

1	Applicable To:		Manufacturer: Daekyung		Requisition No.: MR205-E-1-1		1B
2	☐ Proposal		TEMA Type: AES		Shells/Unit: 6		
3	☒ Purchase		Size (in X in): 52 X 288		Connected In: 3 Parallel 2 Series		1B
4	☐ As Built		Surface/Unit (Eff): 37077 ft ²		Surface/Shell (Eff): 6179.5 ft ²		1D
5	Orientation: Horizontal						
6	PERFORMANCE OF ONE UNIT: PFTB OPERATING SUMMER CASE						
7	Fluid Name		SHELL SIDE PFT Bitumen		TUBE SIDE Kerosene		1D
8	Fluid Quantity, Total		3,934,343		1,289,268		1D
9			IN		OUT		
10	Vapor		-		-		
11	Liquid		3,934,343		1,289,268		1D
12	Steam		-		-		
13	Water		-		-		
14	Noncondensable		-		-		
15	Molecular Weight, Vapor		-		-		
16	Molecular Weight, Noncondensable		-		-		
17	Temperature		284		340		1D
18			LIQ		VAP		
19	Density		57.78		56.66		1D
20	Viscosity		22.83		10.83		1D
21	Specific Heat		0.506		0.532		1D
22	Thermal Conductivity		0.05		0.048		1D
23	Latent Heat		-		-		
24	Inlet Pressure		308		382		1D
25	Velocity		1.8		4.9		1D
26	Pressure Drop (Allowable / Calculated)		40.0		35.9 (Note 2)		1D
27	Fouling Resistance		0.0075		0.002		
28	Heat Exchanged		114.1		73.0		1D
29	Transfer Rate (Required / Fouled / Clean)		43.9		44.2		1D
30	nV ² - lb/ft ² -s ²		Inlet Nozzle 1305		Bundle Entrance		1D
31	CONSTRUCTION OF ONE SHELL						
32			SHELL SIDE		TUBE SIDE		
33	Design Pressure / Test Pressure		425 (Note 10) / Per Code		500.0 / Per Code		1C
34	External Design Pressure		15 @ 400°F		15 @ 400°F		
35	Design Temperature (Max / Min)		650 (Note 10) / -20		650.0 / -20		1C
36	No. of Passes per Shell		1		8		1B
37	Corrosion Allowance		0.125 (Note 4)		0.125 (Note 4)		
38	Insulation Thickness		2.5"		3"		
39			NO.		SIZE		
40	Inlet		1		16 NPS		
41	Outlet		1		16 NPS		
42	Connections, Size, Rating & Facing		Note 3		2		1D
43	Temp. Conn. w/blind		Note 3		2		1D
44	Press. Conn. w/blind		-		-		1B
45	Vents		-		-		1B
46	TUBES		SA 268 TP405		SHELL		
47	No.		1008		ID: 52		
48	OD		1		OD: (Note 3)		1C
49	Thk. (ave/min)		0.065 MIN (Note 4)		Cover: SA516-70N		1D
50	Length		24		Body Flanges: SA266-2N		1D
51	Pitch		1.25		Studs/Nuts (External): SA193 B7/SA194 2H		
52	Layout		45°		Gaskets: Kamprofile B7A (SA240-316L w/Graphite)		1D
53	Type		Bare / Seamless		Expansion Joint: N/A		
54	CROSS BAFFLES		410S		Nozzle Necks: SA106 Gr B		
55	Type/Orientation		Seg/Horizontal		Nozzle Flanges: SA105N		1B
56	%Cut diameter		25		Nozzle Reinforcement: SA516-70N		
57	No. Crosspasses		13		Supports: SA516-60N		1C
58	Spacing, c/c		18.34		FLOATING HEAD		1D
59	Inlet		32.67		Flange: SA266-2N		1D
60	LONG. BAFFLE		N/A		Backing Ring: SA266-2N		1C
61	Seal Type		-		Studs/Nuts (Internal): SA193 B7/SA194 2H		
62	SUPPORT		410S		Gasket: Kamprofile B7A (SA240-316L w/Graphite)		1D
63	Tubes		-		WEIGHT/SHELL-Empty		1D
64	Floating Head		Full		Filled with Water		1D
65	U-bends		-		Bundle		1C
66	CODE STAMP		Yes		CODE REQUIREMENTS		
67	NOTE1 205E-100B is part of a 3 parallel 2 series arrangement.						
68	Summer Case: DESIGN CASE						
69	Datasheet is updated for PFTB Operating Case. PFTB Operating Case conditions have been reviewed for suitability against previously submitted						
70	documentation for the equipment without consultation with the manufacturer. Actual performance may vary.						
1D	2012-10-30	IFP (As Fabricated) (Updated for PFTB Operating Case)	YGR	AFK	ORS	N/A	
1C	2008-05-14	Issued for Purchase	PF	JN	PS	MI	
1B	2007-09-07	Issued for Purchase	PF	NM	PS	FO	
1A	Dec. 18 2006	Issued for Purchase	PF	ZQ	MI	EH	
NO.	DATE	REVISION	BY	CHK.	APPR.	APPR.	
PROJECT: VOYAGEUR UPGRADE (VU)			JOB NO.: 1077 Project# 03-00005-PU-05-00				
CLIENT NAME: SUNCOR ENERGY INC.			REQUISITION NO.: MR205-E-1-1				
PLANT LOCATION: SUNCOR FEE LOT #2			DOCUMENT NO.: DS205-A-E100B-1				
SERVICE: KERO PRODUCT / FEED EXCHANGER			REV 1D				
EQUIP NO.: 205E-100B							

