	Customer	PV Engineering	Reference No.:	
3	Address	Waterloo, ON	Proposal No.:	
4	Plant Location		Date:	August 24, 2010 Rev. 2
5	Service of Unit:	Hot oil heater	Item No.: E-101	
6	Size	17 / 96 in	Type	BEM Hor
7	Surf/unit (eff.)	213.7 ft <sup>2</sup>	Shells/unit	1
8	<b>PERFORMANCE OF ONE UNIT</b>			
9	Fluid allocation		<b>Shell Side</b>	<b>Tube Side</b>
10	Fluid name			
11	Fluid quantity, Total	lb/h	10443	116667
12	Vapor (In/Out)	lb/h	10443	0
13	Liquid	lb/h	0	116667
14	Noncondensable	lb/h	10443	116667
15				
16	Temperature (In/Out)	F	572.59	571.2
17	Dew / Bubble point	F	572.59	380
18	Density (Vap / Liq)	lb/ft <sup>3</sup>	44.755	53.323
19	Viscosity	cp	0.0953	0.2262
20	Molecular wt, Vap		18.01	
21	Molecular wt, NC			
22	Specific heat	BTU/(lb*F)	1.1674	0.5199
23	Thermal conductivity	BTU/(ft*h*F)	0.301	0.071
24	Latent heat	BTU/lb		
25	Pressure	psi	1250	30
26	Velocity	ft/s	2.93	6.5
27	Pressure drop, allow./calc.	psi	13.95	0.05
28	Fouling resist. (min)	ft <sup>2</sup> *h*F/BTU	0.0005	0.001
29	Heat exchanged	BTU/h	6273921	140.31
30	Transfer rate, Service	BTU/(h*ft <sup>2</sup> *F)	209.93	326.28
31	<b>CONSTRUCTION OF ONE SHELL</b>			
32			<b>Shell Side</b>	<b>Tube Side</b>
33	Design/Vac/Test pressure	psi	1400	150
34	Design temperature	F	650	650
35	Number passes per shell		1	4
36	Corrosion allowance	in	0.0625	0.0625
37	Connections	In	6 / 900 ANSI	4 / 300 ANSI
38	Size/rating	Out	3 / 900 ANSI	4 / 300 ANSI
39	Nominal	Intermediate	/ 900 ANSI	/ 300 ANSI
40	Tube No.	OD	1	96
41	Tube type	Plain	Material	Carbon Steel
42	Shell	Carbon Steel	ID	17.25
43	Channel or bonnet	Carbon Steel	OD	19
44	Tubesheet-stationary	Carbon Steel	Shell cover	-
45	Floating head cover	-	Channel cover	-
46	Baffle-crossing	Carbon Steel	Type	Single segmental
47	Baffle-long	-	Seal type	Inlet
48	Supports-tube	-	U-bend	Type
49	Bypass seal	-	Tube-tubesheet joint	Exp. 2 grv
50	Expansion joint	Carbon Steel	Type	Flange and flued (TEMA)
51	RhoV2-Inlet nozzle	98	Bundle entrance	14
52	Gaskets - Shell side	Spiral-Wound Metal Fib	Tube Side	Spiral-Wound Metal Fib
53	Floating head	-	Bundle exit	38
54	Code requirements	ASME Code Sec VIII Div 1	TEMA class	B - chemical service
55	Weight/Shell	3709.1	Filled with water	4554.4
56	Remarks		Bundle	1198.5
57				
58				
59				





