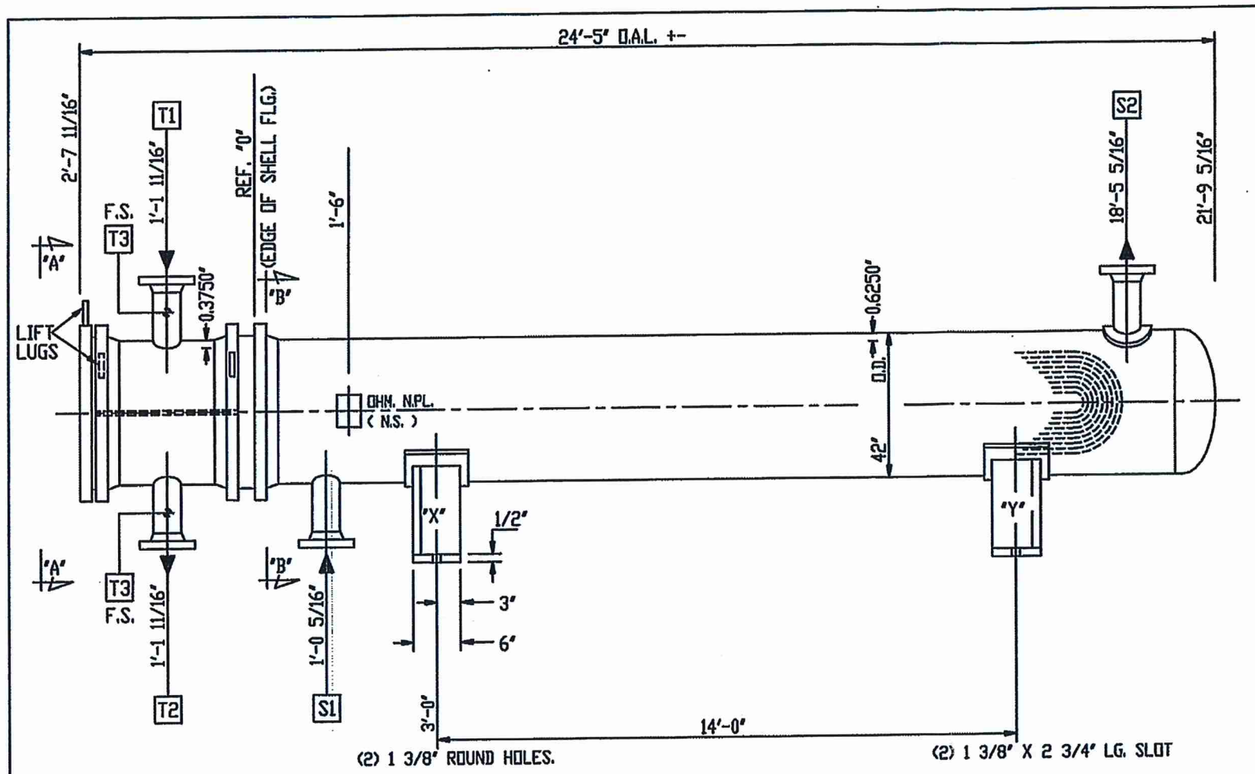
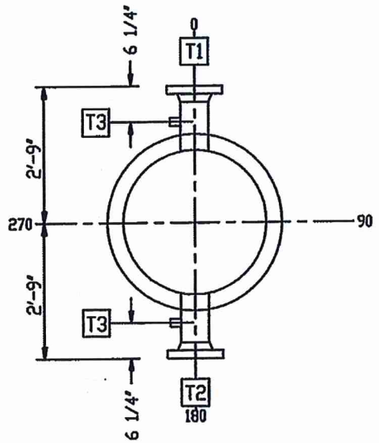
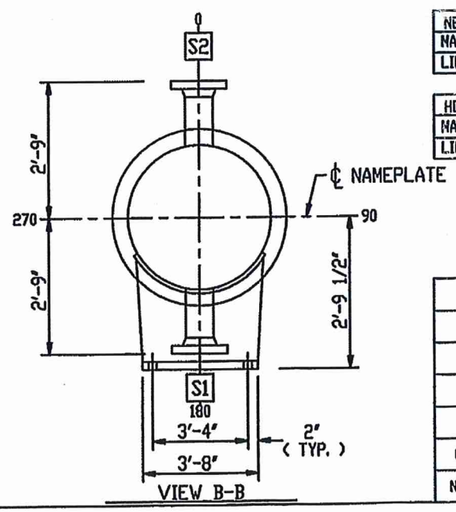
HE-309