1	Applicable To:	Manufacturer: Daekyung	Requisition No.: MR205-E-1-1	1B
2	☐ Proposal	TEMA Type: AES	Shells/Unit: 8	
3	☒ Purchase	Size (in X in): 52 X 288	Connected In: 3 Parallel 2 Series	1B
4	☐ As Built	Surface/Unit (Eff): 37077 ft ² Surface/Shell (Eff): 6179.5 ft ² Orientation: Horizontal		1D
5	PERFORMANCE OF ONE UNIT: PFTB OPERATING WINTER CASE			1D
6				
7	Fluid Name	SHELL SIDE		TUBE SIDE
8	Fluid Quantity, Total	PFT Bitumen		Kerosene
9		3,934,343		1,085,165
10	Vapor	IN	OUT	IN
11	Liquid	3,934,343	3,934,343	1,085,165
12	Steam	-	-	-
13	Water	-	-	-
14	Noncondensable	-	-	-
15	Molecular Weight, Vapor	-	-	-
16	Molecular Weight, Noncondensable	-	-	-
17	Temperature	284	330	467
18		LIQ	VAP	LIQ
19	Density	57.78	56.85	45.99
20	Viscosity	22.83	12.28	0.262
21	Specific Heat	0.508	0.527	0.599
22	Thermal Conductivity	0.05	0.048	0.047
23	Latent Heat	-	-	-
24	Inlet Pressure	308		382
25	Velocity	1.8		4.1
26	Pressure Drop (Allowable / Calculated)	40.0	36.1 (Note 2)	40
27	Fouling Resistance	0.0075		0.002
28	Heat Exchanged	92.0	MTD (Corrected) (Weighted)	70.3
29	Transfer Rate (Required / Fouled / Clean)	36.9	42.9	Blu/hr-ft ² -°F
30	pV ² - lb/ft-s ² : Inlet Nozzle	Outlet Nozzle	Bundle Entrance	Bundle Exit
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68	Winter Case			
69		NOTE! 205E-100B is part of a 3 parallel 2 series		
70		arrangement.		
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75	--- Continued ---			
PROJECT: VOYAGEUR UPGRADE (VU)		JOB NO.: 1077 Project#: 03-00005-PU-05-00		
CLIENT NAME: SUNCOR ENERGY INC.		REQUISITION NO.: MR205-E-1-1		
PLANT LOCATION: SUNCOR FEE LOT #2		DOCUMENT NO.: DS205-A-E100B-1		
SERVICE: KERO PRODUCT / FEED EXCHANGER		REV		
EQUIP NO.: 205E-100B		1D		

