

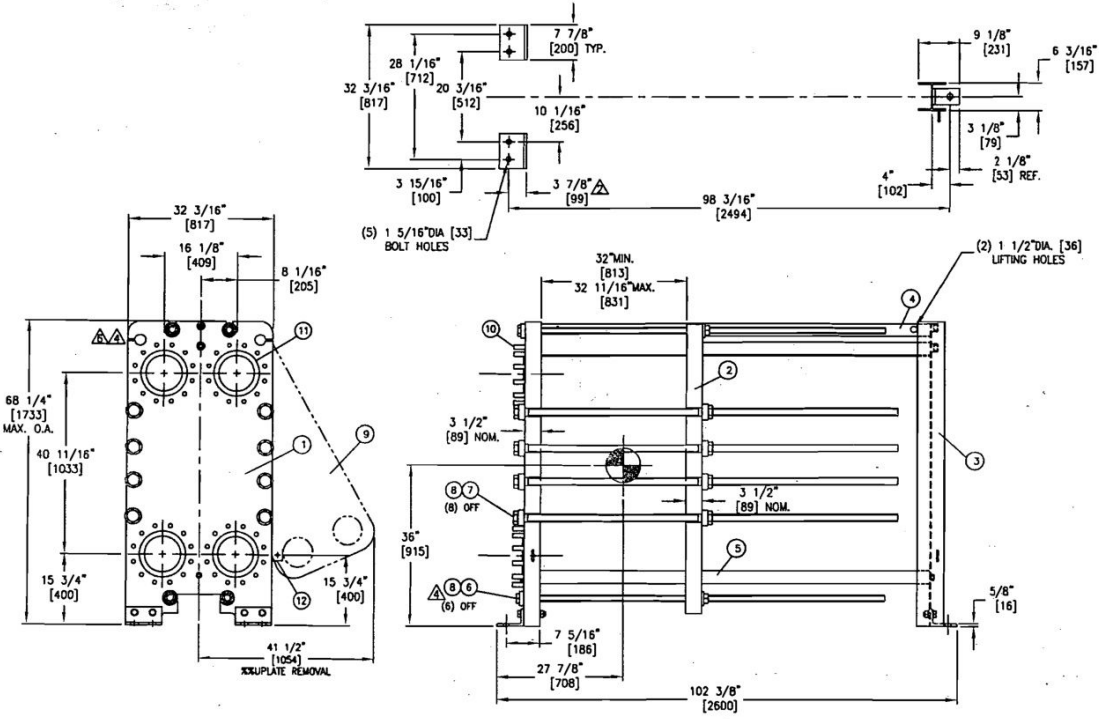
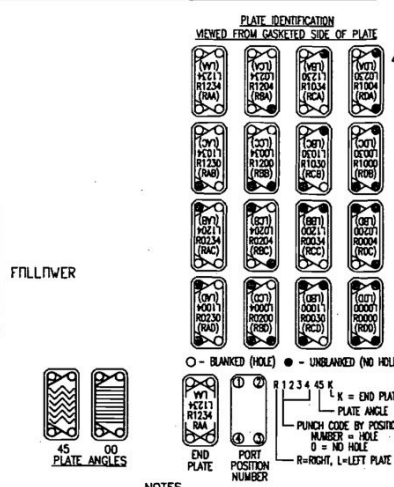
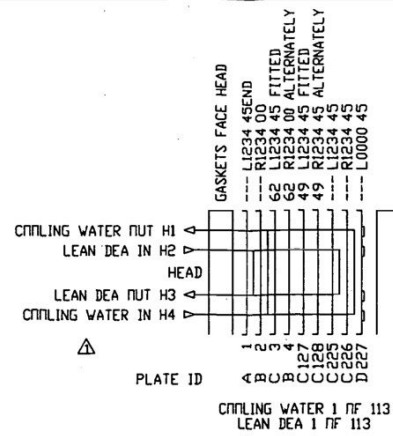
MATERIALS OF CONSTRUCTION		
ITEM NO.	DESCRIPTION	MATERIAL
1	HEAD	SA516 GR70
2	FOLLOWER	SA516 GR70
3	END SUPPORT	A36
4	TOP BAR	A36 W/304 SS STRIP
5	BOTTOM BAR	A36 W/304 SS COVER
6	M36 DIA. TIE BAR	SA193 GRB7
7	M42 DIA. TIE BAR	SA193 GRB7
8	TIE BAR HEX NUTS	SA194 GR2H ZINC PLATED
9	HEAT TRANSFER PLATES	SA240 GR316
10	STUDS	SA193 GRB7 ZINC PLATED
11	LINERS	316L STAINLESS STEEL
12	GROUNDING LUGS	A36