## HEAT EXCHANGER SPECIFICATION SHEET

1						Job No.:						
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3	Address	Waterloo, ON					Proposal No.:					
4	Plant Location						Date:	August 24, 2010		Rev.	2	
5	Service of Unit:	Hot oil heater					Item No: E-101					
6	Size	17 / 96 in		Type	BEM	Hor	Connected in		1	parallel	1	series
7	Surf/Unit(eff)	213.7 ft2		Shells/Unit	1		Surf/Shell(eff)		213.7 ft2			
8												
9												
10												
11	<b>Shell Side Nozzle Table</b>											
12												
13	<b>Nozzle Service</b>	<b>Mark</b>	<b>No.</b>	<b>Size (inch)</b>	<b>SCH</b>	<b>Class (psig)</b>	<b>FACE</b>	<b>TYPE</b>	<b>COMMENT</b>			
14												
15	Steam Inlet	S1	1	6	XXH	900 ANSI	RF	WN	located on the side			
16	Condensate Outlet	S2	1	3	XXH	900 ANSI	RF	WN	located on the bottom			
17	Vent	S3	1	2	XXH	900 ANSI	RF	WN	located on the top			
18												
19												
20												
21												
22												
23	<b>Tube Side Nozzle Table</b>											
24												
25												
26	<b>Nozzle Service</b>	<b>Mark</b>	<b>No.</b>	<b>Size (inch)</b>	<b>SCH</b>	<b>Class (psig)</b>	<b>FACE</b>	<b>TYPE</b>	<b>COMMENT</b>			
27												
28	Inlet	T1	1	4	40	300 ANSI	RF	WN	located on the bottom			
29	Outlet	T2	1	4	40	300 ANSI	RF	WN	located on the top			
30	Drain	T3	1	1	80	300 ANSI	RF	WN	located at rear end			
31	Vent	T4	1	1	80	300 ANSI	RF	WN	located at rear end			
32												
33												
34												
35												
36												
37	<b>Mean Metal Wall Temperature</b>											
38												
39	<b>Temperature Conditions</b>				<b>Shell</b>	<b>Tube</b>	<b>Tubesheet</b>	<b>Units</b>				
40												
41	Normal Operating Mean Wall Temperature				573	535.89	463	F				
42	Maximum Operating Mean Wall Temperature							F				
43	Startup Mean Wall Temperature				480	394	240	F				
44	Upset Mean Wall Temperature											
45	Steam Out Mean Wall Temperature											
46	Other Operating Mean Wall Temperature											
47												
48												
49												
50												
51												
52												
53												
54												
55												
56												



## HEAT EXCHANGER SPECIFICATION SHEET

1		Job No.:
2	Customer PV Engineering	Reference No.:
3	Address Waterloo, ON	Proposal No.:
4	Plant Location	Date: August 24, 2010 Rev. 2
5	Service of Unit: Hot oil heater	Item No: E-101
6	Size 17 / 96 in Type BEM Hor	Connected in 1 parallel 1 series
7	Surf/Unit(eff) 213.7 ft2	Shells/Unit 1 Surf/Shell(eff) 213.7 ft2