DESIGN DATA	SHELL	TUBE
DESIGN PRESSURE P.S.I.G.	100	100
VACUUM PRESSURE P.S.I.G.	14.7 EXT	14.7 EXT
TEST PRESSURE P.S.I.G.	182 SHOP, 130 FIELD	182 SHOP, 130 FIELD
DESIGN TEMP. Deg.F.	300	300
MDMT Deg. F.	-20	-20
CORROSION ALLOWANCE	1/4"	0"
NUMBER OF PASSES	1	4
RADIOGRAPHY	SPOT	SPOT
HEAT TREAT REQUIRED	NO	NO
INSULATION (BY OTHERS)	N/A	N/A

ESTIMATED WEIGHTS, LBS.

DRY: 22000 BUNDLE: 11600 WET: 35800

SPECIFICATIONS

ASME CODE SECT. VIII DIV.1, 2007 EDD. 2008 ADD. (STAMP YES)
TEMA CLASS R and API-660 APPLIES
NATIONAL BOARD REGISTRATION REQUIRED

MATERIAL

CHANNEL: SA-240-316
SHELL: SA-516-70
TUBESHEETS: SA-240-316
BAFFLES: SA-516-70
TUBES: SA-249TP316L
(312) 1" O.D. X 0.0650" (AW) X 20'-0" STRAIGHT LG.
TUBE PITCH 1 1/4" ◇ SURFACE 3175 SQ.FT.

GENERAL NOTES

ALL BOLT HOLES TO STRADDLE NATURAL CENTER LINES.
GASKETS: .0625" THK. CHEVRON-CGG
2 SETS OF SPARE GASKETS REQUIRED.
EXEMPT FROM IMPACT TESTING PER UCS-66 & UHA-51

PAINT: SEE DWG. SHT. NO. 1A FOR PROCEDURE
TUBE TO TUBESHEET JOINT STRENGTH WELDED & ROLLER EXPANDED

NEW & COLD	SHELLSIDE	TUBESIDE
MAP (PSIG)	140	140
LIMITED BY	TUBESHEET	TUBESHEET

HOT & CORR.	SHELLSIDE	TUBESIDE
MAWP (PSIG)	100	100
LIMITED BY	TUBESHEET	TUBESHEET

CERTIFIED R.T. McDaniel
DATE 5/7/09

NOZZLE SCHEDULE

MK	QT	DESCRIPTION	PROCESS
S1	1	10" - 150#FF WN	INLET
S2	1	10" - 150#FF WN	OUTLET
T1	1	10" - 150#FF WN	INLET
T2	1	10" - 150#FF WN	OUTLET
T3	2	1" - 6000# CPLG. w/PLUG	AUX.