1	Applicable To:	Manufacturer: Daekyung	Requisition No.: MR205-E-1-1	1B
2	☐ Proposal	TEMA Type: AES	Shells/Unit: 6	
3	☒ Purchase	Size (In X In): 52 X 288	Connected In: 3 Parallel 2 Series	1B
4	☐ As Built	Surface/Unit (Eff): 37077 ft ² Surface/Shell (Eff): 6179.5 ft ²	Orientation: Horizontal	1D
5	PERFORMANCE OF ONE UNIT: SUMMER (DESIGN) CASE			
6	TUBE SIDE			
7	Fluid Name	Firebag Bitumen (Note 1)	Kerosene (Note 1)	1D
8	Fluid Quantity, Total	3,596,870	1,350,696	1B
9		IN OUT	IN OUT	
10	Vapor	-	-	-
11	Liquid	3,596,870	3,596,870	1,350,696
12	Steam	-	-	-
13	Water	-	-	-
14	Noncondensable	-	-	-
15	Molecular Weight, Vapor	-	-	-
16	Molecular Weight, Noncondensable	-	-	-
17	Temperature	284	337	449
18		LIQ VAP	LIQ VAP	LIQ VAP
19	Density	59.22	58.16	45.8
20	Viscosity	44.6	20	0.277
21	Specific Heat	0.499	0.523	0.607
22	Thermal Conductivity	0.05	0.048	0.05
23	Latent Heat	-	-	-
24	Inlet Pressure	323	358	358
25	Velocity	2.4	5	5
26	Pressure Drop (Allowable / Calculated)	40.0 / 35 Note 2	40 / 25	40 / 25
27	Fouling Resistance	0.0075	0.002	0.002
28	Heat Exchanged	96.8 (Note 1)	MTD (Corrected) (Weighted)	67.1
29	Transfer Rate (Required / Fouled / Clean)	38.9 / 40.2	66.3	66.3
30	pV ² - lb/ft ² Inlet Nozzle 1305 Outlet Nozzle	Bundle Entrance 613	Bundle Exit	613
31	CONSTRUCTION OF ONE SHELL			
32	TUBE SIDE			
33	Design Pressure / Test Pressure	425 (Note 10) / Per Code	500.0 / Per Code	1C
34	External Design Pressure	15 @ 400°F	15 @ 400°F	1C
35	Design Temperature (Max / Min)	650 (Note 10) / -20	650.0 / -20	1B
36	No. of Passes per Shell	1	8	1B
37	Corrosion Allowance	0.125 (Note 4)	0.125 (Note 4)	1B
38	Insulation Thickness	2.5"	3"	1B
39		NO. SIZE RATING FACING	NO. SIZE RATING FACING	
40	Inlet	1 16 NPS 300# RFWN	1 10 NPS 300# RFWN	
41	Outlet	1 16 NPS 300# RFWN	1 10 NPS 300# RFWN	
42	Temp. Conn. w/blind	Note 3 2 300# RFLWN	Note 3 2 300# RFLWN	1D
43	Press. Conn. w/blind	Note 3 2 300# RFLWN	Note 3 2 300# RFLWN	1D
44	Vents	-	-	1B
45	Drains	-	-	1B
46	TUBES	SA 268 TP405	SHELL	SA516-70N
47	No.:	1008	ID:	52
48	OD:	1	OD:	(Note 3)
49	Thk. (ave/min)	0.085 MIN (Note 4)	Cover:	SA516-70N
50	Length	24	Body Flanges:	SA266-2N
51	Pitch	1.25	Studs/Nuts (External):	SA193 B7/SA194 2H
52	Layout	45°	Gaskets:	Kammprofile B7A (SA240-316L w/Graphite)
53	Type	Bar / Seamless	Expansion Joint:	N/A
54	CROSS BAFFLES	410S	Nozzle Necks:	SA106 Gr B
55	Type/Orientation	Seg/Horizontal	Nozzle Flanges:	SA105N
56	%Cut diameter	25	Nozzle Reinforcement:	SA516-70N
57	No. Crosspasses:	13	Supports:	SA516-60N
58	Spacing, c/c:	18.34	FLOATING HEAD	SA266-2N
59	Inlet:	32.67	Flange:	SA266-2N
60	LONG. BAFFLE	N/A	Backing Ring:	SA266-2N
61	Seal Type:	-	Studs/Nuts (Internal):	SA193 B7/SA194 2H
62	SUPPORT	410S	Gasket:	Kammprofile B7A (SA240-316L w/Graphite)
63	Tubes:	-	WEIGHT/SHELL - Empty	68,800
64	Floating Head:	Full	Filled with Water:	95,100
65	U-bends:	-	Bundle:	28,000
66	CODE STAMP	Yes	CODE REQUIREMENTS	ASME Sect VIII Div 1
67	NOTE! 205E-100B is part of a 3 parallel 2 series arrangement.			
68	Summer Case: DESIGN CASE			
69	--- continued ---			
SHELL AND TUBE HEAT EXCHANGER SPECIFICATION SHEET				
PROJECT: VOYAGEUR UPGRADE (VU)		JOB NO.: 1077 Project# 03-00005-PU-05-00		
CLIENT NAME: SUNCOR ENERGY INC.		REQUISITION NO.: MR205-E-1-1		
PLANT LOCATION: SUNCOR FEE LOT #2		DOCUMENT NO.: DS205-A-E100B-1		
SERVICE: KERO PRODUCT / FEED EXCHANGER		REV 1D		
EQUIP NO.: 205E-100B				

FORM E309-E (2004/05)