### NOTES

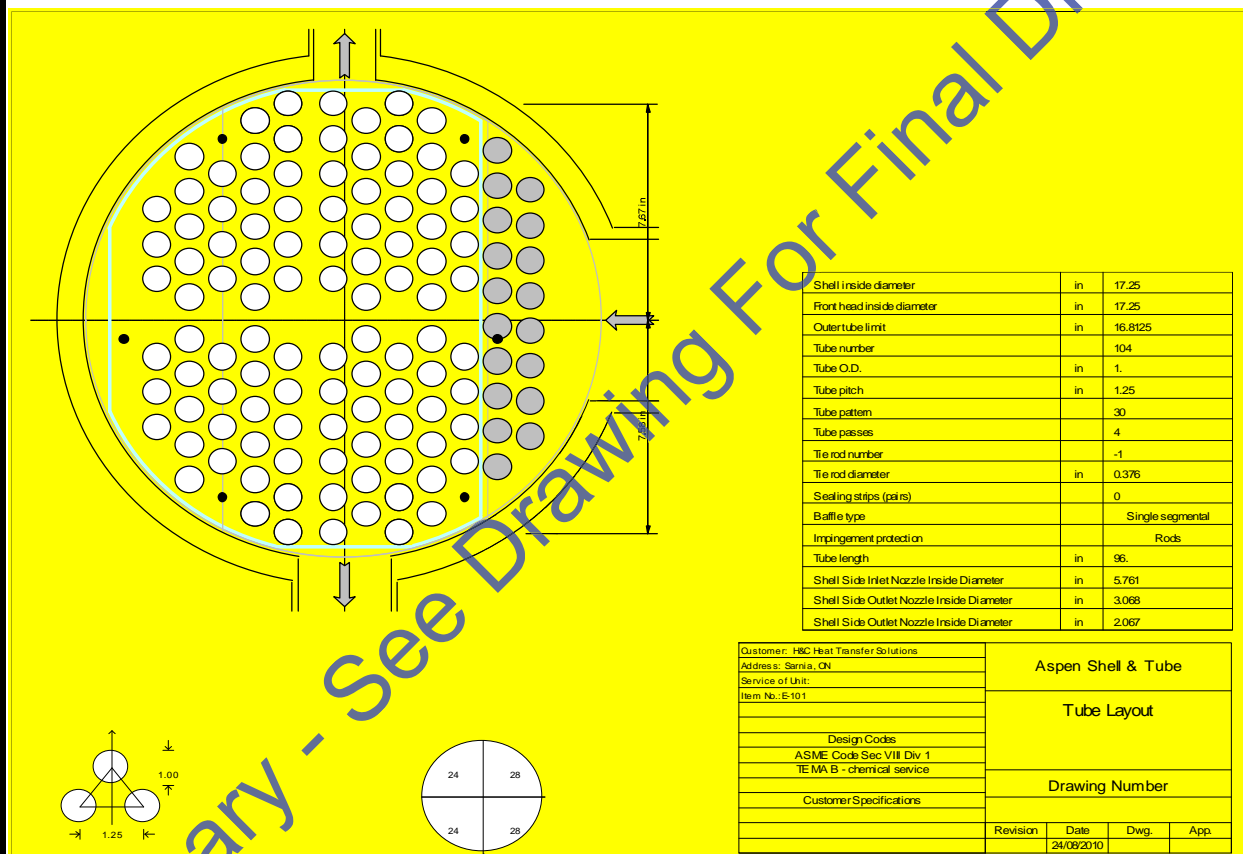
- 1- Two (2) rows of impingement rods on a 30 deg layout are to be used for impingement protection
- 2- Baffles to have a 1" V notch at the bottom
- 3- The shell inlet nozzle is to be located on the side
- 4- Dummy tubes (6) are to be installed in the horizontal pass partition lane.



## HEAT EXCHANGER SPECIFICATION SHEET

1					Job No.:				
2	Customer	PV Engineering			Reference No.:				
3	Address	Waterloo, ON			Proposal No.:				
4	Plant Location				Date:	August 24, 2010	Rev.	2	
5	Service of Unit:	Hot oil heater			Item No.:	E-101			
6	Size	17 / 96 in	Type	BEM Hor	Connected in	1 parallel	1 series		
7	Surf/Unit(eff)	213.7 ft2	Shells/Unit	1	Surf/Shell(eff)	213.7	ft2		

