H&C Heat Transfer Solutions

HEAT EXCHANGER SPECIFICATION SHEET

												Job No.:							
Customer		PV Engineering										Reference No.:							
Address		Waterloo, ON										Proposal No.:							
Plant Location												Date: August 24, 2010		Rev. 2					
Service of Unit:		Hot oil heater										Item No: E-101							
Size		17 / 96 in		Type		BEM		Hor				Connected in	1	parallel	1	series			
Surf/unit (eff.)		213.7 ft2		Shells/unit		1						Surf/shell (eff.)		213.7 ft2					
PERFORMANCE OF ONE UNIT																			
Fluid allocation									**Shell Side**					**Tube Side**					
Fluid name																			
Fluid quantity, Total							lb/h				10443					116667			
Vapor (In/Out)							lb/h			10443		0			0		0		
Liquid							lb/h			0		10443			116667		116667		
Noncondensable							lb/h												
Temperature (In/Out)							F			572.59		571.2			380		479.19		
Dew / Bubble point							F			572.59		572.59			578.38		578.38		
Density (Vap / Liq)							lb/ft3			2.625 /		/ 44.755			/ 53.323		/ 50.581		
Viscosity							cp			0.0215 /		/ 0.0953			/ 0.3576		/ 0.2262		
Molecular wt, Vap										18.01									
Molecular wt, NC																			
Specific heat							BTU/(lb*F)			1.4586 /		/ 1.1674			/ 0.5199		/ 0.5641		
Thermal conductivity							BTU/(ft*h*F)			0.039 /		/ 0.301			/ 0.079		/ 0.071		
Latent heat							BTU/lb												
Pressure							psi			1250		1249.96			30		26.86		
Velocity							ft/s			2.93					6.5				
Pressure drop, allow./calc.							psi			13.95		0.05			10		3.14		
Fouling resist. (min)							ft2*h*F/BTU			0.0005					0.001		0.0012 Ao based		
Heat exchanged		6273921		BTU/h										MTD corrected		140.31	F		
Transfer rate, Service		209.93				Dirty				209.91		Clean		326.28		BTU/(h*ft2*F)			
CONSTRUCTION OF ONE SHELL																**Sketch**			
					Shell Side					**Tube Side**									
Design/Vac/Test pressure			psi	1400 / FV /					150 / /										
Design temperature			F	650					650										
Number passes per shell				1					4										
Corrosion allowance			in	0.0625					0.0625										
Connections	In		in	1 6 / 900 ANSI					1 4 / 300 ANSI										
Size/rating	Out			1 3 / 900 ANSI					1 4 / 300 ANSI										
Nominal	Intermediate			/ 900 ANSI					/ 300 ANSI										
Tube No.	104	OD	1	Tks- Avg	0.083	in	Length	96	in	Pitch	1.25	in							
Tube type	Plain			Material	Carbon Steel					Tube pattern	30								
Shell	Carbon Steel		ID	17.25	OD	19	in		Shell cover	-									
Channel or bonnet		Carbon Steel							Channel cover	-									
Tubesheet-stationary		Carbon Steel							Tubesheet-floating	-									
Floating head cover		-							Impingement protection		Rods								
Baffle-crossing		Carbon Steel		Type	Single segmental		Cut(%d)	24.7 V		Spacing: c/c	15.5	in							
Baffle-long		-			Seal type					Inlet	15.9375	in							
Supports-tube					U-bend					Type									
Bypass seal					Tube-tubesheet joint					Exp. 2 grv									
Expansion joint		Carbon Steel			Type				Flange and flued (TEMA)										
RhoV2-Inlet nozzle		98		Bundle entrance		14				Bundle exit	38	lb/(ft*s2)							
Gaskets - Shell side		Spiral-Wound Metal Fib			Tube Side		Spiral-Wound Metal Fib												
Floating head		-																	
Code requirements		ASME Code Sec VIII Div 1							TEMA class		B - chemical service								
Weight/Shell	3709.1			Filled with water		4554.4				Bundle	1198.5	lb							
Remarks																			

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Surf/Unit(eff)	213.7 ft2	Shells/Unit	1		Surf/Shell(eff)	213.7 ft2		

Shell Side Nozzle Table

Nozzle Service	Mark	No.	Size (inch)	SCH	Class (psig)	FACE	TYPE	COMMENT
Steam Inlet	S1	1	6	XXH	900 ANSI	RF	WN	located on the side
Condensate Outlet	S2	1	3	XXH	900 ANSI	RF	WN	located on the bottom
Vent	S3	1	2	XXH	900 ANSI	RF	WN	located on the top

Tube Side Nozzle Table

Nozzle Service	Mark	No.	Size (inch)	SCH	Class (psig)	FACE	TYPE	COMMENT
Inlet	T1	1	4	40	300 ANSI	RF	WN	located on the bottom
Outlet	T2	1	4	40	300 ANSI	RF	WN	located on the top
Drain	T3	1	1	80	300 ANSI	RF	WN	located at rear end
Vent	T4	1	1	80	300 ANSI	RF	WN	located at rear end

Mean Metal Wall Temperature

Temperature Conditions	Shell	Tube	Tubesheet	Units
Normal Operating Mean Wall Temperature	573	535.89	463	F
Maximum Operating Mean Wall Temperature				F
Startup Mean Wall Temperature	480	394	240	F
Upset Mean Wall Temperature				
Steam Out Mean Wall Temperature				
Other Operating Mean Wall Temperature				

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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.

