EQUIPMENT DATASHEET

175-C
LTS START-UP HEATER

N° del Contrato : DLG 0304

N° del Proy. de SECL : SC2566

B	04-SEP 2013	IFR	Issued for Review	J.Y.SHIN	T.Y.KIM	S.H.KIM
A	19 JUL 2013	IFR	Issued for Review	H.J.JOO	T.Y.KIM	S.H.KIM
Rev.	**Fecha**	**Estado**	**Descripción del Estado**	**Preparado por**	**Verificado por**	**Aprobado por**
Revisión del Documento				Página: Total de 6 hojas (Incl. Carátula)		

RESUMEN DE REVISION DEL DOCUMENTO

Rev.	Fecha de Revisión	Sección Revisada	Descripción de Revisión
A(BPC)	08 FEB 2013	ALL	Issued for Review
B(BPC)	19 FEB 2013	1	Data Sheet Cover is revised
C(BPC)	12 APR 2013	ALL	Data sheet format, Baffle Spacing, Heat Duty, Pressure Drop, Overall Coefficient
A(DPC)	19 JUL 2013	4,5	Channel side ID is revised. T3 is added on the drawing
B(DPC)	04 SEP 2013	3,4,5,6	Title block is revised.

SAMSUNG ENGINEERING CO., LTD.
SEOUL, KOREA

TUBULAR HEAT EXCHANGER

Sheet 3 of 6

		REV	MADE BY	CHECKED BY	APPROVED BY	DATE
Customer	YACIMIENTOS PETROLIFEROS FISCALES BOLIVIANOS	A	H.J.JOO	T.Y.KIM	S.H.KIM	Jul. 19, 2013
Plant	BOLIVIA YPFB FERTILIZER POJECT	B	J.Y.SHIN	T.Y.KIM	S.H.KIM	Sep. 04, 2013
Job No	SC2566					
Location	CARRASCO, BOLIVIA					
Service	LTS START-UP HEATER					
Item No.	175-C					

Total ONE(1) Shells, Connected in 1 Parallel, 1 Series Shells | Install Horizontal | Size 550 ID – 4,000 L

Code ASME Sec.VIII Div.1 | TEMA Type NEU (*5) | TEMA Class R | Effective Area 44.9 (*4) m²/Shell

PERFORMANCE OF ONE UNIT

Case :

Fluid Allocation			SHELL SIDE		TUBE SIDE	
			INLET	OUTLET	INLET	OUTLET
Fluid Name			REDUCTION GAS FOR LTS		SUPERHEATED MP STEAM	
Fluid Quantity, Total			28,057 X 1.05		1,850 X 1.05	
Vapor	kg/hr		28,057 X 1.05	28,057 X 1.05		
Liquid	kg/hr					
Steam	kg/hr				1,850 X 1.05	
Water	kg/hr					1,850 X 1.05
Noncondensable	kg/hr					
Operating Temperature	°C		81.37	205.0	388.5	259.43
Operating Pressure	kg/cm² [a]		5.06		47.43	
Density	kg/m³	Vap	4.5918	3.2336	16.36	784.49
		Liq				
Viscosity	cP	Vap	0.0201	0.0250	0.0239	0.1019
		Liq				
Specific Heat	kcal / kg °C	Vap	0.2565	0.2615	0.5864	1.1888
		Liq				
Thermal Conductivity	kcal / hr m °C	Vap	0.0272	0.0343	0.0498	0.5216
		Liq				
Latent Heat	kcal/kg	Vapor MW	Lat / MW 27.31	Lat / MW 27.31	Lat / MW	Lat / MW
Bubble and Dew Point	°C		Dew	Bubble	Dew	Bubble
Critical Properties	kg/cm² [a]	°C	Press.	Temp.	Press.	Temp.
Velocity	m/sec		9.7		1.0	
Pressure Drop	kg/cm²		Allow. 0.25	Calc. 0.22	Allow. 0.02	Calc. 0.01
Fouling Resistance	hr m² °C / kcal		ZERO (*2)		ZERO (*2)	
Film Coefficient	kcal / hr m² °C		225.6		1825.4	
Overall Coefficient	kcal / hr m² °C		Design 171.8	Clean 192.4	Calculated 192.4	
Heat Duty	Gcal / hr		0.90 X 1.05		MTD, corrected 122.4 °C	

CONSTRUCTION OF ONE SHELL

Design Pressure	kg/cm² [g]	Internal 11.0	External	Internal 51.6	External F.V
Design Temperature	°C	Internal 275	External	Internal 420	External 420
Min. Design Metal Temperature	°C	-12		-12	
No. of Passes		ONE(1)		TWO(2)	
Corrosion Allowance	mm	3.0		3.0	
Insulation	mm	HC		HC	

Tubes No. 98 U's / Shell, Size 19.05 mm OD, Thk . (Min.) 2.108 mm (BWG 14) , Length 4,000 mm

