



OIL & GAS DEVELOPMENT COMPANY LIMITED
PROCUREMENT DEPARTMENT (LOCAL), ISLAMABAD
SCHEDULE OF REQUIREMENT

Material : **REPLACEMENT OF TUBE BUNDLES**

Due Date:

Tender Enquiry No: **PROC/LF/PT/18628/21**

Bid Bond Value : **RS.1,500,000.00**

EVALUATION WILL BE CARRIED OUT ON OUR CHOICE

Attachment(if any) : **YES**

Sr No	Description	Quantity	Make/Brand offered	Unit	Unit Price (PKR) Inclusive Of All Taxes Except GST/PST	Unit Price (PKR) Inclusive of GST/PST	Total Price (PKR) Inclusive of GST/PST	Delivery Period Offered	deviation from Tender Spec. If Any
1	FABRICATION&SUPPLY OF TUBE BUNDLES OF AMINE SOLUTION COOLERS (10-E-203 & 20-E-203),INCLUDING INSERTION OF TUBE BUNDLE,REBUILD OF DAMAGED AREA OF SHELL (IF ANY),COMPLETE REASSEMBLY & SURFACE PREPARATION/PAINTING OF HEAT EXCHANGER AS PER DWGS	2		Number					
2	SERVICES FOR AMINE SOLUTION COOLERS/TUBE BUNDLES (QA/QC,PWHT,NDT,HYDRO TESTING,ASME R STAMP ETC.)	2		Number					
3	LOADING/UNLOADING % TRANSPORATION FOR AMINE SOLUTION COOLERS.	1		Number					
4	BUY BACK OF SCRAP MATERIAL	1		Number					
5	TUBE SHEETS (MAT.SA-516 GR.70N) – OPTIONAL	4		Number					

Special Note: The prospective bidders also download the master set of Tender Document

- The prospective bidders may keep in touch with OGDCL web site for downloading the clarifications/amendments (if any) issued by OGDCL.
- EVALUATION WILL BE CARRIED OUT ON ITEM # (1+2+3)-4.BID VALIDITY 180 DAYS FROM TECHNICAL BID OPENING.DELIVERY IN 180 DAYS FROM LPO ISSUE ON FOR UCH. 20% ADVANCE AGST BANK GUARANTEE & 80% AFTER SUCCESSFUL INSPECTION & DELIVERY AT SITE.PERFORMANCE BOND VALID UPTIL 12 MONTHS AFTER INSTALLATION.



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PROCUREMENT DEPARTMENT (LOCAL), ISLAMABAD
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Mandatory Checklist

Please confirm the compliance of the following mandatory information along with the bid(s) (failing which bids(s) will not be accepted)

Documents	To be Attached with the Technical/Financial Bids	Compliance	
		Yes <input type="checkbox"/>	No <input type="checkbox"/>
Original Bid Bond	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Copy of NTN Certificate	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Copy of GST Certificate	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Confirmation that the Firm is appearing on FBR's Active Taxpayer List	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Duly signed and stamped Annexure-A (Un-priced)	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Duly filled, signed and stamped Annexure-B	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Duly filled, signed and stamped Annexure-D	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Duly filled, signed and stamped Annexure-L on Company's Letterhead	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Duly signed and stamped Annexure-M on Company's Letterhead	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Duly signed and stamped Annexure-N on Non-Judicial Stamp Paper duly attested by Notary Public	Technical Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Duly filled, signed and stamped Annexure-A (Priced)	Financial Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Duly filled, signed and stamped Annexure-C	Financial Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>
Duly filled, signed and stamped Annexure-E	Financial Bid	Yes <input type="checkbox"/>	No <input type="checkbox"/>



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For the Vendors/Contractors who opt to submit Bank Draft/Call Deposit/Pay order against Bid Bond/Performance Bond, our Accounts Department has finalized an arrangement for online payment to such Vendors/Contractors, which will be processed through (IBFT & LFT) for which following information is required:

i.	IBAN No. (International Bank Account Number 24 Digits)	
ii.	Vendor Name as per Title of their Bank Account	
iii.	Contact No.of Company's CEO/ Owner (Mobile & Landline)	
iv.	Bank Name.	
v.	Bank Branch Name and Code	

Name, Sign and Stamp of the authorized official of the Bidder(s) _____

TERMS OF REFERENCE (TOR)

DATA SHEET & DIMENSIONS:

Heat Exchanger Specification Sheets & Drawings attached.

MATERIAL OF CONSTRUCTION:

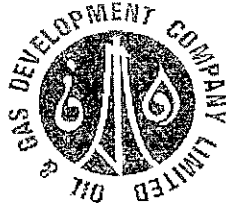
Part Description	Material
Tube Sheet	SA-516 GR.70N
Tubes	SA 179 SMLS (Tubes shall be Eddy Current Tested)
Tie Rods / Spacer Tubing	Carbon Steel
Baffles	SA-516 GR.70N

SCOPE OF WORK/SUPPLY:

- 1- Loading and transportation of Heat Exchangers from OGDCL Uch Gas Field.
- 2- Supply of Material including Consumables & Fabrication Work for Re-tubing of Amine Solution Coolers (Shell & Tube Heat Exchanger) as per OGDCL provided Engineering Data/Drawings.
- 3- Shop fabrication drawings (as-built).
- 4- Removal of Old Tube bundle.
- 5- Insertion of New Tubes (Tube Material SA-179 (SMLS) shall be used instead of SA-214 (Welded).
- 6- Installation of Baffles, Tie rods, Spacer & Tube Sheets
- 7- Tubes shall be roller expanded to Tube Sheets.
- 8- Minimum wall thickness of tubes shall be as per API 660 (2015) 7.5.1.2
- 9- Rebuild of eroded/damage area of shell (if any) as per standard.
- 10- Complete re-assembly.
- 11- Surface preparation/painting of outer surface of Heat Exchanger as per standard.
- 12- QA/QC of Entire Work.
- 13- PWHT, NDT & Hydro Testing as per Applicable TEMA/API/ASME Codes & Standards.
- 14- ASME R-Stamp.
- 15- Transportation of Heat Exchangers back to OGDCL Uch Gas Field.
- 16- Unloading of Heat Exchangers at site, OGDCL can only provide one 30-TON Crane available at UCH Gas Field.

TERMS & CONDITINS:

- 1- Supply of 04 Nos. (50mm THK.) Tube Sheets of SA-516 Gr.70N shall be considered as optional, i.e. in case existing tube sheets are found unfit for re-use after NDT testing (DPT & MPI) and combined inspection by OGDCL Representative, ASME Inspector & Supplier QA/QC.
- 2- Supplier shall quote separate price of tube sheets in financial bid.
- 3- Country of Origin for all material should be Europe / Korea / Japan.
- 4- Certified material should be used and supplier to provide Material Test Certificates (MTCs).
- 5- ASME Code Sect. VIII Div.1, TEMA Class R and API 660 will apply.
- 6- OGDCL Representative will carry out stage wise inspection at Supplier Works at below mentioned stages.
 - i. To witness the condition of tube sheets
 - ii. After receipt of material with MTC's
 - iii. Before insertion/installation of tube bundle
 - iv. Hydro-testing
- 7- Old tube bundle along with all waste/scrape material shall buy-back by the supplier/bidder and quote its separate price that will be subtracted from the final payment to supplier.
- 8- It is mandatory requirement that the supplier/manufacture have 05 years past experience of manufacturing the same type & size of equipment. (Supporting documents/purchase order copies to be provided with technical bid).
- 9- 10% Performance bond to be valid upto December, 2024.



OIL & GAS DEVELOPMENT COMPANY LTD

BIDDERS QUALIFICATION CRITERIA FOR

FABRICATION & SUPPLY OF 02NOS. TUBE BUNDLES OF AMINE SOLUTION COOLERS INSTALLED AT
UCH-I PLANT

1.0 MINIMUM REQUIREMENTS FOR CONTRACTOR QUALIFICATION

All the interested parties intending to participate must fulfil all the requirements / parameters for Contractor qualification as per tender document in their bids. The evaluation of the bids shall be finalized through grading of the Contractors according to marks calculated as per criteria defined in Annexure-A. Contractor should earn minimum 75 marks as overall in order to qualify. The minimum qualifying marks in each category are also defined in Annexure-A. The Contractors are required to provide the following documents for Contractor qualification:

- i. Certified copy of valid NTN / GST certificates.
- ii. Contractor should have 05 years' experience of fabrication of heat exchangers and tube bundles. Contractor must submit a list of his clients to which equipment of similar nature has been supplied.
- iii. Contractor should have manufactured at least 05 numbers Shell & Tube Heat exchangers / U tube bundles/ Floating Head Tube Bundles. Contractor must submit a list of his clients to which heat exchangers of similar nature has been supplied.
- iv. Valid Copies of ASME U & R Stamp Certificates.
- v. Certified copy of valid PEC Registration.
- vi. Company profile, which may also include the list of all offices and service agencies across Pakistan, available equipment, tools, camp, office & workshop facilities, logistic equipment, cranes, lifters etc. It may be verified physically if OGDCL deem necessary.
- vii. Method statement for fabrication of tube bundles.
- viii. Contractor must submit verifiable copy of purchase orders / satisfactory performance certificate from clients where Contractor has provided shell & tube type heat exchangers, U-tube bundles, Floating Head Tube Bundles etc.
- ix. Contractor declared as black listed at PPRA website will not be entertained.

Contractor Qualification Criteria

Sr No	Evaluation Item	Description of Criteria	Max Marks	Min Marks	Remarks
1.	Contractor must have minimum 05 Years' experience in fabrication of heat exchangers and tube bundles.	Contractor should provide evidence of experience.	30	15	Each year : 03 marks
2.	TOR Compliance	Contractor must fully comply with TOR & submit method statement.	25	20	TOR compliance: 15 marks Method statement: 10 Marks
3.	Certifications	Contractor must provide valid copies of PEC Registration, ASME U & R-Stamp certificates.	15	15	PEC Registration: 05 marks, ASME U Stamp: 05 marks, R Stamp: 05 marks. Certificate status in process will not be considered.
4.	Material Compliance	Tubes: SA 179 SMLS (Eddy Current Tested) Tube Sheets: SA-516 GR.70N Baffles: SA-516 GR.70N Tie rods / spacers: Carbon Steel	15	15	Tubes: 06 Marks Tube sheets: 04 Marks Baffles: 03 Marks Tie rods: 02 Marks
5.	Company Profile	List of all offices and workshop facilities across Pakistan, available equipment, tools, logistic equipment, cranes, lifters etc.	15	10	Office & Workshop facilities: 04 Marks Equipment/Tools: 06 Marks Logistics/cranes/lifter: 05 marks