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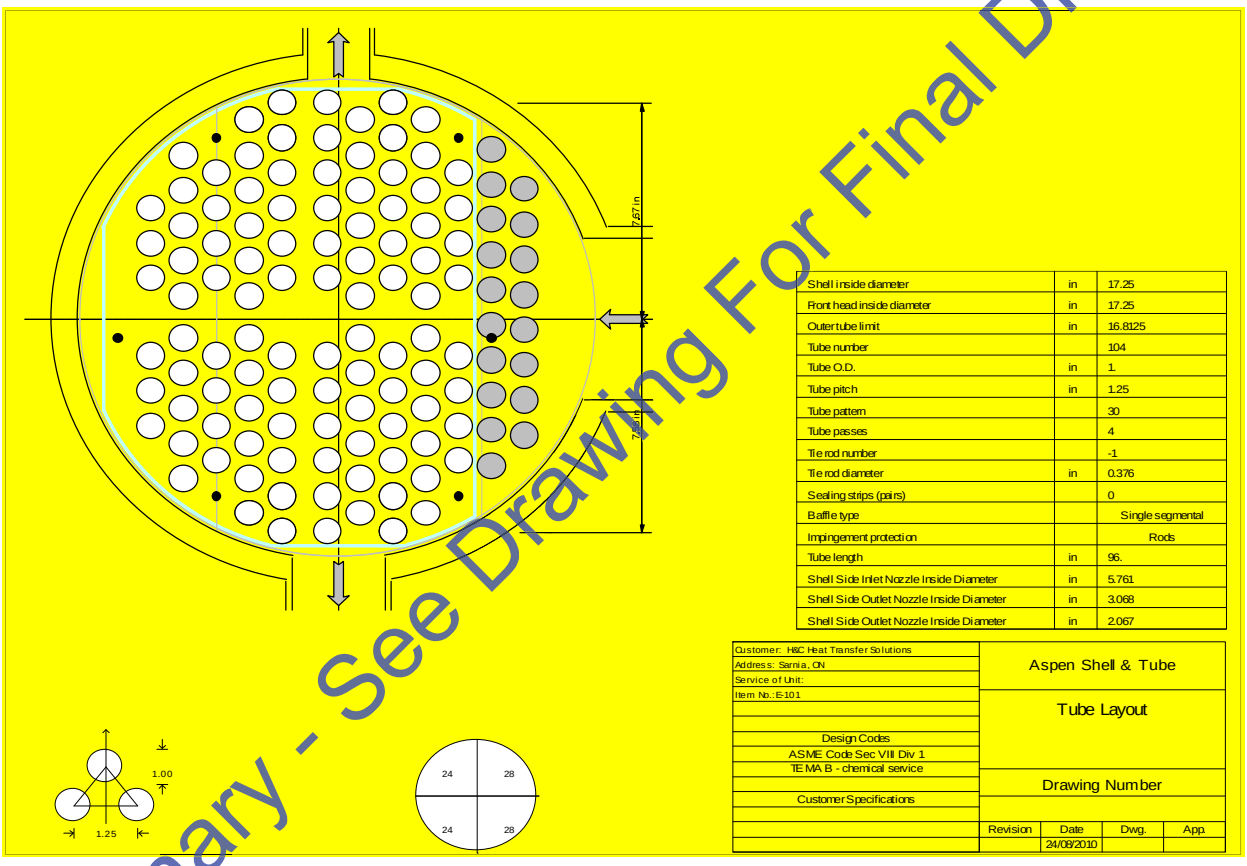
Tubesheet Layout



Shell inside diameter	in	17.25
Front head inside diameter	in	17.25
Outer tube limit	in	16.8125
Tube number		104
Tube O.D.	in	1.
Tube pitch	in	1.25
Tube pattern		30
Tube passes		4
Tie rod number		-1
Tie rod diameter	in	0.376
Sealing strips (pairs)		0
Baffle type		Single segmental
Impingement protection		Rods
Tube length	in	96.
Shell Side Inlet Nozzle Inside Diameter	in	5.761
Shell Side Outlet Nozzle Inside Diameter	in	3.068
Shell Side Outlet Nozzle Inside Diameter	in	2.067

Customer: H&C Heat Transfer Solutions	Aspen Shell & Tube			
Address: Sarnia, ON				
Service of Unit:				
Item No.: E-101	Tube Layout			
Design Codes				
ASME Code Sec VIII Div 1				
TEMA B - chemical service	Drawing Number			
Customer Specifications				
	Revision	Date	Dwg.	App.
		24/09/2010		