Shell 550 mm ID | Tube Pitch 25.4 mm , Layout angle 60 ° , Leffective 3,827 mm

Baffles Cross Baffle 2 + 1(S) + 3(I) ea / Shell, Type N.T.I.W , Cut H - 23.4 % Dia. , Spacing c/c 1,275 mm

ρv^2 Inlet Noz. 3,394 , Entrance Shell 963 , Bundle 424 kg/m-s² | Impingement 19.05Φ Rods x 3 Rows mm

Outlet Noz. 4,819 , Exit Shell 1,367 , Bundle 600 kg/m-s² | Tube to Baffle Diametral Clearance 0.8 mm

Material		
	Tube	CS
	Shell & Cover	CS
	Channel & Cover	CS
	Tube Sheet	CS
	Baffle	CS
	Expansion Joint	--

Tube to Tube Sheet Joint : Strength Weld with Light Expanding

NOZZLE	SHELL SIDE Tag	No.	NPS	Remarks	TUBE SIDE Tag	No.	NPS	Remarks
Inlet	S1	1	12	150# RF	T1	1	3	600# RF
Outlet	S2	1	12	150# RF	T2	1	2	600# RF
Intermed.								
Vent					T3	1	1	600# RF
Drain								
RATING								

MEAN METAL TEMPERATURE	Temperature, °C Shell	Tube	Pressure, kg/cm² [g] Shell side	Tube Side
Normal Operating				

Estimated Weight / Shell | Empty Weight 2,600 kg, | Bundle Weight 1,100 kg, | Full Water Weight 3,600 kg

Remarks (See sheet 4 of 6)

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Job No	SC2566						
Location	CARRASCO, BOLIVIA						
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NOTE

2. EXCHANGER IS USED FOR LTS CATALYST REDUCTION AND REHEAT AND IS NOT IN USE DURING NORMAL OPERATION. WHEN NOT IN SERVICE, BOTH SIDES MUST BE FILLED WITH NITROGEN.
3. PROVIDE A PASS PARTITION BOX ON THE TUBE SIDE INLET.
4. EXCLUDES U-BEND SURFACE.
5. BUNDLE IS NOT REMOVABLE.
6. PROVIDE ONE 1"-600# RF TUBE SIDE VENT NOZZLE (T3)
   (TO BE LOCATED AT THE TOP ON OUTLET CHANNEL FLANGE, SEE DETAIL ON SHEET 3).
7. U-BENDS TO BE IN THE VERTICAL PLANE.
8. PROVIDE ONE INTERMEDIATE SUPPORT PER BAFFLE SPACE AND ONE FULL CIRCLE SUPPORT AT THE U-BEND.
9. 10% MARGIN ON SURFACE PROVIDED.
10. SHELLSIDE HYDROGEN PARTIAL PRESSURE, kg/cm² (a): INLET = 0.5 (Max.) / OUTLET = 0.5 (Max.)
11. CHANNEL SIDE ID IS 570 mm

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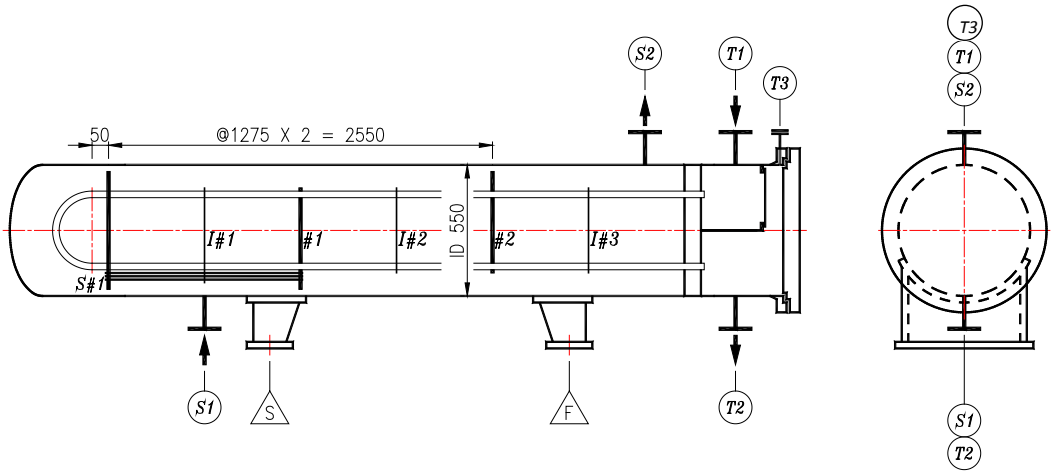
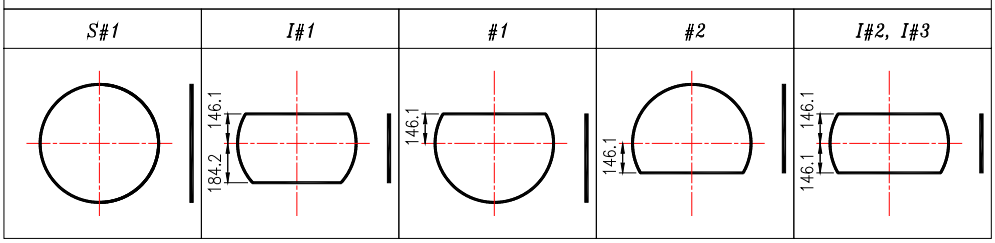
ARRANGEMENT