Total Marks = 100

Minimum Qualifying Marks= 75

2.0 FINANCIAL BID FORMAT

Sr. No.	Description	Qty Required	Unit Rate (PKR)	Total Amount (PKR)
1.1	Fabrication & supply of Tube Bundles including all material / accessories / consumables required for fabrication of tube bundles (as per attached drawings) including insertion of tube bundle, rebuild of eroded/damage area of shell (if any), Complete re-assembly and Surface preparation/painting of Heat Exchanger outer surface.	02 No.		
1.2	Services Cost for Amine Solution Coolers/Tube Bundles (QA/QC, PWHT, NDT & Hydro Testing, ASME R-Stamp etc.)	02 No.		
1.3	Loading/unloading and Transportation Cost for Amine Solution Coolers from/to Uch Gas Plant	01 No.		
1.4	Buy back value of scrape material	01 No.		
Total Cost {(1.1+1.2+1.3)-1.4}				
1.5	Tube Sheets (Material: SA 516 Gr. 70N) - optional	04 Nos.		
<p>Note:</p> <ul style="list-style-type: none"> i. Bid price must be quoted in PKR otherwise the bid will be rejected. ii. Bid price shall be inclusive of all taxes, duties, levies, charges etc., <p>Financial Evaluation will be carried out as complete package {(1.1+1.2+1.3)-1.4} as mentioned above. LPO will be awarded to technically qualified and financially lowest evaluated bidder .</p>				

3.0 Attachments:

Specification sheets & Drawings (11 pages)

Chromstede

HEAT EXCHANGER SPECIFICATION SHEET

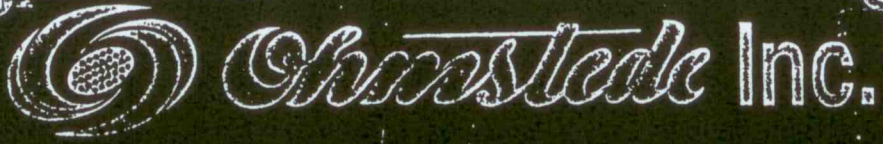
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Customer	ADVANTECK	Job No.	
Address		Ref. No.	
Plant Location		Proposal No.	B6-1169
Service of Unit	AMINE SOLUTION COOLER	Date	10/28/96 Rev.
Size	48"-576" Type NJN (Horiz)	Conn In	1 Parallel 1 Series
Surf/Unit	(Sq Ft/Sq Ft/Unit) 14768	Surf/Shell	(Sq Ft/Unit) 14768
PERFORMANCE OF ONE UNIT			
Fluid Allocation		Shell Side	Tube Side
Fluid Name		LEAN AMINE SOLN	COOLING WATER
Fluid Quantity, Total	Lb/Hr	1115424	4176000
Vapor (In/Out)			
Liquid		1115424	1115424
Steam			
Water			4176000
Noncondensable			
Temperature (In/Out)	°F	174 110	90 105
Specific Gravity	DENSITY	62.5	64.4
Viscosity	cp	1.7	4.2
Molecular Weight, Vapor			
Molecular Weight, Noncondensable			
Specific Heat	Btu/Lb °F	.89	.85
Thermal Conductivity	Btu Ft/Hr Sq Ft °F	.23	.22
Latent Heat	Btu/Lb @ °F		
Inlet Pressure	Psig	64.7 PSIA	64.7 PSIA
Velocity	Ft/S		4.2
Pressure Drop, Allow./Calc.	Psi	5.0 / 4.0	10.0 / 3.0
Fouling Resistance (Min.)		.0015	.002
Heat Exchanged	Btu/Hr	62400000	
Transfer Rate, Service	125.6	Clean	
CONSTRUCTION OF ONE SHELL			
Design/Test Pressure	Psig	150 / CODE	150 / CODE
Design Temperature	°F	250	160
No. Passes per Shell		DIVIDED FLOW	TWO
Corrosion Allowance	In.	.125	.125
Connections	In.	1-14"-150#RF	24"-150#RF
Size & Rating	Out	2-10"-150#RF	24"-150#RF
	Intermediate		
Tube No.	1184 OD 1	In. Thk (Min.) .075" Lqth. 48'	Pitch 1.25" / 4 30
Tube Type	BARE	Material	SA-214
Shell	SA-516-70 ID 48 OD	In. Shell Cover	(Integ) (Remov.)
Channel or Bonnet	SA-516-70	Channel Cover	SA-516-70 CARBON STEEL
Tubesheet - Stationary	SA-516-70	Tubesheet Floating	
Floating Head Cover		Impingement Protection	YES
Baffles - Cross	C.S. Type VERT. SEG %Cut (Dia./Area)	20	Spacing: C/C 24 Inlet In.
Baffles - Long		Seal Type	
Supports - Tube	U-Bend	Type	
Bypass Seal Arrangement		Tube - Tubesheet Joint	ROLLED
Expansion Joint		Type	
pv Inlet Nozzle	Bundle Entrance	Bundle Exit	
Gaskets - Shell Side		Tube Side	D.J.N.A.F.
- Floating Head			
Code Requirements	ASME SEC. VIII DIV. I W/STAMP	TEMA Class	R
Weight/Shell	74000	Filled with Water	111500
		Bundle	
Remarks:	(1) TWO UNITS ARE REQUIRED.		

*My Alan Sutterson k.
has provided this data
and which was not
initially available in
manual provided in
0075 before.*



NATL. BD. NO. 1509

CERTIFIED BY
OHMSTEDE INC.
CORPUS CHRISTI PLANT
SHELL



MAWP 150 PSI AT (121°C) 250°F
MDMT (-7°C) 20°F AT 150 PSI

TUBE

MAWP 156 PSI AT (71°C) 160°F
MDMT (-7°C) 20°F AT 156 PSI

S/N 658315-B
YEAR 1997

ITEM NO. 20-F-203 SIZE 48-576 TYPE FINN
P.O. NO. P18170002 AMINE SOLUTION COOLER
WT.DRY=34700 KG WET=52617 KG SURF. AREA=1372 SQ.M
CORR.ALLOW. SHELL=3.2 MM / TUBE=3.2 MM



NATL. BD. NO. 1508

CERTIFIED BY
OHMSTEDE INC.
CORPUS CHRISTI PLANT
SHELL



MAWP 150 PSI AT (121°C) 250°F
MDMT (-7°C) 20°F AT 150 PSI

TUBE

MAWP 156 PSI AT (71°C) 160°F
MDMT (-7°C) 20°F AT 156 PSI

S/N 658315-A
YEAR 1997

ITEM NO. 20-F-203 SIZE 48-576 TYPE FINN
P.O. NO. P18170002 AMINE SOLUTION COOLER
WT.DRY=34700 KG WET=52617 KG SURF. AREA=1372 SQ.M
CORR.ALLOW. SHELL=3.2 MM / TUBE=3.2 MM

AMINE COOLER

OHMSTEDE, INC.

(5)



P.O. no: P181/0002 : Job no: 658315
 Date: 1/ 7/97 : By: SP : Item no: 10-E-203 & 20-E-203
 Customer: PETROSIN : HORIZONTAL
 Service: AMINE SOLUTION COOLER : FIXED T.S.
 2. Shells: 1 Par. 1 Ser. 1 : Surface Sq. Ft.: 14768. Ea. 14768. Total
 Size: 48 X 576 Type: N J N

1184 Tubes X 1.00 O.D. X .0750 (M.W.) THK X 576 In. Lg. 1.250 TRI Pitch
 Tubes: SA-214
 Shell: SA-516-70
 Channel & Cover: SA-516-70 & SA-516-70 NORMALIZED

Tubesheets: SA-516-70 NORMALIZED
 Cross Baffles: SA-516-70 No. 23 Pitch 24.000 Cut 20.00% SGL SEG VERT

Code requirements: SHELL SECT VIII STAMP YES CHANNEL SECT VIII STAMP YES
 Natl. Board # YES Canadian Rec. # NO Tema R

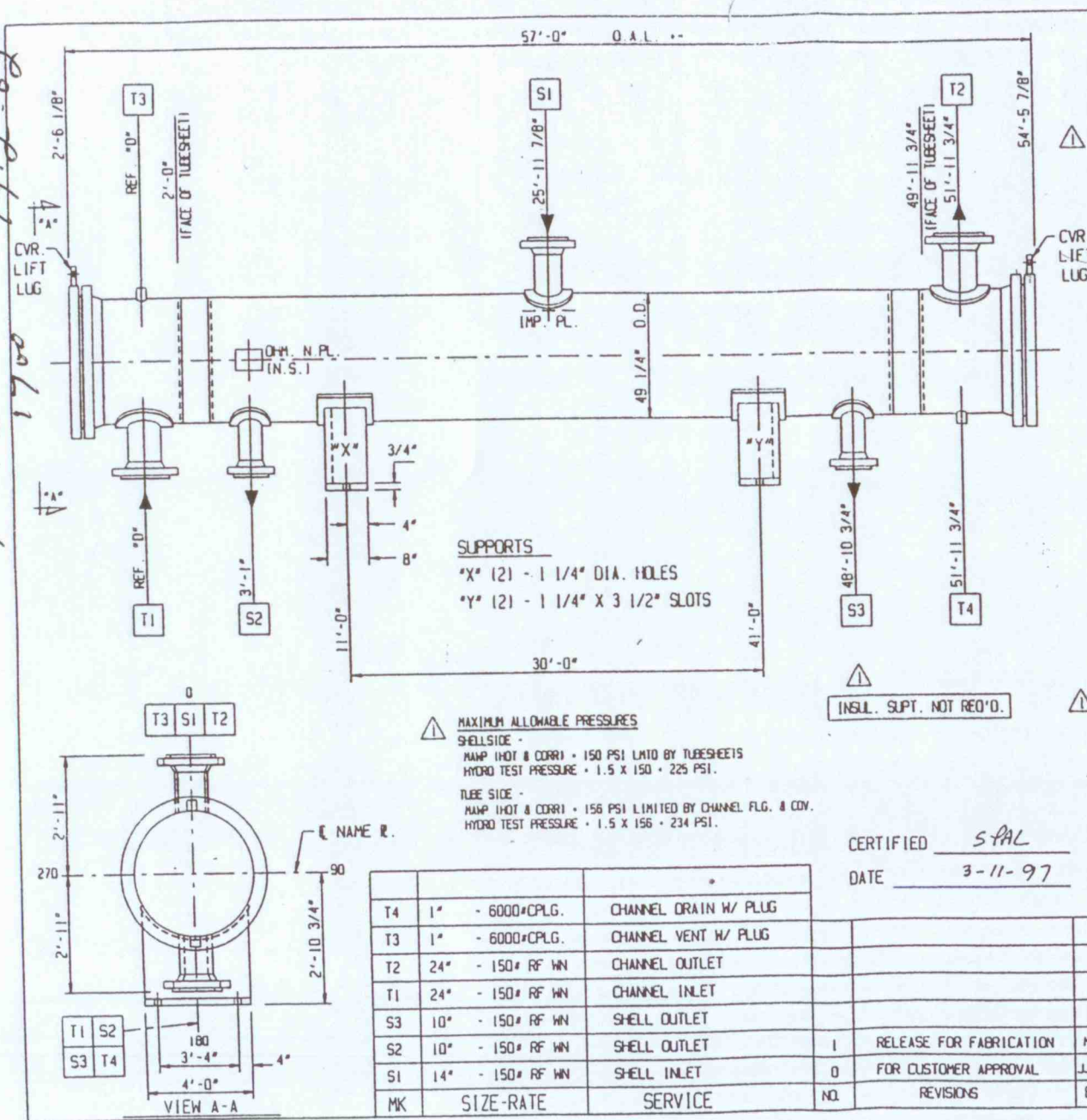
Weight Ea Dry:	76500.	Wet	116000.		
Design Pressure psi		Shell	150	Tubes	150
Test Pressure psi			225		234
Design Temp/MDMT degF	250 (121°C) / 20 (-7°C)			160 (71°C) / 20 (-7°C)	
Corrosion Allowance			.1250		.1250
No. of Passes			DIVIDED FLOW		1
Radiograph			FULL		SPOT
Stress Relieve degF			1150 (5)		1150 (5)
Paint:	SANDBLAST AND PAINT PER DOC.# 1000-PF-A001				

- Remarks:
- Two identical units are required.
 - Tubes are roller expanded to tubesheets.
 - Gaskets are steel Double Jacketed Graphite filled.
 - SPARES: 10 % studs & nuts and two (2) sets gasket for EACH unit is required.
 - All Carbon Steel welded parts are stress relieved.