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

F_x (KN)	12.2
F_y (KN)	7.213
F_z (KN)	7.213
M_x (KNm)	7.157
M_y (KNm)	7.157
M_z (KNm)	7.157

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

Cham L. V. J. J. J.
04/18/2007



- NOTES**
- THE INSTALLATION, OPERATION AND MAINTENANCE OF THIS HEAT EXCHANGER SHALL BE IN ACCORDANCE WITH THE APV PARAFLOW PLATE HEAT EXCHANGER INSTRUCTION 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-SEZ 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 1/8".
 - 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 FLUID DIMENSIONS.
 - UNID STUDDED 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]
NOZZLE CENTERLINE AND FACE DIMENSIONS: ±1/8 INCH [±3mm]

DESIGN SPECIFICATIONS	
DESIGN CODE	ASME SECTION VIII DIV 1, 2004 EDITION API 662
MAX. ALLOWABLE WORKING PRESSURE	399 PSIG. (2750 kPa) FV
MINIMUM DESIGN METAL TEMPERATURE	-20 °F. @ 399 PSIG. (-29°C @ 2750 kPa)
HYDROTEST PRESSURE	519 PSIG. (3575 kPa) FV
MINIMUM OPERATING TEMPERATURE	-20°F (-29°C)
MAXIMUM OPERATING TEMPERATURE	203°F (85°C)
SERIAL NUMBER	20073003000609
HEAT TRANSFER AREA	1298.0 SQ.FT. (120.6 SQ.M.)
FRAME SIZE	No.3
MAXIMUM FRAME CAPACITY	360 PLATES
DRY WEIGHT	6973 LBS. (3163 KG)
FLOODED (OPERATING) WEIGHT	7873 LBS. (3571 KG)
TOTAL LIQUID VOLUME	108.1 GALS. (409.1 LITERS)
FINISH	APV STANDARD PAINT 3196
ACCESSORIES SUPPLIED	304 SS SHROUD GROUNDING LUGS

OPERATING CONDITIONS			
LIQUID	FLOW RATE	TEMP. °C	ΔP (kPa)
LEAN DEA	152.04 KG/S	45.1° - 37.9°	70.0
COOLING WATER	69.31 KG/S	24° - 40°	15.0

Plates (Total: 227)
ID Qty Part Number Description

A 1	4614AXAX7AEEXA	P&G ASY TR9GL (45) END 316 0.7 STK EPDM RC (BL/WH)
B 62	4610FAXAX7AEEXA	P&G ASY TR9GL (00) FLOW 316 0.7 STK EPDM RC (BL/WH)
C 162	4614FAXAX7AEEXA	P&G ASY TR9GL (45) FLOW 316 0.7 STK EPDM RC (BL/WH)
D 1	4614FOXAX7AEEXA	P&G ASY TR9GL (45) FLOW 316 0.7 STK EPDM RC (BL/WH)