Preliminary - See Drawing For Final Dimensions

HEAT EXCHANGER SPECIFICATION SHEET

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2	Customer	PV Engineering						Reference No.:			
3	Address	Waterloo, ON						Proposal No.:			
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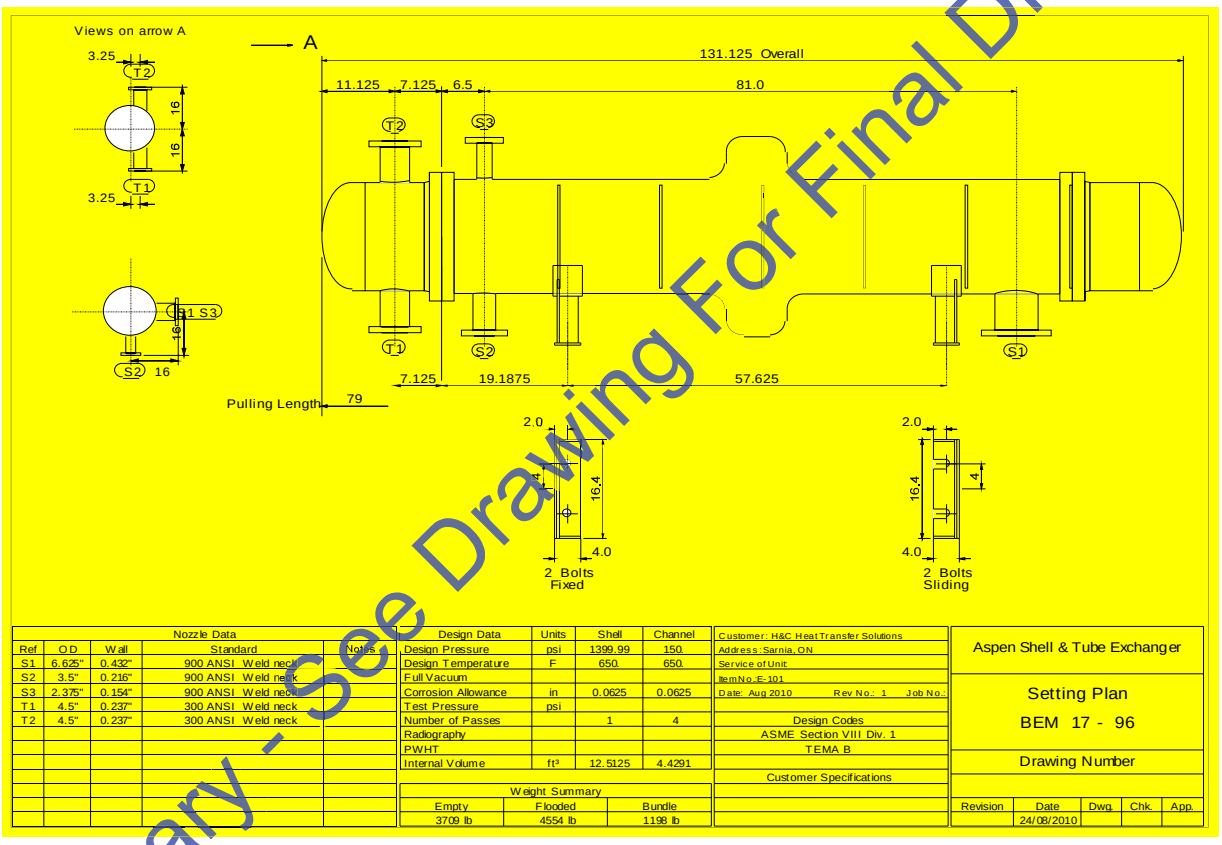
Setting Plan



Nozzle Data				
Ref	OD	Wall	Standard	Notes
S1	6.625"	0.432"	900 ANSI Weld neck	
S2	3.5"	0.216"	900 ANSI Weld neck	
S3	2.375"	0.154"	900 ANSI Weld neck	
T1	4.5"	0.237"	300 ANSI Weld neck	
T2	4.5"	0.237"	300 ANSI Weld neck	

Design Data	Units	Shell	Channel
Design Pressure	psi	1399.99	150.
Design Temperature	F	650.	650.
Full Vacuum			
Corrosion Allowance	in	0.0625	0.0625
Test Pressure	psi		
Number of Passes		1	4
Radiography			
PWHT			
Internal Volume	ft³	12.5125	4.4291

Weight Summary		
Empty	Flooded	Bundle
3709 lb	4554 lb	1198 lb

Customer: H&C Heat Transfer Solutions
Address: Sarnia, ON
Service of Unit:
Item No.: E-101
Date: Aug 2010 Rev No.: 1 Job No.:

Design Codes
ASME Section VIII Div. 1
TEMA B

Customer Specifications

Aspen Shell & Tube Exchanger

Setting Plan
BEM 17 - 96

Drawing Number

Revision	Date	Dwg.	Chk.	App.
	24/08/2010			

Preliminary - See Drawing For Final Dimensions