Detail of Baffles and Supports



NOZZLE	SHELL SIDE				TUBE SIDE				Remarks
	Tag	No.	NPS	Remarks	Tag	No.	NPS	Remarks	
Inlet	S1	1	12	150# RF	T1	1	3	600# RF	
Outlet	S2	1	12	150# RF	T2	1	2	600# RF	
Intermed.									
Vent					T3	1	1	600# RF	
Drain									
Manway									
RATING									

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TUBULAR HEAT EXCHANGER

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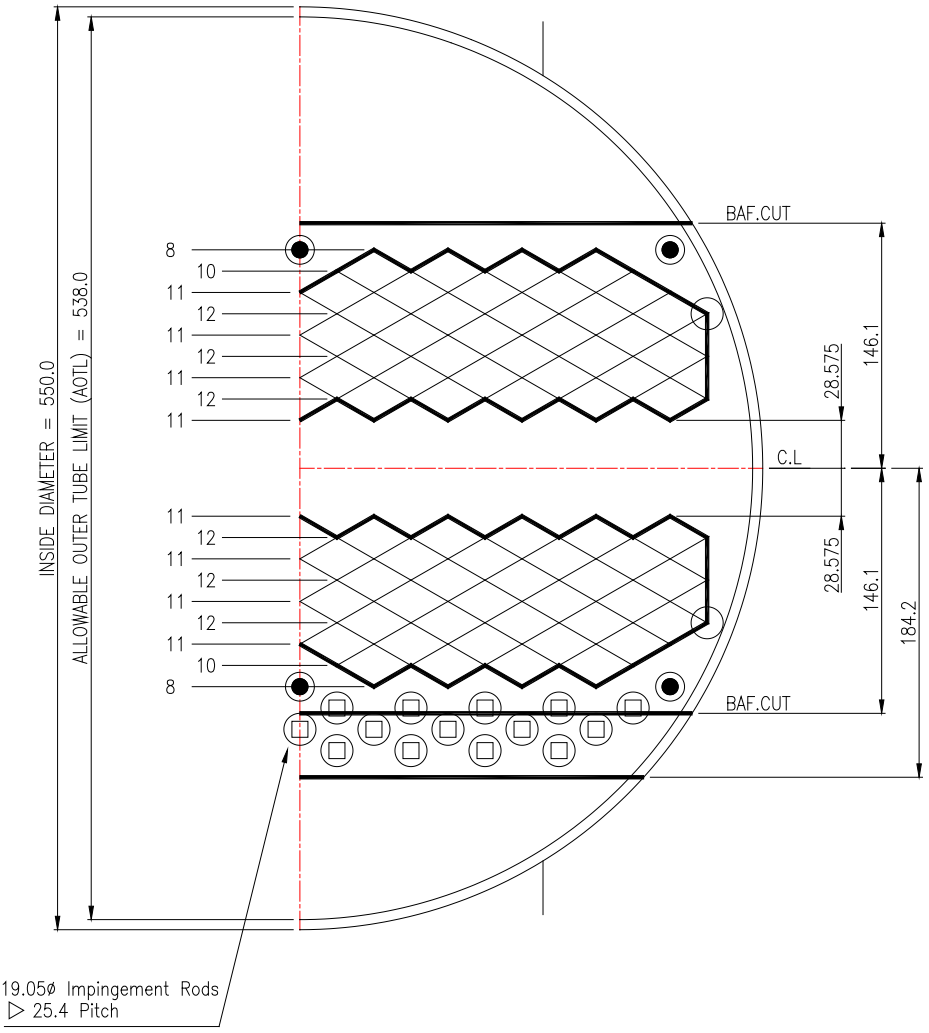
TUBE LAYOUT

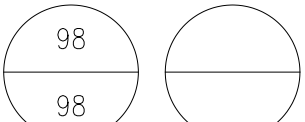
SPACER : NPS 3/8, Sch.80
TIE-ROD : 9.525ø

COORD. OF TIE-ROD
(220.0 , 130.2)
(0.0 , 130.2)
(220.0 , -130.2)
(0.0 , -130.2)



I.D.-SHELL 550.0
ALLOWABLE O.T.L 538.0
ACTUAL O.T.L 536.8

PASS PARTITION ARRANGEMENT



NUMBER OF TUBE HOLES

FRONT END CHANNEL

TOTAL 196 HOLES FOR 98 U-TUBES 19.05 OD TUBES ON 25.4 ROTATED TRIANGULAR PITCH.
2 PASSES. BAFFLE CUT NO TUBES IN WINDOW(N.T.I.W) 23.4 % DIA.