SKETCH Supports: Std. Special

Label	Size & Type	NOZZLES			Weld Pad	Comment
		Bore x Sch	Proj			
1 SH1 INLET	14.00" - 150#RF WN	13.000xXH	35.000	19.000x .500	S1	
2 SH1 OUTLET	10.00" - 150#RF WN	9.750xXH	35.000	14.750x .500	S2	
3 SH1 OUTLET	10.00" - 150#RF WN	9.750xXH	35.000	14.750x .500	S3	
11 Fch INLET	24.00" - 150#RF WN	23.000xXH	35.000	28.000x .500	T1	
17 Rch OUTLET	24.00" - 150#RF WN	23.000xXH	35.000	28.000x .500	T2	

20-2-61
 19-2-02
 67553m



DESIGN DATA		SHELL	TUBE
DESIGN PRESSURE P.S.I.G.	150	150	
TEST PRESSURE P.S.I.G.	225	234	
DESIGN TEMPERATURE DEG. F(C) (MAX/MIN)	250(121)/201(-7)	160(71)/201(-7)	
CORROSION ALLOWANCE	.1250"	.1250"	
NUMBER OF PASSES	DIVIDED FLOW	1	
RADIOGRAPHIC EXAMINATION	FULL	SPOT	
HEAT TREAT REQUIRED	YES	YES	

ESTIMATED WEIGHTS, LBS.
 DRY: 76500 BUNDLE: ----- NET: 116000

SPECIFICATIONS
 ASME CODE SECT. VIII, DIV. 1, 1995 ED. 1995 ADD. (STAMP YES)
 TEMA CLASS R and API-660 APPLIES
 NATIONAL BOARD REGISTRATION REQUIRED
 CUSTOMER SPECS : 1000-PF-A001, ANNEXURE 71

MATERIAL
 CHANNEL: SA-516-70
 SHELL: SA-516-70
 TUBESHEETS: SA-516-70N
 BAFFLES: SA-516-70
 TUBES: SA-214
 (1184) 1" O.D. X .075" (M.W.) X 48'-0" LG.
 TUBE PITCH 1 1/4" SURFACE 14768 SQ. FT.

GENERAL NOTES
 ALL BOLT HOLES TO STRADDLE NATURAL CENTER LINES.
 BODY FLANGE GASKETS: .1250" THK. STL. DOUBLE JACKETED W/ GRAPHITE FILLER
 10% STUDS & NUTS AND TWO (2) SETS OF GASKETS FOR EACH UNIT IS REQUIRED FOR SPARE.

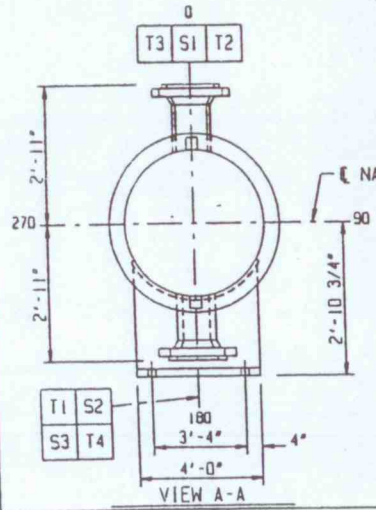
PAINT (PER DOC. # 1000-PF-A001) :
 SANDBLAST ALL EXT. C. STL. SURFACES TO A "NEAR-WHITE" METAL FINISH PER SSPC-SP-10. PRIME WITH ONE (1) COAT OF INORGANIC ZINC SILICATE TO 75 MICRONS D.F.T. FINISH WITH ONE (1) COAT OF ALUMINIUM SILICONE TO 25 MICRONS D.F.T. (TOTAL D.F.T. TO BE 90 - 100 MICRONS) FINISH COLOR TO BE SILVER. CARE SHALL BE TAKEN TO ASSURE THAT BOLT HOLES, FLANGES FACES OUTSIDE THE GASKET SURFACES, ETC. SHALL RECEIVE THE REQUIRED COATINGS.
 TYPE UNIT : N J N SIZE : 48-576

CERTIFIED S.PAL
 DATE 3-11-97

CUSTOMER: PETROSIN
 OHMSTEDE JOB NO.: 658315
 P.O. NO.: P181/0002
 ITEM NO.: 10-E-203/20-E-203 121 UNITS REQ'D.
 SERVICE : AMINE SOLUTION COOLER

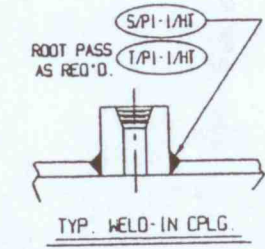
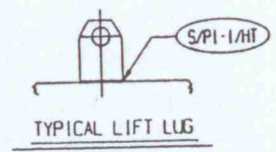
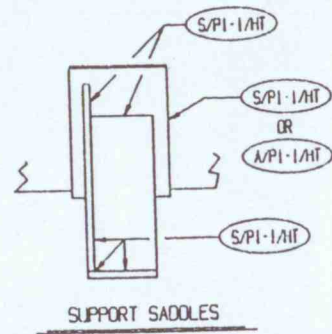
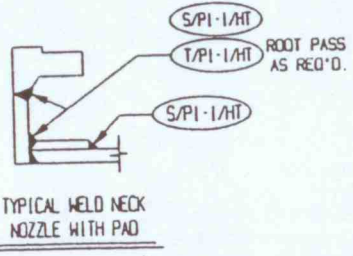
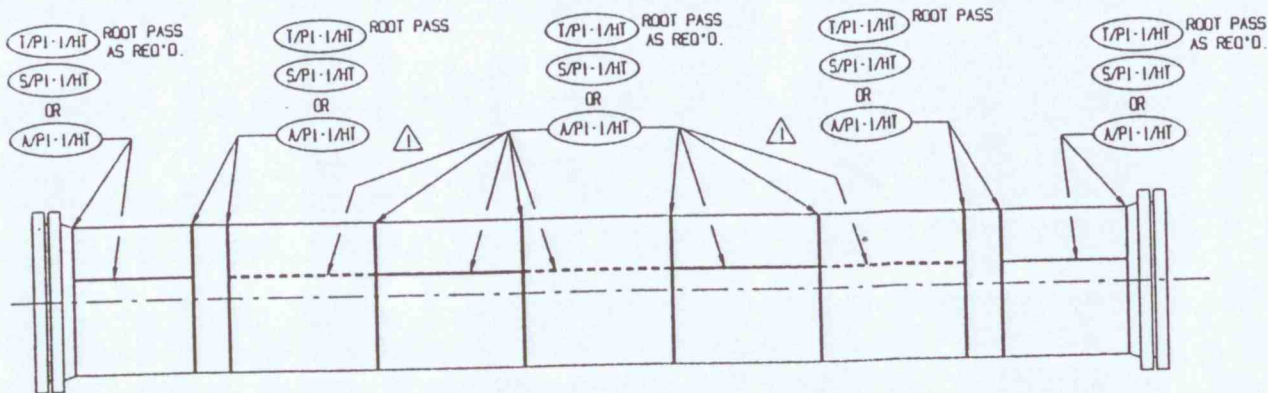
MAXIMUM ALLOWABLE PRESSURES
SHELLSIDE -
 MAMP (HOT & COLD) - 150 PSI LMTD BY TUBESHEETS
 HYDRO TEST PRESSURE - 1.5 x 150 = 225 PSI.
TUBE SIDE -
 MAMP (HOT & COLD) - 156 PSI LMTD BY CHANNEL FLG. & CVD.
 HYDRO TEST PRESSURE - 1.5 x 156 = 234 PSI.

SUPPORTS
 X (2) - 1 1/4" DIA. HOLES
 Y (2) - 1 1/4" X 3 1/2" SLOTS



NO.	SIZE-RATE	SERVICE	NO.	REVISIONS	BY	CHK.	DATE	CHK.
T4	1" - 6000#CPLG.	CHANNEL DRAIN W/ PLUG						
T3	1" - 6000#CPLG.	CHANNEL VENT W/ PLUG						
T2	24" - 150# RF WN	CHANNEL OUTLET						
T1	24" - 150# RF WN	CHANNEL INLET						
S3	10" - 150# RF WN	SHELL OUTLET						
S2	10" - 150# RF WN	SHELL OUTLET	1	RELEASE FOR FABRICATION	MS	DC	3-10-97	
S1	14" - 150# RF WN	SHELL INLET	0	FOR CUSTOMER APPROVAL	JSS	DC	1-9-97	
MK	SIZE-RATE	SERVICE	NO.	REVISIONS	BY	CHK.	DATE	CHK.

ASSEMBLY AND SPECIFICATIONS			
OHMSTEDE	DRAWING NO. 658315	SHEET NO. 1	REV. 1



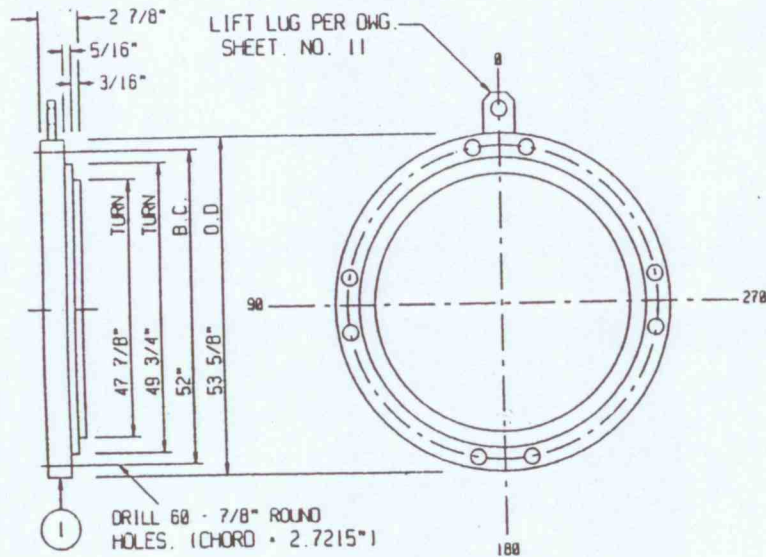
					CUSTOMER: PETROSIN
					OHMSTEDE JOB NO.: 658315
					P.O. NO.: P181/0002
					ITEM NO.: 10-E-203/20-E-203 (2) UNITS REQ'D.
					SERVICE: AMINE SOLUTION COOLER
1	RELEASE FOR FABRICATION	MS	OC	3-10-97	WELD MAP
0	FOR CUSTOMER APPROVAL	JGS	OC	1-9-97	
NO.	REVISIONS	BY	CHK.	DATE CHK.	OHMSTEDE
					DRAWING NO. 658315
					SHEET NO. 2
					REV. 1

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COVER NOTES:

11 MACHINE ALL COVER GASKET SURFACES TO 125 - 250 AARH.

* MACHINE GASKET FACING AFTER ALL HEAT TREATMENT. FOR FLANGE DETAILS SEE DWG. SHT. #13.

