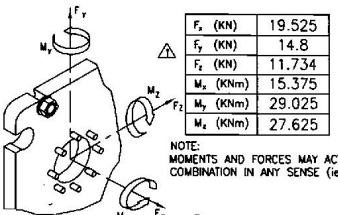


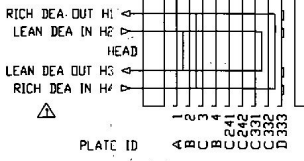
MATERIALS OF CONSTRUCTION		
ITEM NO.	DESCRIPTION	MATERIAL
1	HEAD	SA516 GR70
2	FOLLOWER	SA516 GR70
3	END SUPPORT	A36
4	TOP BAR	A36 W/304 SS STRIP
5	BOTTOM BAR	A36 W/304 SS COVER
6	W48 DIA. TIE BAR	SA193 GRB7
7	TIE BAR HEX NUTS	SA194 GR2H ZINC PLATED
8	HEAT TRANSFER PLATES	SA240 GR316
9	STUDS	SA193 GRB7 ZINC PLATED
10	LINERS	316L STAINLESS STEEL
11	PIPE	SA312 GRTP316L
12	RINGS	SA240 TYPE 316L
13	STUB ENDS	SA316 GRTP316L
14	FLANGES	SA105
15	GROUNDING LUGS	A36



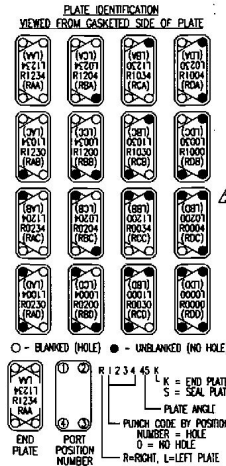
APV
FACTORY SERVICE
FOR PARTS AND SERVICE
CALL OUR CUSTOMER
SERVICE DEPARTMENT
1-888-278-4321

F _x (KN)	19.525
F _y (KN)	14.8
F _z (KN)	11.734
M _x (KNm)	15.375
M _y (KNm)	29.4
M _z (KNm)	27.625

NOTE: MOMENTS AND FORCES MAY ACT IN ANY COMBINATION IN ANY SENSE (ie. +/-).



FOLLOWER



NOTES

- THE INSTALLATION, OPERATION AND MAINTENANCE OF THIS HEAT EXCHANGER SHALL BE IN ACCORDANCE WITH THE APV PARAFLOW PLATE HEAT EXCHANGER DESTRUCTION MANUAL.
- THIS MODEL HEAT EXCHANGER IS TIGHTENED USING A WRENCH ON THE TIE BAR HEX NUTS AT THE HEAD (FIXED COVER) END ONLY. CLEAN AND LUBRICATE THE THREADS BEFORE OPENING OR CLOSING USING A LUBRICANT COMPATIBLE WITH CARBON STEEL. APV RECOMMENDS NEVER-SEIZ, REGULAR GRADE. DO NOT USE COMMON GREASE.
- THE CUSTOMER IS RESPONSIBLE FOR PROVIDING:
 - ANCHOR BOLTS PER ASTM A36 MINIMUM WITH A RECOMMENDED DIAMETER OF 1 3/16"
 - PROTECTION AGAINST START UP OR OPERATING PRESSURES EXCEEDING THE MAXIMUM ALLOWABLE WORKING PRESSURE.
 - PIPING TO THE FOLLOWER OR CONNECTOR GRIDS THAT ALLOWS FOR FREE MOVEMENT WHEN THE UNIT IS OPENED FOR SERVICE AND PROVIDES FLEXIBILITY FOR THE VARIATION OF THE COMPRESSED FLANGE DIMENSIONS.
- NOZZLES ARE PROVIDED WITH A SMOOTH RAISED FACE FINISH.
- LINED STUBBED PORTS ARE PROVIDED WITH A SMOOTH RAISED FACE FINISH.
- BOLT HOLES STRADDLE CENTERLINES SHOWN.
- DIMENSIONS ARE SHOWN IN INCHES. DIMENSIONS IN BRACKETS [] ARE IN MILLIMETERS.
- STANDARD TOLERANCES:
FRAME AND FOUNDATION BOLT LOCATIONS: ±1/4 INCH [±6mm]
- LONG TERM OPERATION AT THIS TEMPERATURE IS NOT RECOMMENDED IT WILL SIGNIFICANTLY REDUCE LIFE OF GASKETS.
- THE TIE BARS AT THE TOP & BOTTOM OF THE SLAB SHOULD BE RELAXED 15MM [1/2] TO THE CENTER TIE BARS.