Frame Qty Part Number Description

1	TR9GLXC25X00X318	TR9GL M-25c (C:SS T:CS) Size 3, Max 368 Plates
1	GB505365GZGZGZGZ	Head
1	GB505365AXAXAXAX	Follower

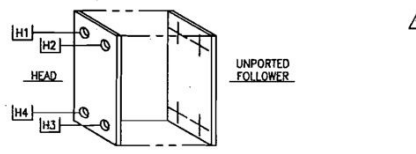
Fitting Qty Part Number Position Description

4	GB505370	H1,H2,H3,H4 NPS 8.0 Studded SS 316L ANSI B16.5 CL300
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Qty Part Number Accessory Description

1	500534	SS Shroud, FS3
1	ASME U STAMP	ASME INSPECTION AND U STAMP
1	501255	GROUNDING LUG HEAD
1	501252	GROUNDING LUG END SUPPORT

PROJECT NO.	DATE	BY	CHECKED	SCALE
103933	0032			5/2 - E-7A



07	REV 4-18-07	REMOVED SEP NOTE - FSD REQUIREMENT PER ASME & B&E		
08	REV 4-17-07	REMOVED (2) NON TIE BARS - UPDATED FRAME P/N		
09	REV 4-17-07	CHANGED GASKETS TO STYRE		
04	REV 10-17-06	ADDED (2) NON TIE BARS - UPDATED FRAME P/N		
03	REV 9-14-06	CHANGED GASKET MATERIAL		
02	REV 12-18-05	INCORPORATED CUSTOMER COMMENTS		
01	REV 9-29-05	APPROVED - INCORPORATED COMMENTS		
REV.	BY / DATE	CL. BY / DATE	DESCRIPTION AND LOCATION	

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

TR9GL M-25SPEC
PLATE HEAT EXCHANGER

Scale: N.T.S. Sheet: 1 OF 1

Approved: Date: 8-3-05
Drawn: Date: 8-3-05
KWR

0500609

				Plate and Frame Exchanger			DATA SHEET NO:	REV:
							52-E-7-DS-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:	
2	GQW	15-May-07	AS BUILT - revised gaskets	GQW				
				P.O.:	383-1296-0032			
				REQ:	HT-1300-005			

TAG NO:	52-E-7A/B		Spec No:		r e v
Asset No:			P&ID:	52-PID-PR-0015	
Service Description:	Lean Amine Trim Cooler			Manufacturer:	APV
				Model:	TR9GL
User 1:			User 3:		
User 2:			User 4:		

General	Job No:	103933		Process Unit:	52 Amine Unit		
	Item No:	52-E-7A/B		Fabricator:	APV		
	Location:	Fort McMurray		No. of Units:	Two (1 operating & 1 spare) (Note 7.)		
	Size:	M-25/3	mm	Type:		No. Connected in:	1
						Parallel:	1
						Series:	
	Surface area/Unit (Eff.):	120.6	m ²	Shells/Unit:	1	Surface area/Shell (Eff.):	120.6 m ²

		HOT SIDE		COLD SIDE	
		Lean DEA		Cooling Water	
Fluid Allocation:					
Fluid Name:					
Fluid Quantity, Total:	kg/hr	536,626		250,196	
		IN	OUT	IN	OUT
Fluid Quantity, Vapor (In/Out):	kg/hr				
Fluid Quantity, Liquid:	kg/hr	536,626	536,626		
Fluid Quantity, Steam:	kg/hr				
Fluid Quantity, Water:	kg/hr			250,196	250,196
Fluid Quantity, Noncondensable (MW):	kg/hr				
Temperature (In/Out):	°C	46.1	37.9	24	40
Density (Vapor/Liquid):	kg/m ³	1,020	1,026	997	992
Viscosity (Vapor/Liquid):	mPa-s	1.571	1.953	0.911	0.651
Molecular Weight, Vapor:					
Specific Heat (Vapor/Liquid):	kJ/(kg °C)	3.742	3.733	4.180	4.179
Thermal Conductivity (Vapor/Liquid):	W/(m °C)	0.459	0.453	0.610	0.632
Dew Point:	°C				
Bubble Point:	°C				
Critical Pressure:	kPa(g)				
Critical Temperature:	°C				
Latent Heat:	kJ/kg@°C				
Surface Tension:	Dyne/cm	58.19	59.44	72.27	69.49
Inlet Pressure:	kPa(g)	1,615		845	
Velocity:	m/s	4.6 (port) , 0.57 (passages)		2.2 (Port) , 0.27 (passages)	
Pressure Drop (Allowable/Calculated):	kPa	70	70	70	15
Overall Fouling Allowance:	% Excess Area	10		10	
Wall Shear Stress:	kPa	103		21	
Heat Exchanged per Unit:	Watts	4,642,220	LMTD (Corrected) (Weighted):		9.46 °C
Transfer Rate (Service/Clean):	W/(m ² °C)	4,068	4,509		