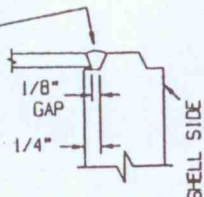


DRILL 60 - 7/8" ROUND HOLES. (CHORD = 2.7215")

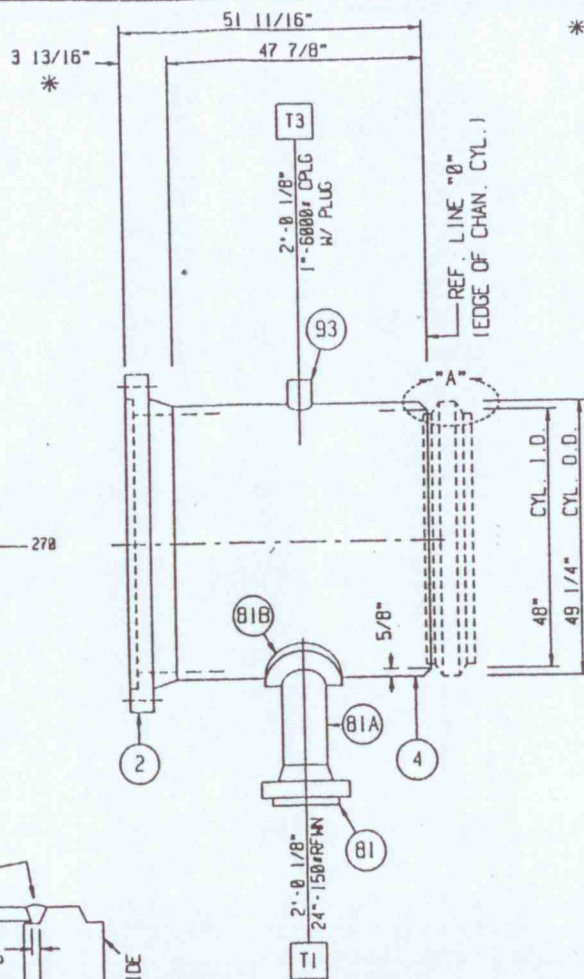
CHANNEL-COVER DETAIL

SHOP NOTE:

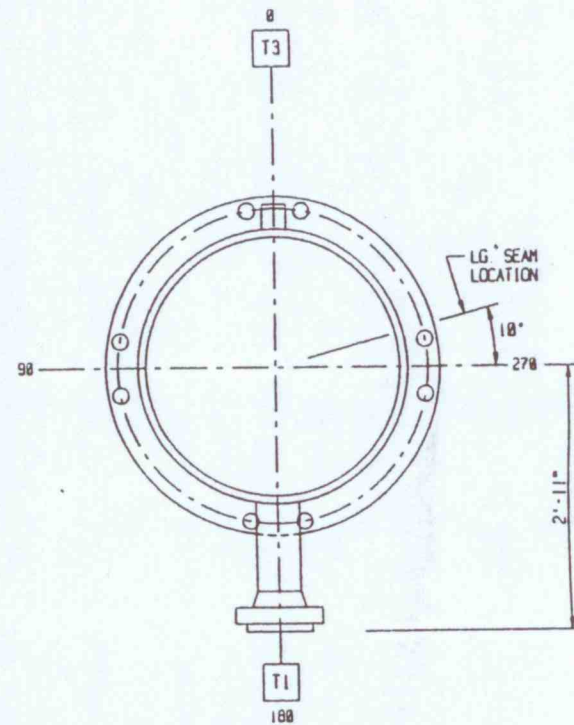
ALL SURFACES LEFT EXPOSED AFTER ATTACHMENT OF TUBESHEET & THE TUBESHEET ATTACHMENT WELD SHALL BE H.T. EXAMINED PER UG-93 (d) 131 AFTER WELDING IS COMPLETE.



DETAIL "A"



CHANNEL SIDE VIEW



CHANNEL END VIEW

FRONT CHANNEL WEIGHT = 5,850 LBS.

NOTES:

- 11 ALL BOLT HOLES TO STRADDLE CENTER LINES.
- 21 FOR WELD & BEVEL DETAILS SEE DWG. SHT. #14.
- 31 SPOT RADIOGRAPHY.
- 41 POST-WELD HEAT TREAT CHANNEL:
 - A1 HEAT FROM 800 deg.F TO 1150 deg.F AT 400 deg.F PER HOUR
 - B1 HOLD AT 1150 deg.F FOR 1.00 HOUR (MIN).
 - C1 COOL FROM 1150 deg.F TO 800 deg.F AT 500 deg.F PER HOUR
 - D1 FURTHER COOLING MAY BE IN STILL AIR.
 - E1 AN OVEN RECORDING CHART IS REQUIRED.

NO.	REVISIONS	BY	CHK.	DATE CHK.
1	RELEASE FOR FABRICATION	MS	DC	3-18-97
2	FOR CUSTOMER APPROVAL	JSS	DC	1-14-97

CUSTOMER: PETROSIN
 OHMSTEDE JOB NO.: 658315
 P.O. NO.: P181/0002
 ITEM NO.: 10-E-203/20-E-203
 SERVICE: AMINE SOLUTION COOLER

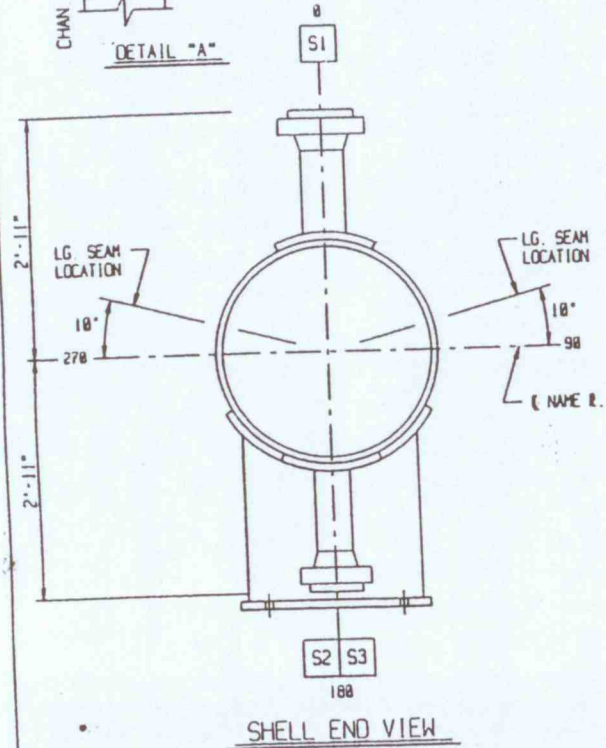
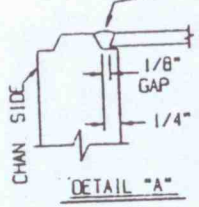
121 UNITS REQ'D.

FRONT CHANNEL DETAILS			
OHMSTEDE	DRAWING NO. 658315	SHEET NO. 3	REV. 1

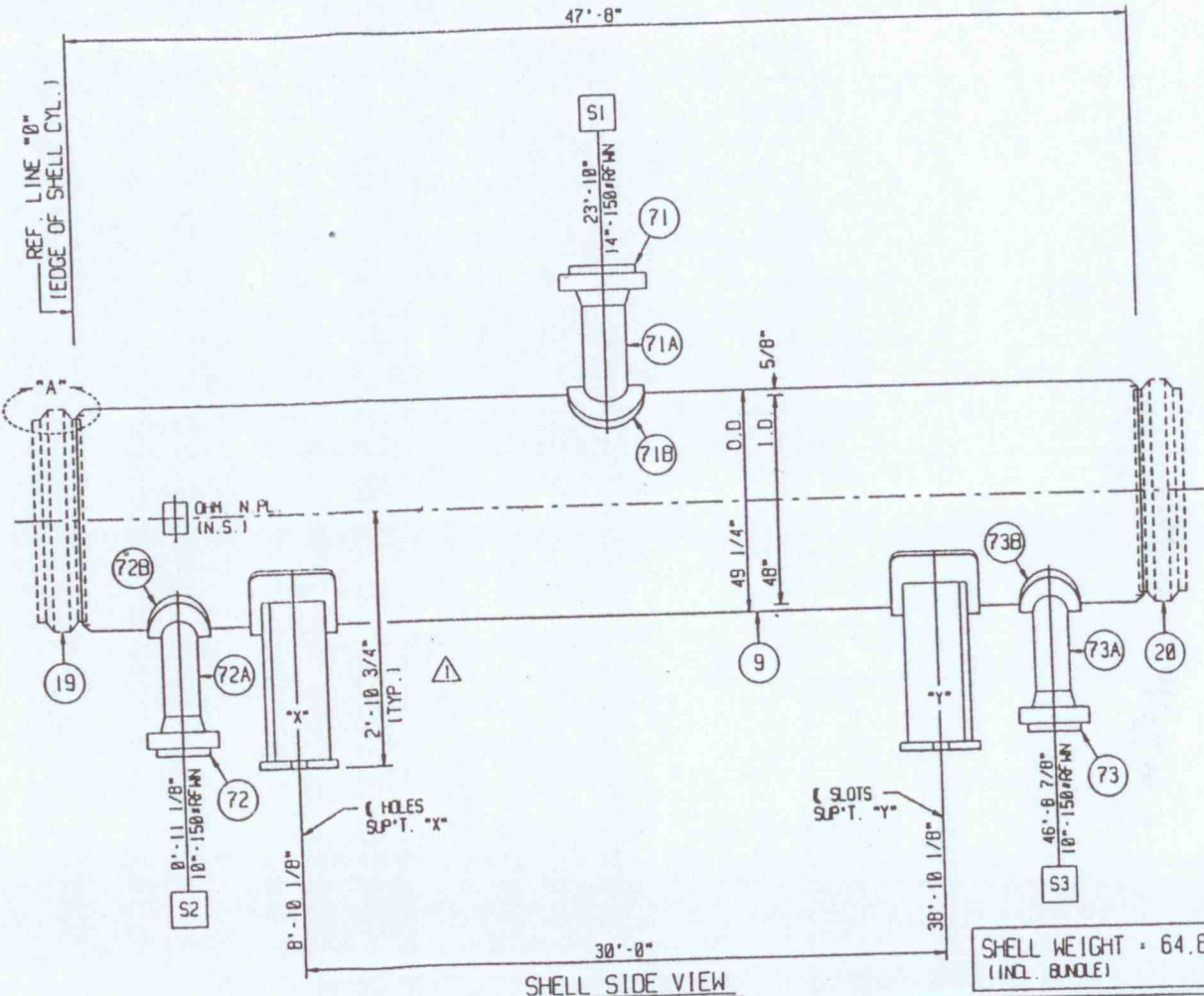
Page 106

Page 110

SHOP NOTE:
 ALL SURFACES LEFT EXPOSED AFTER ATTACHMENT OF TUBESHEET & THE TUBESHEET ATTACHMENT WELD SHALL BE H.T. EXAMINED PER UG-93 (d) 131 AFTER WELDING IS COMPLETE.