NO.	REVISION	BY	CHK.	DATE CHK.
0	RELEASE FOR FAB	JMB		05-07-09

CUSTOMER: CHEVRON WYOMING
P. O. NO. : 3525 ALMM
ITEM NO. : HE-309
SERVICE : QUENCH COOLER

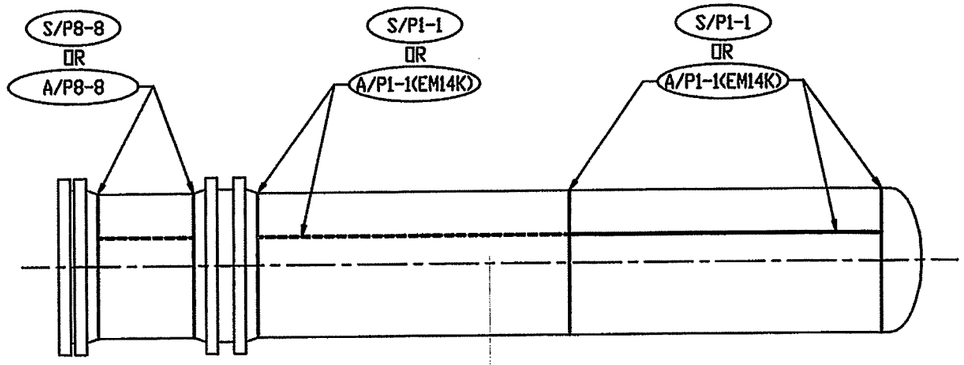
OUTLINE DRAWING
ONE 41-240 A E U

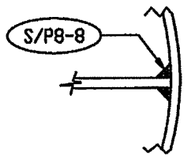
Ohmstede LTD.

DRAWING NO. 958418-1

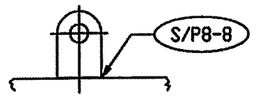
#106316

HE-309

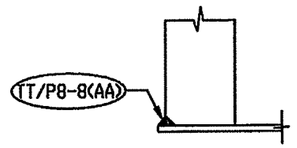




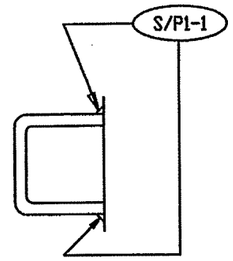
PASS PLATES



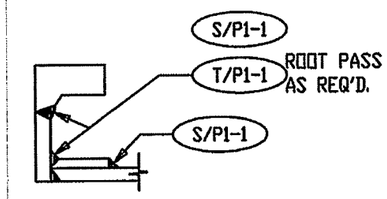
TYPICAL LIFT LUG



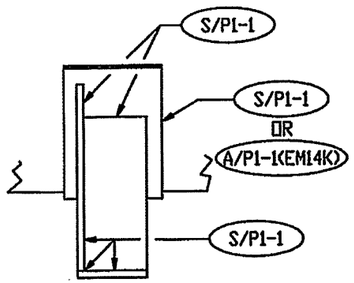
TUBE STRENGTH WELDS



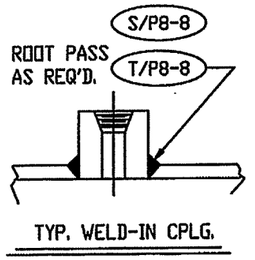
TYPICAL NM. PL.
BRACKET



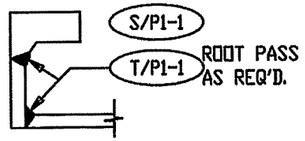
TYPICAL WELD NECK
NOZZLE W/ PAD
SHELLSIDE



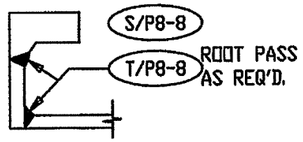
SUPPORT SADDLES



TYP. WELD-IN CPLG.



TYPICAL WELD NECK
NOZZLE W/O PAD
SHELLSIDE



TYPICAL WELD NECK
NOZZLE W/O PAD
TUBESIDE

NO.	REVISION	BY	CHK.	DATE CHK.
0	RELEASE FOR FAB/CUST REVIEW	JMB	RM	05-07-09

CUSTOMER: CHEVRON WYOMING
P. O. NO. : 3525 ALMM
ITEM NO. : HE-309

WELD MAP

Ohmstede LTD.