UNPORTED FOLLOWER

PROJ NO: 103933
 CONTROL NO: 383-120
 DATE: 07/11/2006
 DRAWN BY: [Signature]
 CHECKED BY: [Signature]
 APPROVED BY: [Signature]

DESIGN SPECIFICATIONS

DESIGN CODES	ASME SECTION VIII DIV 1, 2004 EDITION API 682 SOUND ENGINEERING PRACTICE
Manufactured in accordance with Sound Engineering Practice per Article 3 paragraph 3 of Pressure Equipment Directive 97/23/EC	
MAX. ALLOWABLE WORKING PRESSURE	248 PSIG. (1710 kPa) FV
MINIMUM DESIGN METAL TEMPERATURE	-20 °F. @ 248 PSIG. (-29°C @ 1710 kPa)
HYDROTEST PRESSURE	322 PSIG. (2223 kPa) FV
MINIMUM OPERATING TEMPERATURE	-20°F (29°C)
MAXIMUM OPERATING TEMPERATURE	347°F (175°C) (SEE NOTE 8)
HEAT TRANSFER AREA	4774.2 SQ.FT. (443.5 SQ.M.)
FRAME SIZE	NO. 30
FRAME CAPACITY	455 PLATES MAX.
DRY WEIGHT	15251 LBS. (6918 KG)
FLOODED (OPERATING) WEIGHT	18509 LBS. (8396 KG)
TOTAL LIQUID VOLUME	391.2 GALS. (1480.7 LITERS)
FINISH	APV STANDARD PAINT 3196
ACCESSORIES	304 SS SHROUD GROUNDING LUGS

OPERATING CONDITIONS

LIQUID	FLOW RATE	TEMP. °C	ΔP (kPa)
LEAN DEA	216.66 KG/S	128.4	76.6
RICH DEA	226.21 KG/S	53.3	104.4

Plates (Total: 333)	Description
A 1 6048K4XAX6AZZXA	P&G ASY B1345 (60) END 316 0.6 PCL EPDM (1 GREY)
B 120 6042F4XAX6AZZXA	P&G ASY B1345 (29) FLOW 316 0.6 PCL EPDM (1 GREY)
C 211 6046F4XAX6AZZXA	P&G ASY B1345 (60) FLOW 316 0.6 PCL EPDM (1 GREY)
D 1 6046Y0XAX6AZZXA	P&G ASY B1345 (60) SEAL 316 0.6 PCL EPDM (1 GREY)

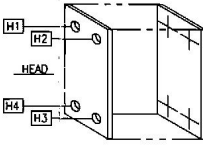
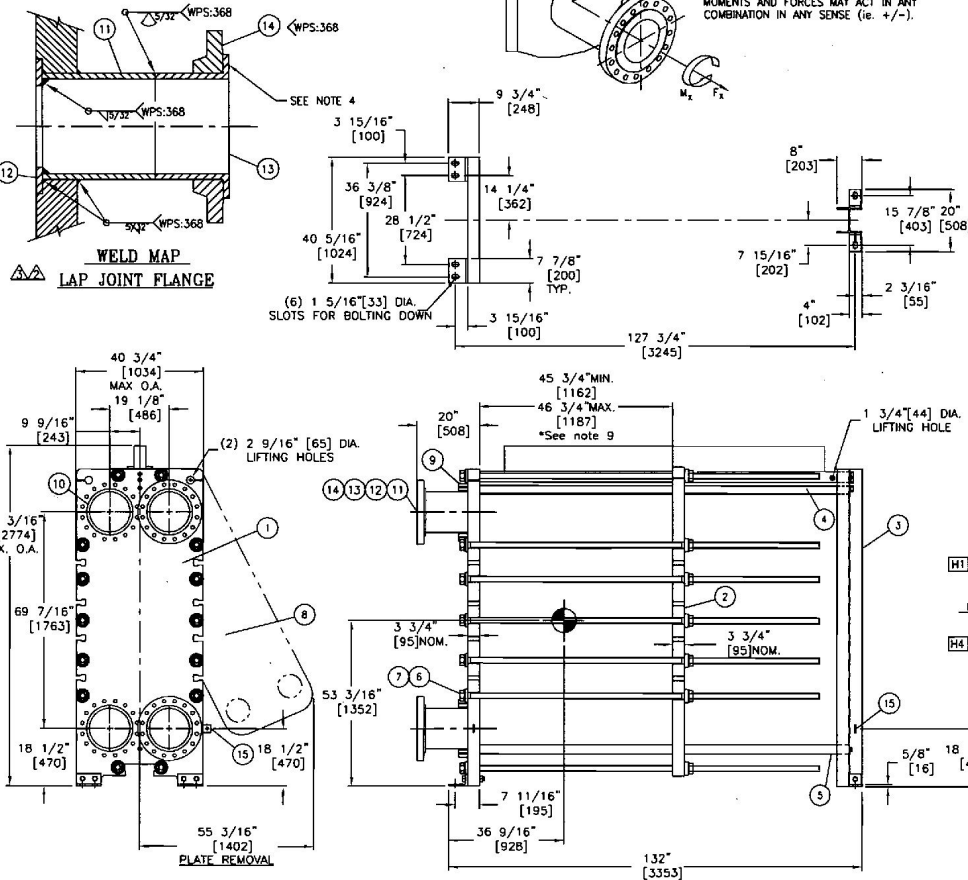
Qty Part Number	Description
1 B134XK20XXX30B	B134 M-20c (C:SS T:CS) Size 30, Max 455 Plates
1 GB5065BGC2WXXXG2	Head
1 GB5065B7AXAXXXX	Follower