SHELL END VIEW



SHELL SIDE VIEW

SHELL WEIGHT = 64,800 LBS.
 (INCL. BUNDLE)

NOTES:

- 1) ALL BOLT HOLES TO STRADDLE CENTER LINES.
- 2) FOR WELD & BEVEL DETAILS SEE DWG. SHT. #14.
- 3) GRIND ALL INSIDE WELDS FLUSH.
- 4) FULL RADIOGRAPHY.
- 5) POST-WELD HEAT TREAT SHELL:
 - A) HEAT FROM 800 deg.F TO 1150 deg.F AT 400 deg.F PER HOUR
 - B) HOLD AT 1150 deg.F FOR 1:00 HOUR (MIN).
 - C) COOL FROM 1150 deg.F TO 800 deg.F AT 500 deg.F PER HOUR
 - D) FURTHER COOLING MAY BE IN STILL AIR.
 - E) AN OVEN RECORDING CHART IS REQUIRED.

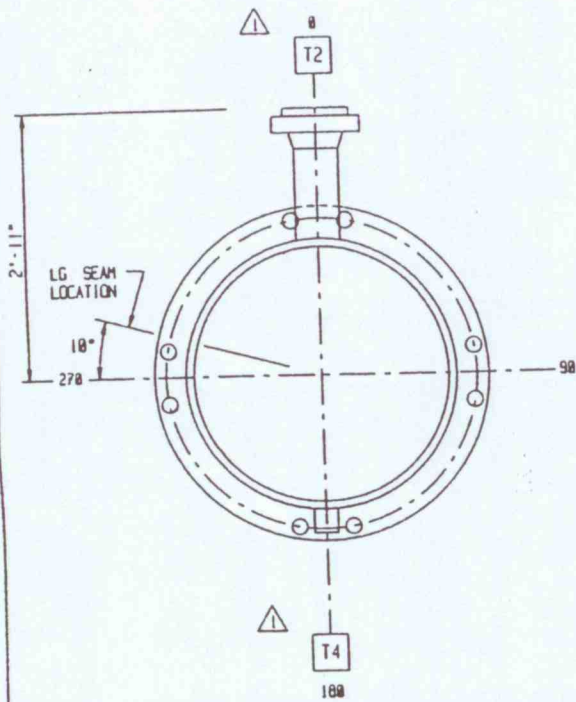
NO.	REVISIONS	BY	CHK.	DATE OK.
1	RELEASE FOR FABRICATION	HS	DC	3-18-97
2	FOR CUSTOMER APPROVAL	JUSS	DC	1-14-97

CUSTOMER: PETROSIN
 OHMSTEDE JOB NO.: 658315
 P.O. NO.: P181/0002
 ITEM NO.: 10-E-203/20-E-203
 SERVICE: AMINE SOLUTION COOLER

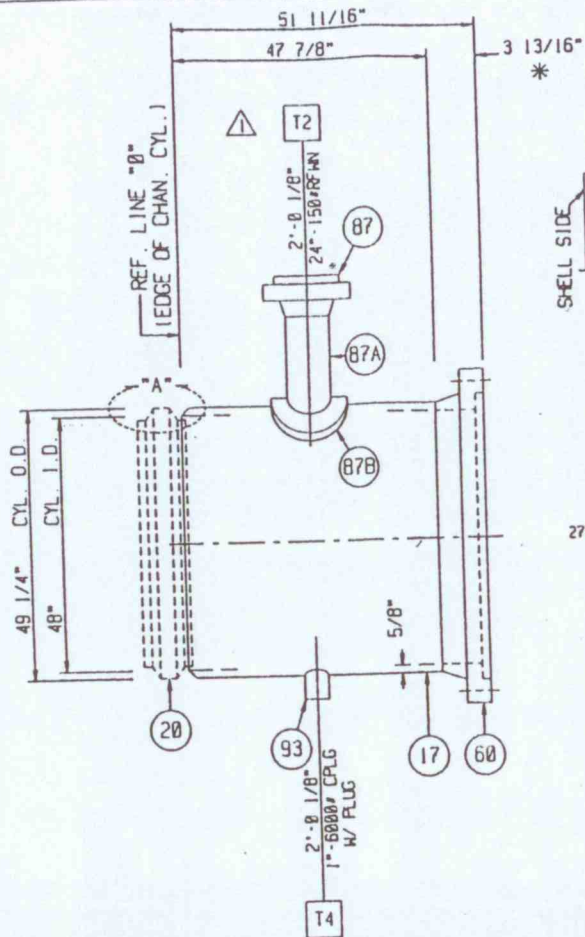
SHELL DETAILS			
OHMSTEDE	DRAWING NO. 658315	SHEET NO. 4	REV. 1

38

* MACHINE GASKET FACING AFTER ALL HEAT TREATMENT.
FOR FLANGE DETAILS SEE DWG. SHT. #13.

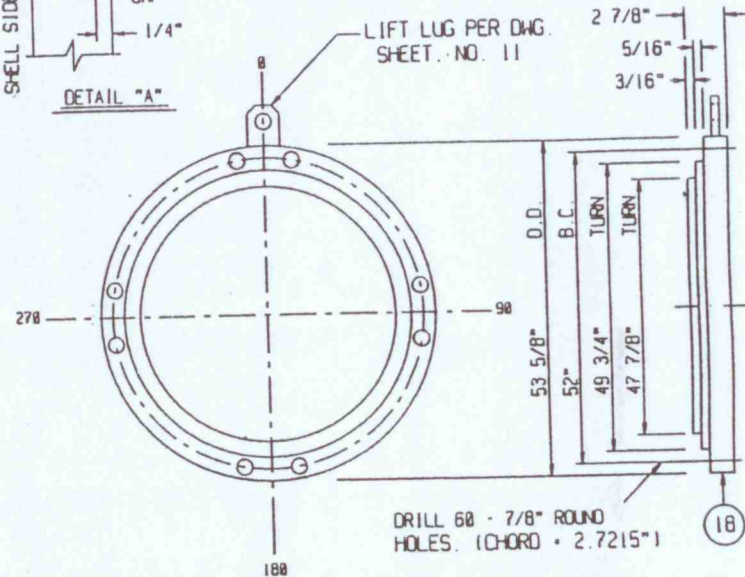
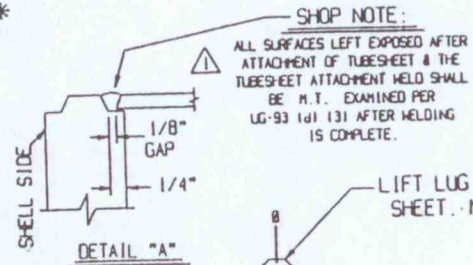


CHANNEL END VIEW



CHANNEL SIDE VIEW

COVER NOTES:
1) MACHINE ALL COVER GASKET SURFACES TO 125 - 250 AARH.



CHANNEL-COVER DETAIL

NOTES:

- 1) ALL BOLT HOLES TO STRADDLE CENTER LINES.
- 2) FOR WELD & BEVEL DETAILS SEE DWG. SHT. #14.
- 3) SPOT RADIOGRAPHY.
- 4) POST-WELD HEAT TREAT CHANNEL:
 - A) HEAT FROM 800 deg.F TO 1150 deg.F AT 400 deg.F PER HOUR
 - B) HOLD AT 1150 deg.F FOR 1.00 HOUR (MIN).
 - C) COOL FROM 1150 deg.F TO 800 deg.F AT 500 deg.F PER HOUR
 - D) FURTHER COOLING MAY BE IN STILL AIR.
 - E) AN OVEN RECORDING CHART IS REQUIRED.

REAR CHANNEL WEIGHT = 5.850 LBS.

NO.	REVISIONS	BY	CHK.	DATE	OK.
1	RELEASE FOR FABRICATION	MS	DC	3-10-97	
2	FOR CUSTOMER APPROVAL	JES	DC	1-14-97	

CUSTOMER: PETROSIN.
OHMSTEDE JOB NO.: 658315
P.O. NO.: P181/0002
ITEM NO.: 10-E-203/20-E-203
SERVICE: AMINE SOLUTION COOLER

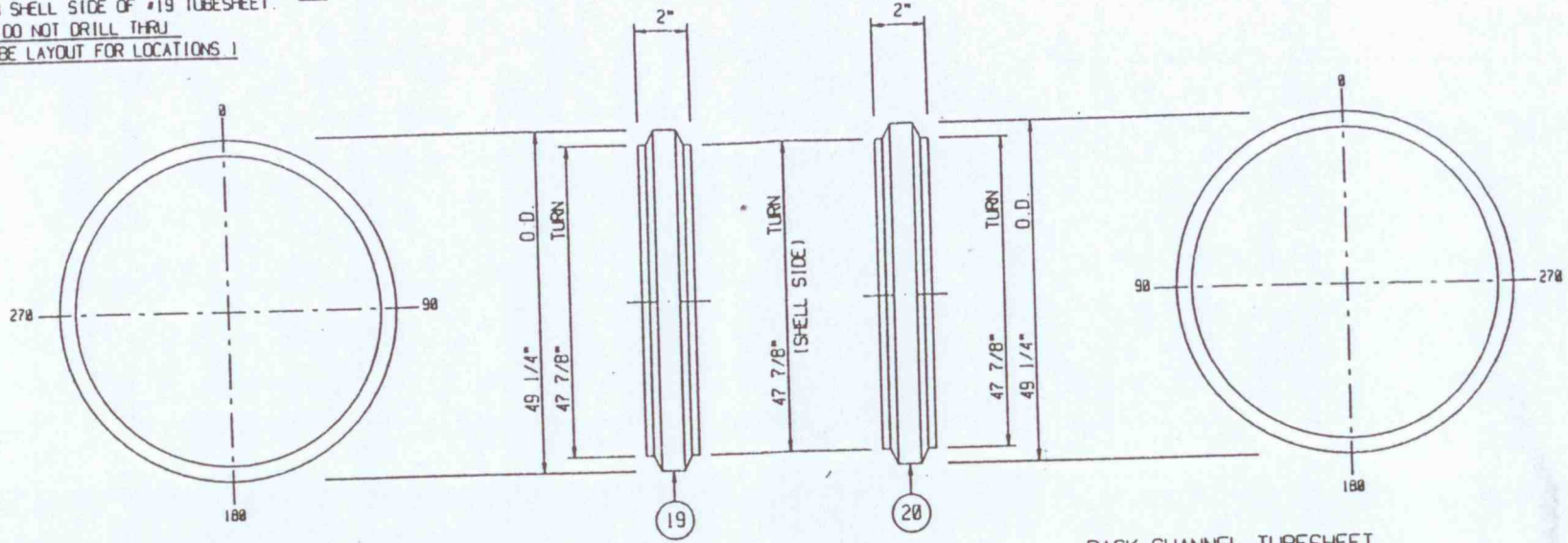
REAR CHANNEL DETAILS

OHMSTEDE	DRAWING NO.	SHEET NO.	REV.
	658315	5	1

(2) UNITS REQ'D.