- Remarks: * Information to be supplied by Manufacturer
- Design case: Napthenic Solvent design case flow, composition and conditions.
 - Nozzles shall be designed for the loads shown in Attachment 1, Nozzle Loads for Plate & Frame Heat Exchangers, Rev. 0.
 - All materials and components in contact with process fluid to meet 00-STD-ME-0034 requirement, Category 1.
 - CRN/ ABSA registration required.
 - Structural design shall be per 00-STD-ST-0001, Rev. 4. Saddles shall be designed for -45 °C minimum ambient temperature.
 - Provide loads (weight and forces) at the bottoms of the base plates.
 - Two 100% units are to be installed in Phase 1.
 - The exchanger design shall prevent process fluids from contacting carbon steel surfaces.
 - Structural supports shall have 1.6 mm corrosion allowance.

TAG NO.	52-E-7A/B	Plate and Frame Exchanger	DATA SHEET NO.	52-E-7-DS-1	REV.	2	SHT.	2	OF.	2
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			HOT SIDE				COLD SIDE					
Design Press / Test Press:	kPa(g)		2,750 & FV	/	per code	2,750 & FV	/	per code				
Design / MDMT Temperature:	°C		95	/	-29	95	/	-29				
Corrosion Allowance (wetted Carbon Steel only):	mm		(Note 8)		(Note 8)							
No. of Passes / No. Channels per Pass:			1	/	113	1	/	113				
Passages Per Pass:												
Number of Plates per Frame	227		368 (Max.)		Plate Thickness	0.7	mm					
Connections Size, Rating & Type:	In:	8" 300# RF		8" 300# RF		8" 300# RF		Type: Studded Port				
	Out:	8" 300# RF		8" 300# RF		8" 300# RF		Type: Studded Port				
Intermed:												
Weights - Plates:	1,005	kg	Frame	2,158	kg	Total Flooded:	3,571	kg	Empty:	3,163	kg	
Frame Material:	SA-516-70N			Tie Bars Material:		SA-193 B7						
Plate Material:	SA-240-316			Shroud Material:		304 SS						
Gasket Material:	EPDM RC (Paratemp) Glue In <input checked="" type="checkbox"/>			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:	113											
No. of Plates:	227											
Plate Model:	Dura Flow											
Chevron Angle:	0, 45											
Surface Area Enhancement Factor:	N/A											
Plate Materials:	SA-240-316											
Plate Thickness:	mm	0.7										
Plate Spacing:	mm	3										
Area per Plate:	m2	0.531 (Effective)										
Port Diameter:	in.	8"										
Vertical Distance between Port Centres:	mm	1033										
Horizontal Distance between Port Centres:	mm	817										
Frame Size: L x W x H:	2594 x 817 x 1733		mm	Plate Size:	1292 x 674		mm					
Code Requirement:	ASME Sect. VIII, Div. 1		Stamp	YES	API 662:	YES	CRN / ABSA Registration:	YES				
Remarks:												

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

Notes	

Plate Heat Exchanger Data Sheet

Ref.: EJW60169/1 (O)