Qty Part Number	Position	Description
2 120HCPEP95A	H1,H4	NPS 12 Sludded SS 316L ANSI B16.5 CL300
2 GB506700	H2,H3	NPS 12 LWF SS 316L ANSI B16.5 CL300

Qty Part Number	Accessory Description
1 500700	SS Shroud, FFS
1 ASME U STAMP	ASME INSPECTION AND U STAMP AND MAT'L BOARD No.
1 501255	GROUNDING LUG HEAD
1 501252	GROUNDING LUG END SUPPORT

invensys APV Products
 1200 W. Ash Street
 Goldsboro, NC 27530
 Tel: (919) 735-4570/Fax: (919) 581-1134

Description:		B134 MGS-20	
PLATE HEAT EXCHANGER		N.T.S.	
Checked: Date:	Supervised: Date:	Scale:	Sheet: 1 OF 1
Approved: Date:	Drawn: Date:	Rev: 8-8-05	Drawing No.: 0500603
REV. BY / DATE	CHK. BY / DATE	DESCRIPTION AND LOCATION	CAL:EB 0500603



REV.	BY / DATE	CHK. BY / DATE	DESCRIPTION AND LOCATION
05	DWR 7-11-06		CONNECTED FLANGE MAT'L
04	RVS 1-23-06		ADDED COIL AS BUILT
03	RVS 1-23-06		INCORPORATED COMMENTS - AISA
02	RVS 18-12-05		INCORPORATED CUSTOMER/AISA COMMENTS/REQUIREMENTS
01	RVS 8-28-05	CALL 8-28-05	APPROVED - INCORPORATED COMMENTS

				Plate and Frame Exchanger			DATA SHEET NO.		REV.
							52-E-3-DS-1		1
NO.	BY	DATE	REVISION		SHEET	OF	DATE		
0	GQW	31-Jul-05	ISSUED FOR PURCHASE		1	2	17-Apr-06		
1	GQW	17-Apr-06	AS BUILT		BY	CHK'D	PROC. APPR.		
					GQW				
					P.O.	383-1296-0032			
					REQ.	HT-1300-005			

TAG NO:	52-E-3A/B/C		Spec No:					
Asset No:			P&ID:	52-PID-PR-0007				
Service Description:	Lean/ Rich Exchanger			Manufacturer:	APV			
User 1:			User 3:					
User 2:			User 4:					
				Model:	B134			

General	Job No.:	103933		Process Unit:	52 Amine Unit				
	Item No.:	52-E-3A/B/C		Fabricator:	APV				
	Location:	Fort McMurray		No. of Units	Two (1 operating & 1 spare) (Note 9.)				
	Size	M-20 Ser. 2/3	mm	Type	No. Connected in	1	Parallel	1	Series
	Surface area/Unit (Eff.)	443.5		m ²	Shells/Unit	1	Surface area/Shell (Eff.)	443.5	m ²