DRAWING NO.
958418-2

#106316

HE-309

Ohmstede Ltd.
BILL OF MATERIALS

COPY

WRITTEN BY: J.T. APPROVED BY: [signature] SHEET#: 1
DATE: 5/6/2009

CUSTOMER: CHEVRON WYOMING CUST. P.O. 3525 ALMM ITEM NO.: HE-309

JOB NO.: 958418 RELEASE# 1 FAB START 6/1/2009 DEL.DATE: 7/17/2009

ITEM	QTY.	DESCRIPTION		MATERIAL SPEC.	P.O.	VEND/STOCK	DUE
		TUBES					
21	312	TUBES 1" O.D.X 16 GA. A.W. PER SK-958418-TBS		SA-249TP316L			
		U-BENDS PLUS 12" OF S.L. TO BE STRESS RELEIVED					
		FORGED RING MATERIAL					
2	1	FLG 47" O.D.X 41" I.D.X 5" THK	(f)	SA-182F316			
3	1	FLG 47 1/2" O.D.X 41" I.D.X 4 15/16" THK	(f)	SA-182F316			
7	1	FLG 47 1/2" O.D.X 41" I.D.X 5" THK	(f)	SA-350LF2CL1			
		TUBESHEETS & COVERS					
19	1	TUBESHEET 43 11/16" O.D.X 3 3/8" THK	(f)	SA-240-316			
1	1	COVER 47" O.D.X 3 1/4" THK	(f)	SA-240-316			
		BAFFLES					
22	11	BAFFLES 41 1/8" B.O.D.X 3/4" THK		SA-516-70			
22A	1	SUPT PL. 41 1/8" B.O.D.X 3/4" THK		SA-516-70			
		HEADS					
18	1	ELLIP HD. 41" I.D.X 7/16" THK(min) W/2" SF		SA-516-70			
		& 3/16" LAND W/30 deg O.S. BEVEL					
		CYLINDERS					
9	1	R&W CYL 41" I.D.X 1/2" THK X 15'-10" LG.		SA-516-70			
		PER SK-958418-SH1					
9A	1	R&W CYL 41" I.D.X 5/8" THK X 4'-5 9/16" LG.		SA-516-70			
		PER SK-958418-SH2					
4	1	R&W CYL 41" I.D.X 3/8" THK X 1'-5 1/16" LG.		SA-240-316			
		PER SK-958418-CH					

#106316

Sinclair Ltd.

DESIGN CALCULATIONS

CUSTOMER: CHEVRON WYOMING

P.O. NO. : 3525 ALMM

JOB NO. : 958418

ITEM NO. : HE-309

SERVICE: QUENCH COOLER

SHEETS: 29

REV	DESCRIPTION	BY	CHCK	DATE
Φ	FOR COST. APPROVAL	G.D		5/6/09

108318

HE-309

Ohmstede Ltd.
DESIGN CALCULATIONS

P.O. No: 3525 ALMM	Job No : 958418	
Date: 5/ 6/09 | By: GH	Item No: HE-309	
Customer: CHEVRON WYOMING		HORIZONTAL
Service : QUENCH COOLER		U-TUBE
No. Shells: 1 Par. 1 Ser. 1	Surface: 3524 Each	3524 Total Sq.fT.
Size: 41 x 240 Type: A E U		
312 Tubes x 1.000 OD x 0.065 Thk BWG x 240 Lg 1.2500 ROT.SQ. Pitch		
Tubes : SA-249TP316L		
Shell : SA-516-70		
Channel : SA-240-316		
Body Flange : SA-350LF2CL1		
Tubesheets : SA-240-316		
Fltg. Hd. Flg.: N/A		
Cross Baffles : SA-516-70 No. 10 Pitch 21.000 Cut 0.33 SGL SEG VERT		
Code Requirements: ASME Sect. VIII, Div. 1, 2007 ED.,A08.		STAMP YES
Applicable Loadings For UG-22 Have Been Considered.		
National Board No.: YES Canadian Reg. No.: N/A	API 660: YES	Tema R
Weight Ea Dry: 24304 Lbs	Wet 36954 Lbs	Bundle 13500 Lbs
	Shell	Tubes
Design Pressure psig	100.0	100.0
External Pressure psig	14.7	14.7
Design Temp/MDMT deg F	300 / -20	300 / -20
Test Pressure	182 SHOP/130 FIELD psi	182 SHOP/130 FIELD psi
Corrosion Allowance in.	0.2500	0.0000
No. of Passes	1	4
Radiograph	SPOT	SPOT
Stress Relieve deg F	0	0 U-Bends 1900
Paint: Per Customer Specification		
Impact Testing: EXEMPT PER UHA-51 & UCS-66.		
Remarks:		
MAP(NEW & COLD):		
SHELLSIDE=140 PSI LIMITED BY TUBESHEET.		
TUBESIDE= 140 PSI LIMITED BY TUBESHEET.		
MAWP(HOT & CORRODED):		
SHELLSIDE=100 PSI LIMITED BY TUBESHEET.		
TUBESIDE= 100 PSI LIMITED BY TUBESHEET.		