1	Applicable To:	Manufacturer: Daekyung	Requisition No.: MR205-E-1-1	1B
2	☐ Proposal	TEMA Type: AES	Shells/Unit: 8	
3	☒ Purchase	Size (In X In): 52 X 288	Connected In: 3 Parallel 2 Series	1B
4	☐ As Built	Surface/Unit (Eff): 37077 ft ² Surface/Shell (Eff): 6179.5 ft ²	Orientation: Horizontal	1D
5	PERFORMANCE OF ONE UNIT: WINTER CASE			
6				
7	Fluid Name	SHELL SIDE		TUBE SIDE
8	Fluid Quantity, Total	Firebag Bitumen (Note 1)		Kerosene (Note 1)
9		3,598,870		1,151,852
10		IN	OUT	IN OUT
11	Vapor	-	-	- -
12	Liquid	3,598,870	3,598,870	1,151,852 1,151,852
13	Steam	-	-	- -
14	Water	-	-	- -
15	Noncondensable	-	-	- -
16	Molecular Weight, Vapor	-	-	- -
17	Molecular Weight, Noncondensable	-	-	- -
18	Temperature	284 328		436 314
19	Density	LIQ VAP	LIQ VAP	LIQ VAP LIQ VAP
20	Viscosity	59.22 -	58.28 -	45.55 - 48.67 -
21	Specific Heat	44.6 -	22.4 -	0.273 - 0.442 -
22	Thermal Conductivity	0.499 -	0.519 -	0.604 - 0.547 -
23	Latent Heat	0.05 -	0.048 -	0.05 - 0.057 -
24	Inlet Pressure	323		358
25	Velocity	2.4		4.3
26	Pressure Drop (Allowable / Calculated)	40.0 / 36 Note 2		40 / 19
27	Fouling Resistance	0.0075		0.002
28	Heat Exchanged	80.52 (Note 1) MTD (Corrected) (Weighted)		59.8 °F
29	Transfer Rate (Required / Fouled / Clean)	35.8 / 39.2		63.6 Btu/hr-ft ² -°F
30	pV ² - lb/ft-s ² :	Inlet Nozzle	Outlet Nozzle	Bundle Entrance Bundle Exit
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68	Winter Case	NOTE1 205E-100B is part of a 3 parallel 2 series arrangement.		REV
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PROJECT: VOYAGEUR UPGRADER (VU)
 CLIENT NAME: SUNCOR ENERGY INC.
 PLANT LOCATION: SUNCOR FEE LOT #2
 SERVICE: KERO PRODUCT / FEED EXCHANGER
 EQUIP NO.: 205E-100B

SHELL AND TUBE
 HEAT EXCHANGER
 SPECIFICATION SHEET
 JOB NO.: 1077 Project#: 03-00005-PU-05-00
 REQUISITION NO.: MR205-E-1-1
 DOCUMENT NO.: DS205-A-E100B-1
 REV 1D

FORM E3009-E (2004/05)

NOTES				
1	1) Flowrates and duty include 10% design margin			
2	2) Thermal performance calculated with TEMA clearances on "A" and "E" streams. Seller to confirm shell side pressure drop calculated with			
3	A & E streams blocked (as shown on data sheets).			
4	3)	Refer to AS BUILT GA	Bantrel MR205-E-1AC-00009	1D
5		Drawings for final	Suncor VP205-E-67-1	1D
6		Information:	Daekyung DK2007-090-001	1D
7	4) Total corrosion allowance of 0.03" required on tubes; 0.015" applied to outer and inner surfaces. Seller to confirm tube gage. Seller to add			
8	1 gage thickness for HTRI pressure drop calculations on Min Wall tubes.			
9	1/16" corrosion allowance on tubesheets (shellside). Total of 0.25" corrosion allowance on pass partition plates.			1C
10	5) Shell Side: 410S 16" 300# Spacer Ring; one per stacked assembly			1B
11	Tube Side: 410S 10" 300# Spectacle Blind; one per stacked assembly			1B
12	6) Deleted			1D
13	7) Units are Stacked and Aligned			
14	8) Deleted			1D
15	9) Deleted			1D
16	10) Tube External Design Pressure/Temperature: 425 psig/500°F			1C
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46				REV
47	NOTE! 205E-100B is part of a 3 parallel 2 series			
48	arrangement.			
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	PROJECT:	VOYAGEUR UPGRADE (VU)	JOB NO.: 1077	Project# 03-00005-PU-05-00
	CLIENT NAME:	SUNCOR ENERGY INC.	REQUISITION NO.:	MR205-E-1-1
	PLANT LOCATION:	SUNCOR FEE LOT #2	DOCUMENT NO.:	DS205-A-E100B-1
	SERVICE:	KERO PRODUCT / FEED EXCHANGER	REV	1D
	EQUIP NO.:	205E-100B		

**SHELL AND TUBE
HEAT EXCHANGER
SPECIFICATION SHEET**