### Tubesheet Layout

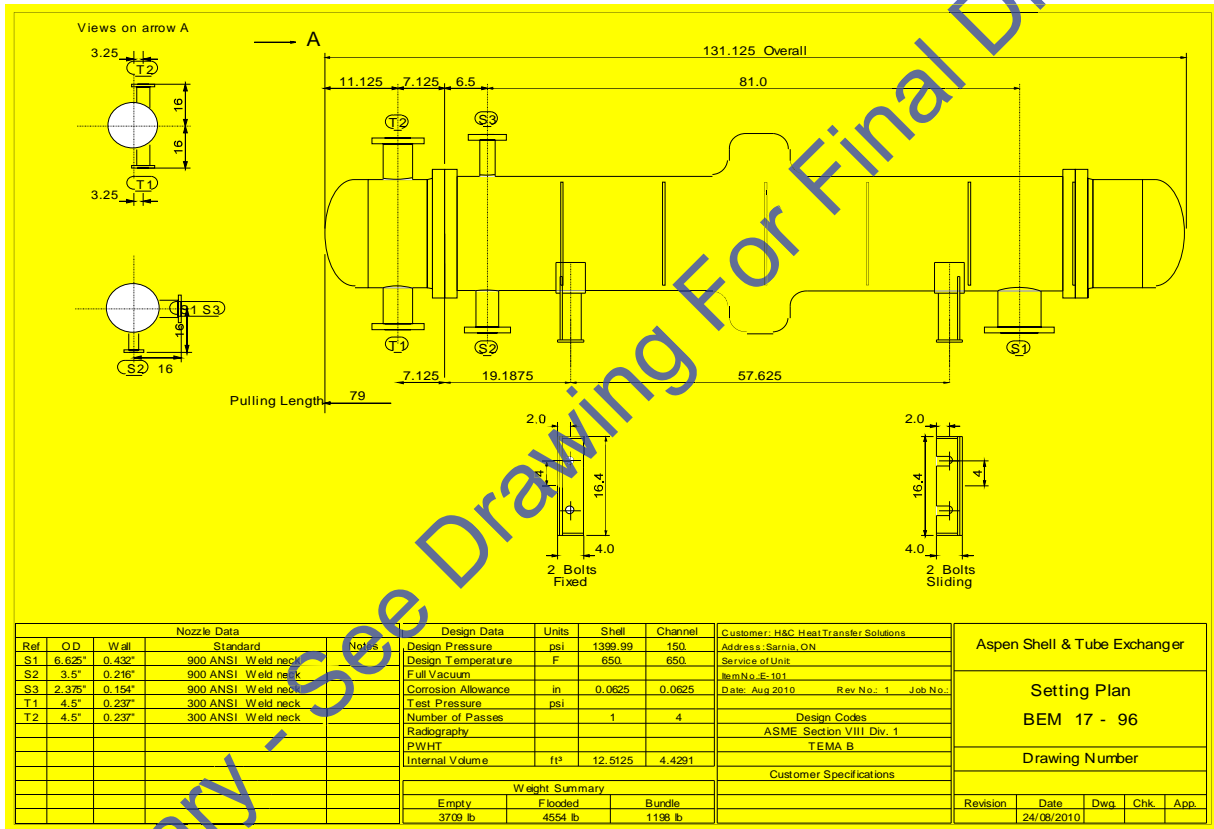


Preliminary - See Drawing For Final Dimensions

## HEAT EXCHANGER SPECIFICATION SHEET

1					Job No.:				
2	Customer	PV Engineering			Reference No.:				
3	Address	Waterloo, ON			Proposal No.:				
4	Plant Location				Date:	August 24, 2010		Rev.	2
5	Service of Unit:	Hot oil heater			Item No.:	E-101			
6	Size	17 / 96 in		Type	BEM Hor		Connected in	1 parallel	1 Series
7	Surf/Unit(eff)	213.7 ft2		Shells/Unit	1		Surf/Shell(eff)	213.7	ft2

### Setting Plan



Nozzle Data			Design Data		Units	Shell	Channel	Customer: H&C Heat Transfer Solutions	
Ref	OD	Wall	Standard	Design Pressure	psi	1399.99	150	Address: Sarnia, ON	
S1	6.625"	0.432"	900 ANSI Weld neck	Design Temperature	F	650	650	Service of Unit:	
S2	3.5"	0.216"	900 ANSI Weld neck	Full Vacuum				Item No.: E-101	
S3	2.375"	0.154"	900 ANSI Weld neck	Corrosion Allowance	in	0.0625	0.0625	Date: Aug 2010 Rev. No.: 1 Job No.:	
T1	4.5"	0.237"	300 ANSI Weld neck	Test Pressure	psi			<b>Setting Plan</b> <b>BEM 17 - 96</b>  <b>Drawing Number</b>	
T2	4.5"	0.237"	300 ANSI Weld neck	Number of Passes		1	4		
				Design Codes		ASME Section VIII Div. 1			
				ASME Section VIII Div. 1		TEMA B			
				Internal Volume	ft <sup>3</sup>	12.6125	4.4291	Customer Specifications	
Weight Summary									
				Empty	Flooded	Bundle			