

cenovus		TAG NO. E-450 A/B/C, E-451 A/B/C, E-452 A/B/C PAGE 1 OF 1		REV
DATA SHEET: DS-E-450 A/B/C, E-451 A/B/C, E-452 A/B/C		SPECIFICATION NO. N/A		
SHELL & TUBE EXCHANGER		MANUFACTURER Calhex Industries Limited		
PROJECT Grand Rapids CPF Phase 1A (CVE14034)		MODEL # NEN 19 x 576		
LOCATION	Grand Rapids, AB	SERIAL #	04-0138-A / 04-0138-D / 04-0138-G	
SERVICE	Clean Oil / Glycol Exchanger	P&ID #	F-33500-F-00-06-SHT-10	

TEMA TYPE	NEN - HORZ	CONNECTED	3 Parallel, 3 Series	SIZE	483 x 14630	NO. UNITS	3
AREA/UNIT (eff.)(m ²)	3197.1	SHELLS/UNIT	9	AREA/SHELL (eff.)(m ²)	355.3	TOTAL SHELL(S)	9

PERFORMANCE OF ONE UNIT									
OPERATING CONDITIONS			SHELL SIDE				TUBE SIDE		
FLUID CIRCULATED			50/50 EG				Clean Sour Oil		
TOTAL FLOW	kg/h	41,134				27,201			
		INLET		OUTLET		INLET		OUTLET	
VAPOR	kg/h	0		0		0		0	
LIQUID	kg/h	55,000		55,000		27,201		27,201	
STEAM	kg/h	0		0		0		0	
DENSITY-LIQUID/VAPOUR	kg/m ³	1055.1 /		1033.6 /		879 /		946.8 /	
MOLECULAR WEIGHT-LIQUID/VAPOUR		/		/		/		/	
VISCOSITY -LIQUID	Cp	1.9727 @ °C		1.8770 @ °C		6.86577 @ °C		47.84 @ °C	
-VAPOUR	Cp	@ °C		@ °C		@ °C		@ °C	
SPECIFIC HEAT-LIQUID	kJ/kg°C	3.470 @ °C		3.525 @ °C		2.2438 @ °C		1.9019 @ °C	
- VAPOR	kJ/kg°C	@ °C		@ °C		@ °C		@ °C	
THERMAL CON.-LIQUID/VAP.	W/m °C	0.536 /		0.5474 /		0.117 /		0.1361 /	
TEMPERATURE	°C	45.0		71.1		137.8		50	
INLET PRESSURE	kPaa	580				1070			
FOULING FACTOR (TEMA)	m ² °C/W	0.00018				0.000352			
PRESS. DROP - DESIGN ALLOW.	kPa	100				100			
- CALCULATED	kPa	24.1				56.0			
FLUID VELOCITY	m/s	0.28				0.160			
NO. PASSES PER SHELL		1				1			
HEAT EXCHANGED (kW)	1,396								
TRANSFER RATE (W/m ² °C):	SERVICE 53	DIRTY 52				CLEAN 54.6			
LMTD (°C)	24.9	[CORRECTED]				[UNCORRECTED]			

CONSTRUCTION OF EACH SHELL									
			SHELL SIDE				TUBE SIDE		
DESIGN PRESSURE	kPag	1500				1379			
DESIGN TEMP. (MAX./MIN.)	°C	140 / -28.9				200 / -28.9			
TEST PRESSURE	kPag	CODE				CODE			
CORROSION ALLOWANCE	mm	1.6				3.2			
CODE REQUIREMENTS	ASME Sec. VIII Div 1	<input type="checkbox"/> CODE STAMP				TEMA CLASS R			
TUBES - O.D.	15.88 mm	NO.	489	BWG	2.12 mm	LENGTH	14630 mm	PITCH	19.4375 mm
SHELL DIAMETER	508 mm	OVERALL LENGTH							
BAFFLE - CROSS	29	TYPE	Vert-Seg	% CUT	40.0 (Area)	SPACING	483 mm	INLET	
IMPINGEMENT PROTECTION	No	SEAL TYPE							
CONNECTIONS - [SHELL]	SIZE/RATING/FACING	INLET	3" / 150# / RFWN	OUTLET	3" / 150# / RFWN				
- [TUBE]	SIZE/RATING/FACING	INLET	3" / 150# / RFWN	OUTLET	3" / 150# / RFWN				
WEIGHT: EACH SHELL	BUNDLE ONLY				EACH EXCHANGER FULL OF WATER				

PART	MATERIAL	THICKNESS	PART	MATERIAL	THICKNESS
SHELL	SA-106-B		BAFFLES - CROSS	SA-36	
SHELL COVER	N/A		BAFFLES - LONG	N/A	
CHANNELS OR BONNET	SA-106-B		TUBE SUPPORTS		
CHANNEL COVERS	SA-105N		TUBES	SA-179	
FIXED TUBE SHEETS	SA-516-70N		GASKETS	Spiral Wound T-316SS	
FLOATING TUBE SHEET	N/A		BOLTS		
FLOATING HEAD			EXT. SUPPORTS		

NOTES:

- 3 Shells in series stacked upon another with flanged interconnectors & 3 in parallel for total service
- Based on 10,000 bbl/day base case.
- This datasheet is NOT as-built, information is based on vendor databooks and drawings provided for Joslyn Phase II SAGD facility. To be verified during detailed design.

REV	DESCRIPTION	DATE	BY	CHK'D	APP'D	REV	DESCRIPTION	DATE	BY	CHK'D	APP'D
ZA	Issued for Information	10-Nov-15	JK	ST/RM	KM						