	Fluid Allocation:		HOT SIDE		COLD SIDE	
	Fluid Name:		Lean DEA		Rich DEA	
Fluid Quantity, Total:			kg/hr		779,963	
			IN	OUT	IN	OUT
Fluid Quantity, Vapor (In/Out):			kg/hr			
Fluid Quantity, Liquid:			kg/hr		779,963	
Fluid Quantity, Steam:			kg/hr			
Fluid Quantity, Water:			kg/hr		814,366	
Fluid Quantity, Noncondensable (MW):			kg/hr		814,366	
Temperature (In/Out):			°C		128.4	
					76.6	
					53.3	
					104.4	
Density (Vapor/Liquid):			kg/m ³		958	
					999	
					1031.9	
					991	
Viscosity (Vapor/Liquid):			mPa-s		0.352	
					0.800	
					1.194	
					0.457	
Molecular Weight, Vapor:						
Specific Heat (Vapor/Liquid):			kJ/(kg °C)		3.904	
					3.791	
					3.689	
					3.783	
Thermal Conductivity (Vapor/Liquid):			W/(m°C)		0.485	
					0.475	
					0.441	
					0.453	
Dew Point			°C			
Bubble Point			°C			
Critical Pressure			kPa(g)			
Critical Temperature			°C			
Latent Heat:			kJ/kg@°C			
Surface Tension			Dyne/cm		44.87	
					53.48	
					58.00	
					47.47	
Inlet Pressure:			kPa(g)		250	
					793	
Velocity:			m/s		3.1 (port), 0.49 (passages)	
					3.1 (Port), 0.50 (passages)	
Pressure Drop (Allowable/Calculated):			kPa		35	
					35	
					70	
					37	
Overall Fouling Allowance:			% Excess Area		10	
					10	
Wall Shear Stress			kPa		29	
					30	
Heat Exchanged per Unit:	43,194,440	Watts	LMTD (Corrected) (Weighted):		23.63	°C
Transfer Rate (Service/Clean):	4,121		4,535		W/(m ² °C)	

Notes	Remarks: * Information to be supplied by Manufacturer
	1. Design case: Napthenic Solvent design case flow, composition and conditions.
	2. Nozzles shall be designed for the loads shown in Attachment 1, Nozzle Loads for Plate & Frame Heat Exchangers, Rev. 0.
	3. Insulation - 50 mm Hot (by others).
	4. All materials and components in contact with process fluid to meet 00-STD-ME-0034 requirement, Category 1.
	5. CRN/ ABSA registration required.
	6. Structural design shall be per 00-STD-ST-0001, Rev. 4. Saddles shall be designed for -45 °C minimum ambient temperature.
	7. Provide loads (weight and forces) at the bottoms of the base plates.
	8. Nozzles (if provided) shall have sufficient projection to permit removal of flange bolts without disturbing insulation.
	9. Two units are required, the above data is for one unit. Units 52-E-3A/B will be installed initially in Phase 1 (one operating and one spare). 52-E-3C will be installed in the future in Phase 2.
	10. The exchanger design shall prevent process fluids from contacting carbon steel surfaces.
11. Structural supports shall have 1.6 mm corrosion allowance.	

TAG NO.	52-E-3A/B/C	Plate and Frame Exchanger	DATA SHEET NO.	REV.	SHT	OF
			52-E-3-DS-1	1	2	2

		HOT SIDE				COLD SIDE				
Design Press / Test Press.:	kPa(g)	1,710 & FV	/	per code	1,710 & FV	/	per code			
Design / MDMT Temperature:	°C	175	/	-29	175	/	-29			
Corrosion Allowance (welded Carbon Steel only):	mm	(Note 10)		(Note 10)						
No. of Passes / No. Channels per pass:		1	/	166	1	/	166			
Passages Per Pass:										
Number of Plates per Frame:	333	455 (Max.)			Plate Thickness	0.6	mm			
Connections Size, Railing & Type:	In:	12" 300# RF			12" 300# RF			Type : Studded Port (Hot), Flange (Cold)		
	Out:	12" 300# RF			12" 300# RF			Type : Studded Port (Hot), Flange (Cold)		
Intermed.										
Weights- Plates:	Δ 2,564	kg	Frame	Δ 4,354	kg	Total Flooded:	Δ 8,396	kg	Empty: Δ 6,918	kg
Frame Material	SA-516-70N				Tie Bars Material	SA-193 B7				
Plate Material	SA-240-316				Shroud Material	304 SS				
Gasket Material	EPDM (Peroxide cured)				Gasket Type	Clipon				
Nozzle Material	N/A				Nozzle Lining Material	316 SS				
Bolts/Nuts Material:	Internal	SA-193-B7M / SA-194-2HM			External	SA-193-B7 / SA-194-2H				
Pass No.		1		2		3		4		
No. of Channels per Fluid		166								
No. of Plates		333								
Plate Model		Dura Flow								
Chevron Angle		Δ 29, 60								
Surface Area Enhancement Factor		N/A								
Plate Materials		SA-240-316								
Plate Thickness	mm	0.6								
Plate Spacing	mm	3								
Area per Plate	m2	1.34 (Effective)								
Port Diameter	in	12"								
Vertical Distance between Port Centres	mm	1763								
Horizontal Distance between Port Centres	mm	Δ 486								
Frame Size: L x W x H	Δ 3353 x 1034 x 2774	mm	Plate Size	Δ 2134 x 852	mm					
Code Requirements	Δ ASME Sect. VIII, Div. 1	Stamp	YES	API 662	YES	CRN / ABSA Registration	YES			
Remarks:										