P03/06

DRILL & TAP 15/16" DEEP FOR 8 - 5/8" DIA.
TIE RODS ON SHELL SIDE OF #19 TUBESHEET.
DO NOT DRILL THRU
(SEE TUBE LAYOUT FOR LOCATIONS)

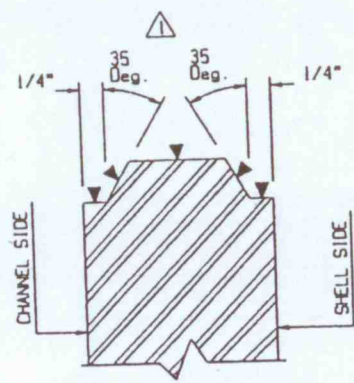


FRONT CHANNEL TUBESHEET

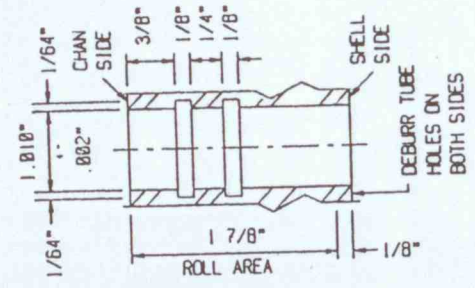
BACK CHANNEL TUBESHEET

SHOP NOTE:

ALL SURFACES MARKED THIS
SHALL BE H.T. EXAMINED
IN ACCORDANCE WITH LG-93
(d) 131 AFTER MACHINING.



TUBESHEET DETAIL
(TYP. BOTH TUBESHEETS)



TUBE HOLE GROOVING DETAIL

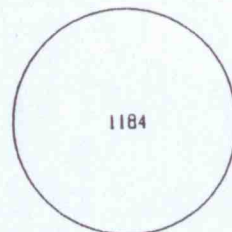
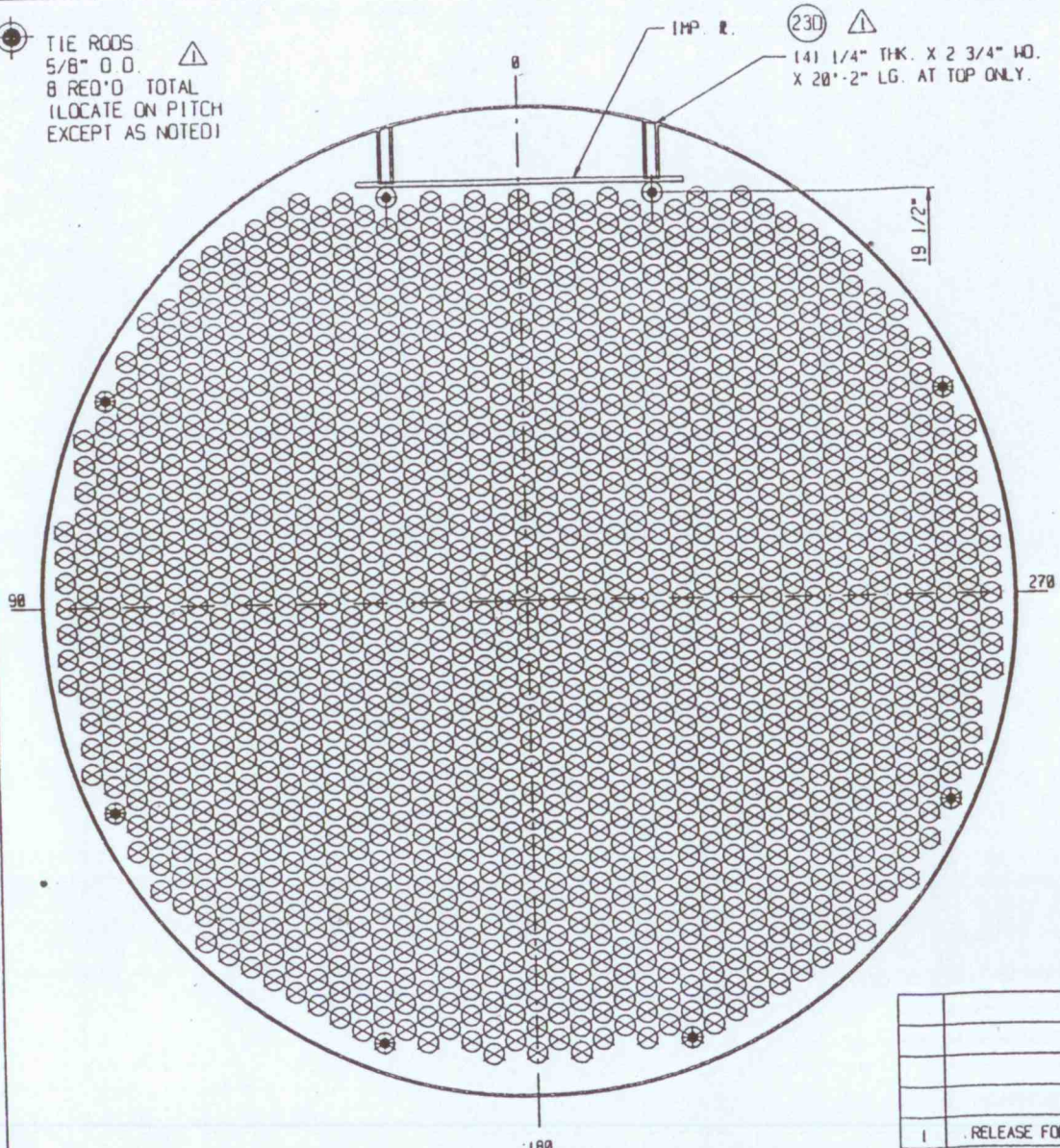
P07/10

				CUSTOMER: PETROSIN				
				OHMSTEDE JOB NO.: 658315				
				P.O. NO.: P181/0002				
				ITEM NO.: 10-E-203/20-E-203 121 UNITS REQ'D.				
				SERVICE: AMINE SOLUTION COOLER				
				TUBESHEET DETAILS				
1	RELEASE FOR FABRICATION	HS	DC	3-18-97	OHMSTEDE	DRAWING NO. 658315	SHEET NO. 6	REV 1
0	FOR CUSTOMER APPROVAL	JUSS	DC	1-14-97				
NO.	REVISIONS	BY	CHK.	DATE CHK				

P04/06

P08/10

TIE RODS
5/8" O.D.
8 REQ'D TOTAL
(LOCATE ON PITCH
EXCEPT AS NOTED)



TUBE DISTRIBUTION

NOTES:

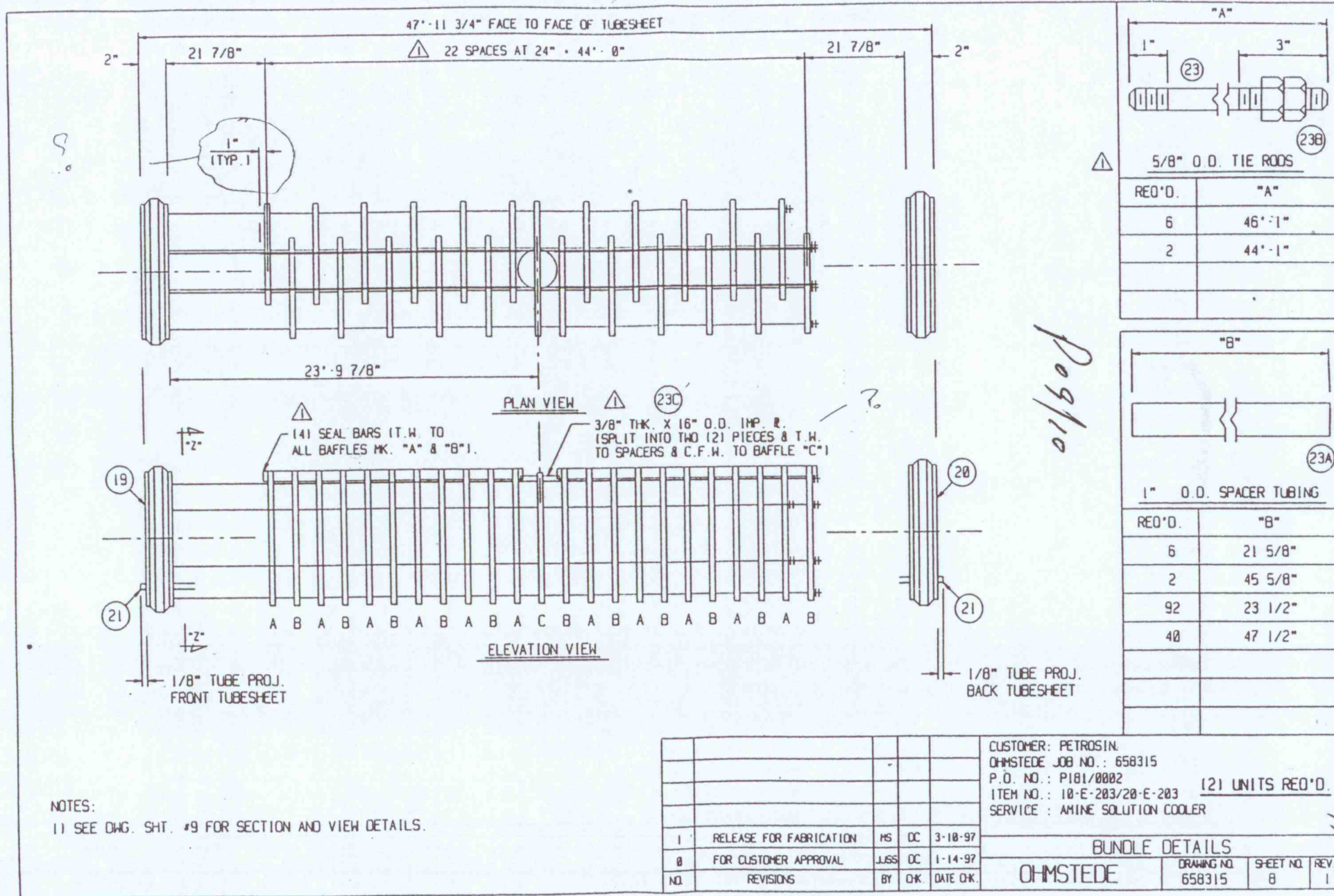
- 1) DRILL AND REAM TUBE HOLES IN TUBESHEETS TO 1.0100" ± .002" DIA. FOR 1184 - 1" O.D. TUBES.
- Δ 2) TUBE PITCH = 1 1/4" 30° TRIANGLE.
- 3) NUMBER OF PASSES = 1
- 4) SEE DRAWING SHEET NO. 6 FOR TUBE HOLE GROOVING DETAILS.
- 5) BAFFLE O.D. = 47 3/4"
- 6) O.T.L. = 47 1/4"

VIEW LOOKING AT SHELL SIDE OF NO. 19 TUBESHEET

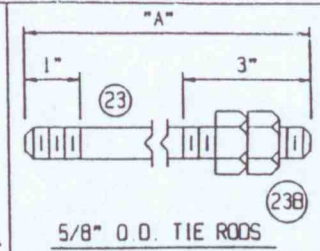
				CUSTOMER: PETROSIN				
				OHMSTEDE JOB NO.: 658315				
				P.O. NO.: P181/0002				
				ITEM NO.: 10-E-203/20-E-203				
				SERVICE: AMINE SOLUTION COOLER				
				(2) UNITS REQ'D.				
				TUBE LAYOUT				
1	RELEASE FOR FABRICATION	MS	DC	3-10-97	OHMSTEDE	DRAWING NO. 658315	SHEET NO. 7	REV. 1
8	FOR CUSTOMER APPROVAL	JSS	DC	1-14-97				
NO.	REVISIONS	BY	CHK.	DATE CHK.				