#1 / 06 316

HE-309

SHELLSIDE

NOM. SIZE	PRESS.	TEMP.	C.A.	RT	H.T.	TEMA
41.000"	100.0psig	300deg.F	0.2500"	SPOT	0deg.F	R

ASME CODE SEC.VIII DIV.I UG-27 [CYLINDER]

====DESIGN CONDITIONS==========CYLINDER CALCULATIONS ON I.D. FORMULA====

SHELL CYL.

MATERIAL: SA-516-70 PRESS = 100.0psig TEMP = 300deg.F

I.D.	NOM. THK.	RW=0/PIPE=1	CORR.ALLOW	EFFICIENCY
41.0000"	0.5000"	0	0.2500"	0.85

ATM.STRS	DES.STRS	STRS/STRS	MAWP N-C	MAWP CORR.
20000.0psi	20000.0psi	1.000	408.654psig	203.349psig

P*(R+CA)
---------- = 0.12249" + CORR. ALLOW. = 0.37249" + MTOL. = 0.37249"
S*E-(.6*P)

****

NOM. SIZE	PRESS.	TEMP.	C.A.	RT	H.T.	TEMA
41.000"	100.0psig	300deg.F	0.2500"	SPOT	0deg.F	R

ASME CODE SEC.VIII DIV.I UG-32 [ELLIPTICAL HEAD]

====DESIGN CONDITIONS=======ELLIPTICAL HEAD CALCULATIONS ON I.D. FORMULA====

MATERIAL: SA-516-70 PRESS = 100.0psig TEMP = 300deg.F

I.D.	(min)THK.	CORR.ALLOW	EFFICIENCY
41.0000"	0.4375"	0.2500"	0.85

ATM.STRS	DES.STRS	STRS/STRS	MAWP N-C	MAWP CORR.
20000.0psi	20000.0psi	1.000	362.032psig	153.476psig

P*(R+CA) 0.0000
---------- = 0.12213" + CORR. ALLOW. = 0.37213" + MTOL. = 0.37213"
S*E-(.1*P)

Item No: HE-309 By: Y.N P.O. No: 3525 ALMM
Job No : 958418 5/ 6/09 Page 3

#10631/0

HE-309

FRONT CHAN.

NOM. SIZE	PRESS.	TEMP.	C.A.	RT	H.T.	TEMA
41.000"	100.0psig	300deg.F	0.0000"	SPOT	0deg.F	R

ASME CODE SEC.VIII DIV.I UG-27 [CYLINDER]

====DESIGN CONDITIONS==========CYLINDER CALCULATIONS ON I.D. FORMULA====

CHAN. CYL

MATERIAL: SA-240-316 PRESS = 100.0psig TEMP = 300deg.F

I.D.	NOM. THK.	RW=0/PIPE=1	CORR.ALLOW	EFFICIENCY
41.0000"	0.3750"	0	0.0000"	0.85

ATM.STRS	DES.STRS	STRS/STRS	MAWP N-C	MAWP CORR.
20000.0psi	20000.0psi	1.000	307.600psig	307.600psig

P*(R+CA)
---------- = 0.12102" + CORR. ALLOW. = 0.12102" + MTOL. = 0.12102"
S*E-(.6*P)

****

----- External Pressure Calculations -----

Ext Press Chart No.=	302
Ext Press Chart....=	HA-2
OD.....=	41.75000
T.....=	0.37500
L.....=	27.00000
Temp.....=	300.00000
Stress from MT.....=	20000.00000
Yield from MT.....=	23400.00000
2 x Stress.....=	40000.00000
B1 from Chart@Right=	0.00000
Yield= 2 x B1 x 0.9=	0.00000
S.....=	0.00000
DO/T.....=	111.33334
L/DO.....=	0.64671
A.....=	0.00183
B.....=	10610.05078
PA1.....=	0.00000
PA2.....=	0.00000
PA.....=	127.06647

Item No: HE-309 By: D.N P.O. No: 3525 ALMM
Job No : 958418 5/ 1/09 Page 2

#106316

HE-309