Duty:	Lean Amine Trim Cooler	REV 05
		Item No: 52-E-7A/B
PHE Type:	TR9GL	Engineer: EJW
Quotation No:	C5EW189WS	Date: 2006.Mar.14

Process Data		Hot	Cold
Fluid		Lean DEA	Cooling water
Mass Flow Rate	Kg/s	149.06	69.50
Volume Flow Rate	l/s	146.14	69.69
Inlet Temperature	°C	46.1	24.0
Outlet Temperature, Duty	°C	37.9	40.0
Pressure Drop, calculated	kPa	70	15
Heat Exchange Rate, Duty	kW	4642.22	
Design (Duty) HTC	W/°C m ²	4068.0	
Clean HTC	W/°C m ²	4508.6	
% Difference in HTC		10.8%	
Fluid Volume in PHE	l	222.0	222.0

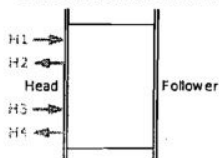
Fluid Properties		Hot	Cold
Density	kg/(m ³)	1023.0	995.0
Specific Heat Capacity	kJ/kg °C	3.738	4.178
Thermal Conductivity	W/m °C	0.456	0.617
Inlet Viscosity	mPa s	1.57	0.91
Outlet Viscosity	mPa s	1.95	0.65

W.P. Sherrill
 04/17/2007
 APPROVED

Plate Heat Exchanger Specifications	
PHE Type	TR9GL
Frame Type / Size	M-25/3. Painted Floor Mount Tie:CS, Carry:SS, max. 368 plates
Dimensions (H*W*L)	mm 1733x820x2594
Total Number of Plates	227
Total Active Area	m ² 120.61
Hot Side Flow Arrangement	1*113
Cold Side Flow Arrangement	1*113
Plate Material	0.7 mm SS 316 SA240 Paraclip
Gasket Material	EPDM RC (Paratemp) Glue In
Hot Side Connection - Inlet	H1 NPS 8.0 Studded SS 316L Class 300 (Mates With) ANSI B16.5
Hot Side Connection - Outlet	H4 NPS 8.0 Studded SS 316L Class 300 (Mates With) ANSI B16.5
Cold Side Connection - Inlet	H3 NPS 8.0 Flange (RFWN) SS 316L Class 300 (Mates With) ANSI B16.5
Cold Side Connection - Outlet	H2 NPS 8.0 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. 95 Min. -29
Design Pressure	kPa 2750
Test Pressure	kPa Balanced 3575 Differential 3575
Mass	kg Flooded 3618 Empty 3170
Approx. Shipping Mass & Volume	Std Packing kg m ³

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 103/21 Pa. Plate gap is 3.0 mm.

Reviewed By

APR 24 2007

W.P. Sherrill



ENGINEER: PETE MATKOVICS
DATE: 18-Oct-06
CALC NO.: 0500608-609 ASME

REV NO.: 03

PRESSURE VESSEL CALCULATIONS
FOR AN
APV PLATE HEAT EXCHANGER
IN ACCORDANCE WITH THE
ASME BOILER AND PRESSURE VESSEL CODE
SECTION VIII, DIVISION 1
2004 EDITION

HEAT EXCHANGER MODEL:	TR9GL MGS-25SPEC
REFERENCE DRAWING NUMBER:	0500608 & 0500609
MATERIAL NUMBER(S):	20053003000608 20053003000609
DESIGN PRESSURE:	398.75 (27.50) psi (bar)
TEST PRESSURE:	519.00 (35.79) psi (bar)
MAXIMUM DESIGN TEMPERATURE:	203.00 (95.00) F (C)
MINIMUM DESIGN METAL TEMPERATURE:	-20.00 (-28.89) F (C)
P.O. NO:	383-1296-0032
TAG / ITEM NO.:	52-E-7A/B LEAN AMINE TRIM COOLER