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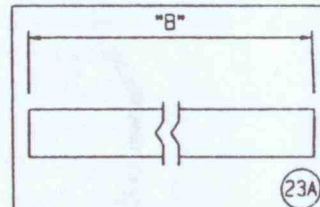
Pos/ob



Pos/10



REQ'D.	"A"
6	46'-1"
2	44'-1"

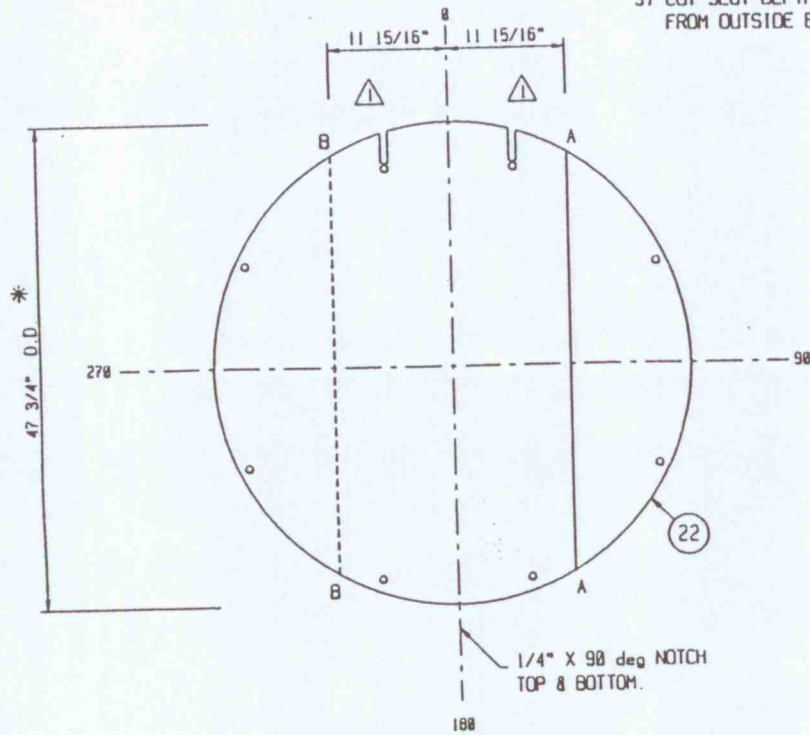


REQ'D.	"B"
6	21 5/8"
2	45 5/8"
92	23 1/2"
40	47 1/2"

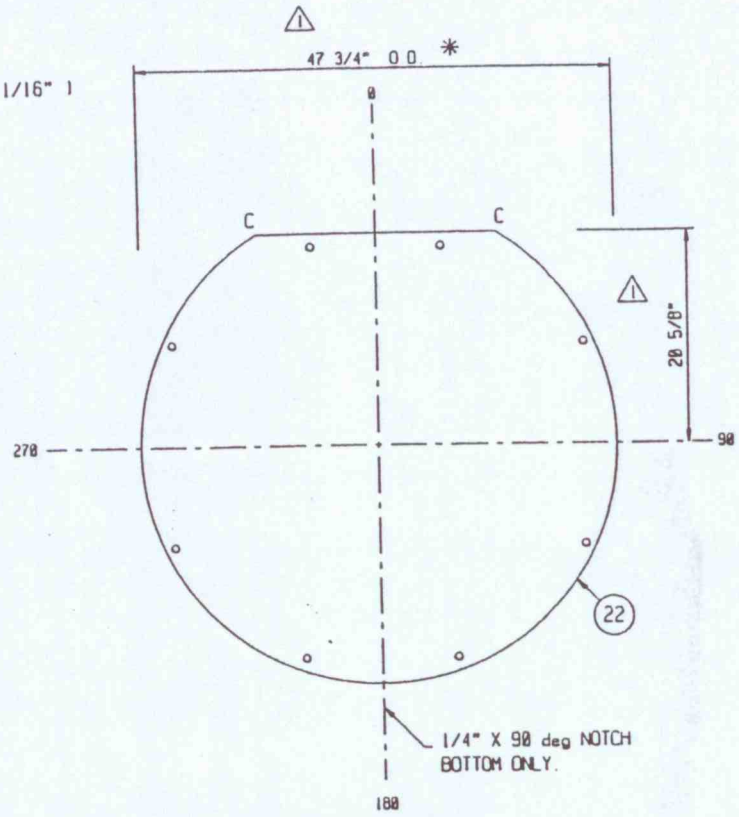
NOTES:
 1) SEE DWG. SHT. #9 FOR SECTION AND VIEW DETAILS.

				CUSTOMER: PETROSIN	
				OHMSTEDE JOB NO.: 658315	
				P.O. NO.: P181/0002	
				ITEM NO.: 10-E-203/20-E-203 (21) UNITS REQ'D.	
				SERVICE: AMINE SOLUTION COOLER	
BUNDLE DETAILS					
1	RELEASE FOR FABRICATION	HS	DC	3-10-97	OHMSTEDE
0	FOR CUSTOMER APPROVAL	JUSS	DC	1-14-97	
NO.	REVISIONS	BY	CHK	DATE CHK.	DRAWING NO. 658315
					SHEET NO. 8
					REV 1

- △ SEAL BAR NOTES:
 1) CUT SLOTS IN BAFFLES ONLY.
 2) CUT SLOTS 5/16" WIDE.
 3) CUT SLOT DEPTHS (SEAL BAR WIDTH + 1/16")
 FROM OUTSIDE EDGE OF SLOT.



VIEW ZZ OF BAFFLES
 1/2" THK.
 11 - REQ'D. CUT AA
 11 - REQ'D. CUT BB



VIEW ZZ OF BAFFLES
 1/2" THK.
 1 - REQ'D. CUT CC

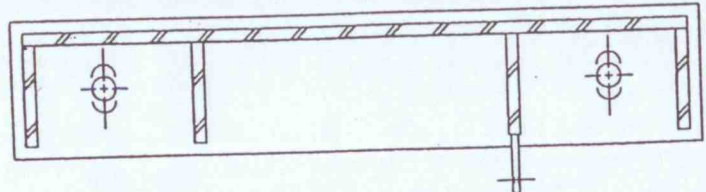
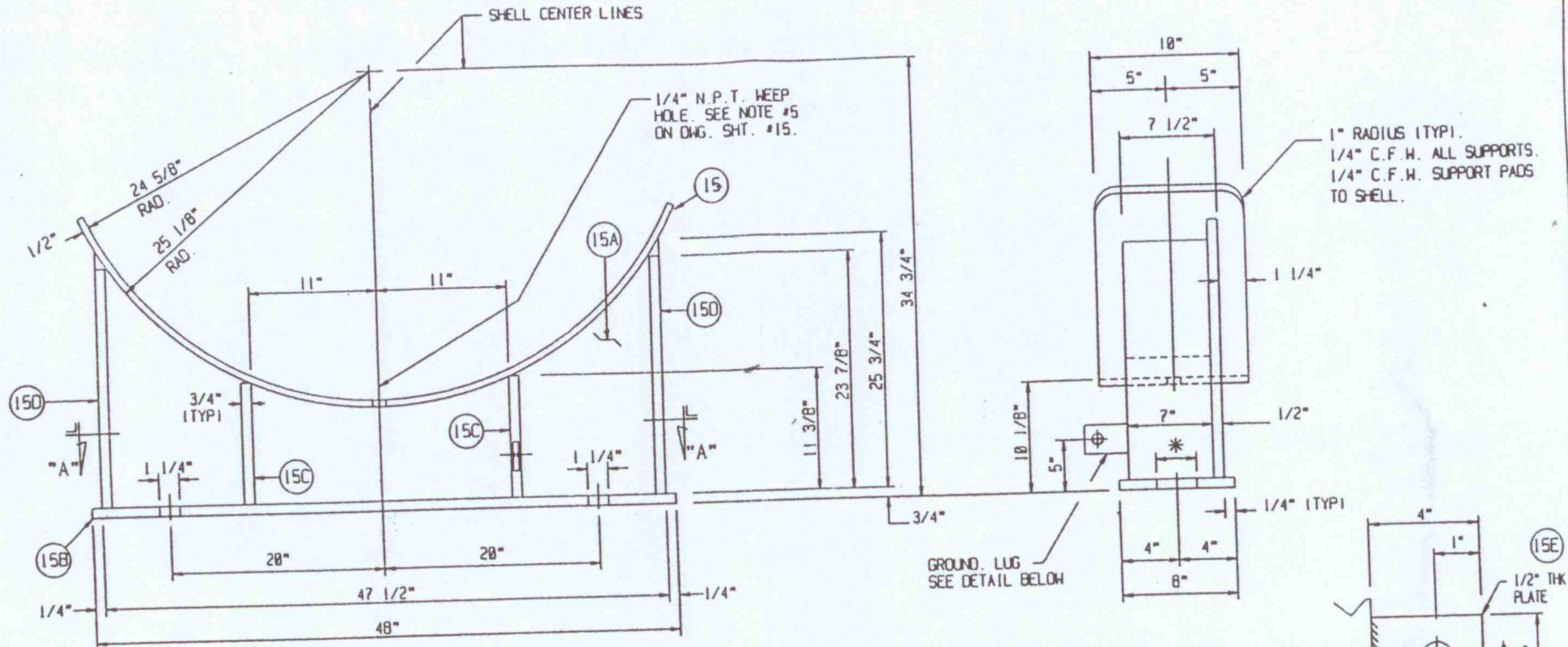
- △ NOTES:
 1) DRILL TUBE HOLES IN BAFFLES 1 1/4" DIA. & DEBURR.
 2) DRILL TIE ROD HOLES 1 1/16" DIA.
 SEE TUBE LAYOUT FOR LOCATION.
 3) RADIUS ALL CORNERS ON BAFFLE CUTS.
 * 4) CHECK SHELL I.D. BEFORE MACHINING BAFFLE O.D.
 5) MACHINE O.D. OF BAFFLES TO 250 AARH.