Construction of One Unit

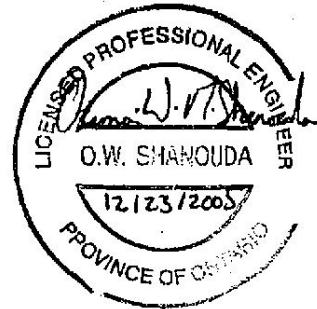
User 5		User 9	
User 6		User 10	
User 7		User 11	
User 8		User 12	

Notes	



Duty:	Lean/Rich Exchanger	REV 02
		Item No: 52-E-3A/B/C
PHE Type:	B134	Engineer: EJW
Quotation No:	CSEW189WS	Date: 2005.May.09

Process Data	Hot	Cold
Fluid	Lean DEA	Rich DEA
Mass Flow Rate	Kg/s 216.66	226.21
Volume Flow Rate	l/s 228.15	219.22
Inlet Temperature	°C 128.4	53.3
Outlet Temperature, Duty	°C 76.6	104.4
Pressure Drop, calculated	kPa 35	37
Heat Exchange Rate, Duty	kW 43194.44	
Design (Duty) HTC	W/°C m² 4120.5	
Clean HTC	W/°C m² 4535.3	
% Difference in HTC	10.1%	
Fluid Volume in PHE	790.7	790.7

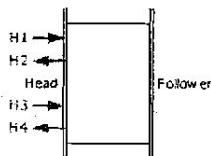


Fluid Properties	Hot	Cold
Density	kg/(m³) 978.5	1011.5
Specific Heat Capacity	kJ/kg °C 3.848	3.736
Thermal Conductivity	W/m °C 0.480	0.447
Inlet Viscosity	mPa s 0.35	1.19
Outlet Viscosity	mPa s 0.80	0.46

Plate Heat Exchanger Specifications			
PHE Type	B134		
Frame Type / Size	M-20 ser2/3. Painted Floor Mount Tie:CS, Carry:SS, max. 455 plates		
Dimensions (H*W*L)	mm	2774x1035x3364	
Total Number of Plates		333	
Total Active Area	m²	443.54	
Hot Side Flow Arrangement		1*166	
Cold Side Flow Arrangement		1*166	
Plate Material	0,6 mm SS 316 SA240		
Gasket Material	EPDM p.c. Paraclip		
Hot Side Connection - Inlet	H1	NPS 12 Studded SS 316L Class 300 ANSI B16.5	
Hot Side Connection - Outlet	H4	NPS 12 Studded SS 316L Class 300 ANSI B16.5	
Cold Side Connection - Inlet	H3	NPS 12 Flange (RFWN) SS 316L Class 300 (Mates With) ANSI B16.5	
Cold Side Connection - Outlet	H2	NPS 12 Flange (RFWN) SS 316L Class 300 (Mates With) ANSI B16.5	
Design Code	A.S.M.E. VIII Div. 1		
Certificate			
Design Temperature	°C	Max. 175	Min. -29
Design Pressure	kPa	1710	
Test Pressure	kPa	Balanced 2223	Differential 2223
Mass	kg	Flooded 8491	Empty 6916
Approx. Shipping Mass & Volume		Std Packing	kg m³

Accessories
AutoCAD Drawing w/ Frame Dimensions (1); ASME Inspection and U Stamp (1); Standard Paint APV Blue (APV3196) (1); Spray Deflector (1)

Connection Placement



Remarks

CRN & API662. Shear stress, hot/cold, is 29/30 Pa. Plate gap is 3.0 mm.