1	RELEASE FOR FABRICATION	MS	DC	3-18-97
2	FOR CUSTOMER APPROVAL	JLSS	DC	1-14-97
NO.	REVISIONS	BY	CHK.	DATE OK

CUSTOMER: PETROSIN
 OHMSTEDE JOB NO.: 658315
 P.O. NO.: P181/0002
 ITEM NO.: 18-E-203/20-E-203 121 UNITS REQ'D.
 SERVICE: AMINE SOLUTION COOLER

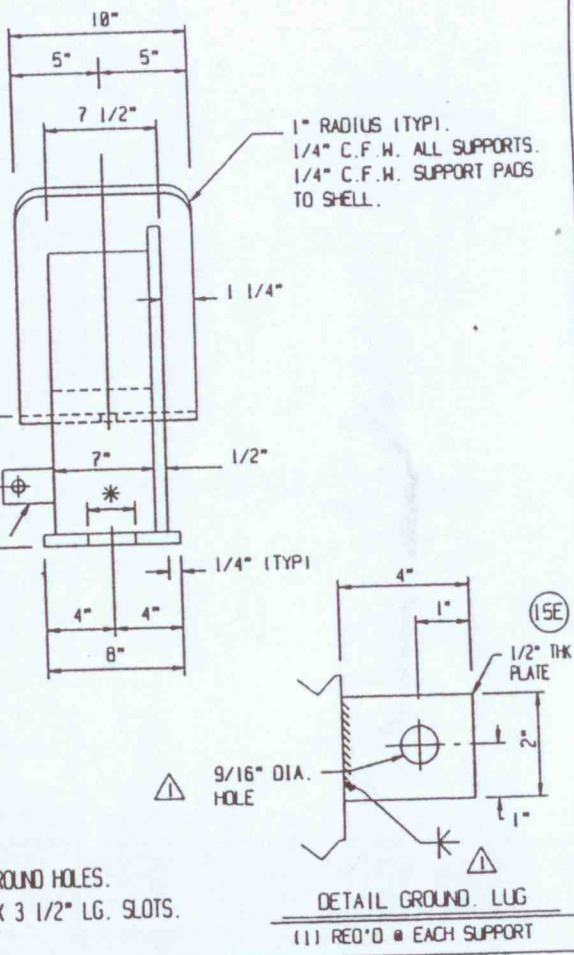
BAFFLE DETAILS			
OHMSTEDE	DRAWING NO. 658315	SHEET NO. 9	REV 1

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SECTION "A-A"

* ONE REQUIRED MARKED "X" W/ (2) 1/4" ROUND HOLES.
 ONE REQUIRED MARKED "Y" W/ (2) 1/4" X 3 1/2" LG. SLOTS.



1" RADIUS (TYP).
 1/4" C.F.W. ALL SUPPORTS.
 1/4" C.F.W. SUPPORT PADS TO SHELL.

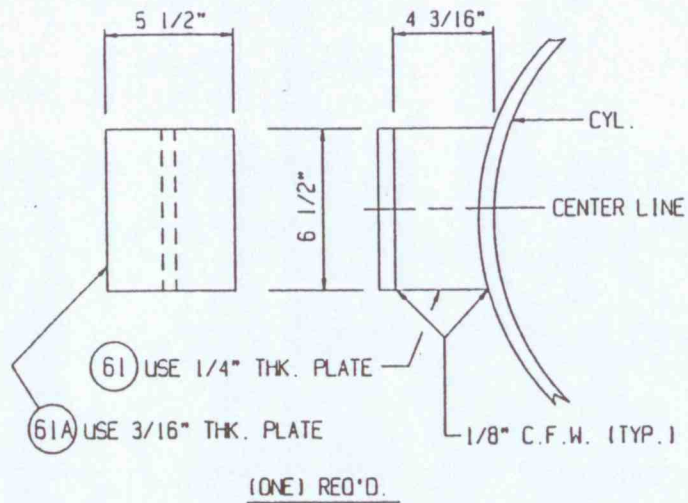
GROUND LUG
 SEE DETAIL BELOW

CUSTOMER: PETROSIN
 OHMSTEDE JOB NO.: 658315
 P.O. NO.: P181/0002
 ITEM NO.: 10-E-203/20-E-203
 SERVICE: AMINE SOLUTION COOLER

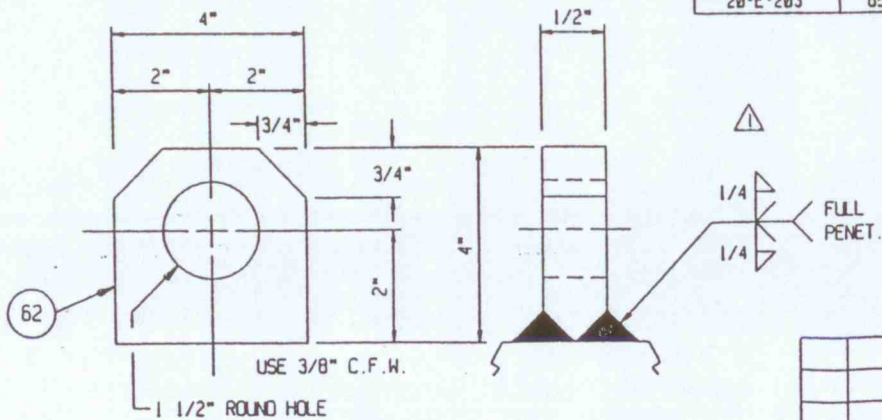
(2) UNITS REQ'D.

NO.	REVISIONS	BY	CHK.	DATE OK.
1	RELEASE FOR FABRICATION	MS	DC	3-10-97
8	FOR CUSTOMER APPROVAL	JUSS	DC	1-14-97

SUPPORT DETAILS			
DRAWING NO.	SHEET NO.	REV.	REV.
OHMSTEDE 658315	10		1



NAME PLATE BRACKET DETAIL



LIFTING LUG DETAIL

NO. REQUIRED: 1 2 1

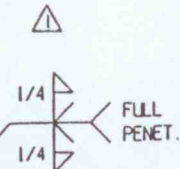
⚠

SHOP CAUTION!!
THE TEMPERATURES SHOWN ON NAMEPLATE ARE IN °C INSTEAD OF °F.

⚠

(A) TWO(2) NAMEPLATES REQ'D.

ITEM NO.	SERIAL NO.
10-E-203	658315-A
20-E-203	658315-B



MATERIAL: 18-8 STN. STL. 116 GA1 (65)



NATL. BO. NO. *

CERTIFIED BY
OHMSTEDE INC.

CORPUS CHRISTI PLANT

SHELL

MAWP	150	PSI AT	121	°C
MDMT	-7	°C AT	150	PSI

TUBE

MAWP	156	PSI AT	71	°C
MDMT	-7	°C AT	156	PSI

S/N (A)

YEAR 1997

ITEM NO. (A) SIZE 48-576 TYPE N J N

P.O. NO. P181/0002 AMINE SOLUTION COOLER

CORR. ALLOW. : SHELL • 3.2 mm / TUBE • 3.2 mm

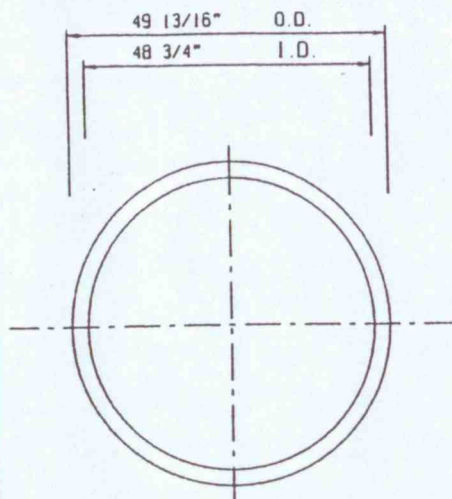
WEIGHT : DRY • 34700 kg WET • 52617 kg SURFACE AREA • 1372 sq. m

* TO BE ASSIGNED AT TIME OF SHIPMENT

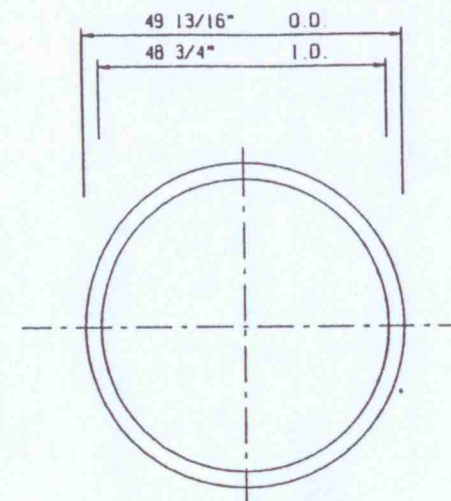
NO.	REVISIONS	BY	CHK.	DATE OK
1	RELEASE FOR FABRICATION	MS	DC	3-18-97
0	FOR CUSTOMER APPROVAL	JSS	DC	1-14-97
NO.	REVISIONS	BY	CHK.	DATE OK

CUSTOMER: PETROSIN		
OHMSTEDE JOB NO.: 658315		
P.O. NO.: P181/0002		
ITEM NO.: 10-E-203/20-E-203 (2) UNITS REQ'D.		
SERVICE: AMINE SOLUTION COOLER		
NAME PL., BRKT. & LIFT LUGS		
OHMSTEDE	DRAWING NO. 658315	SHEET NO. 11
		REV. 1

4



⚠ (40) ONE (1) - REQUIRED
FRONT CHANNEL COVER GASKET
1/8" THK. SOFT STL. DOUBLE JACKETED
W/ FLEXIBLE GRAPHITE FILLER.



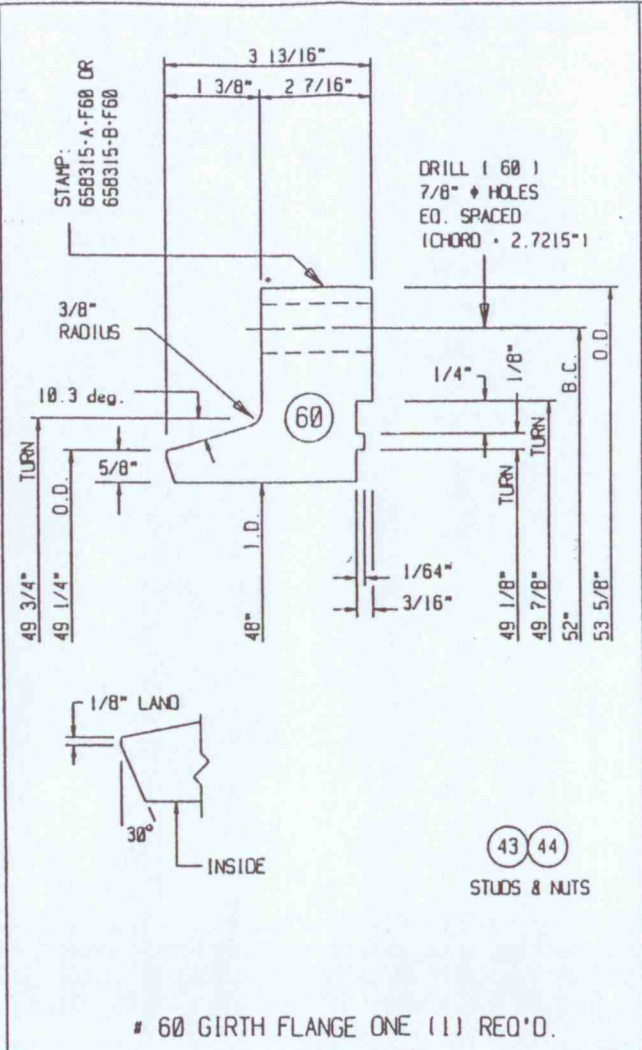
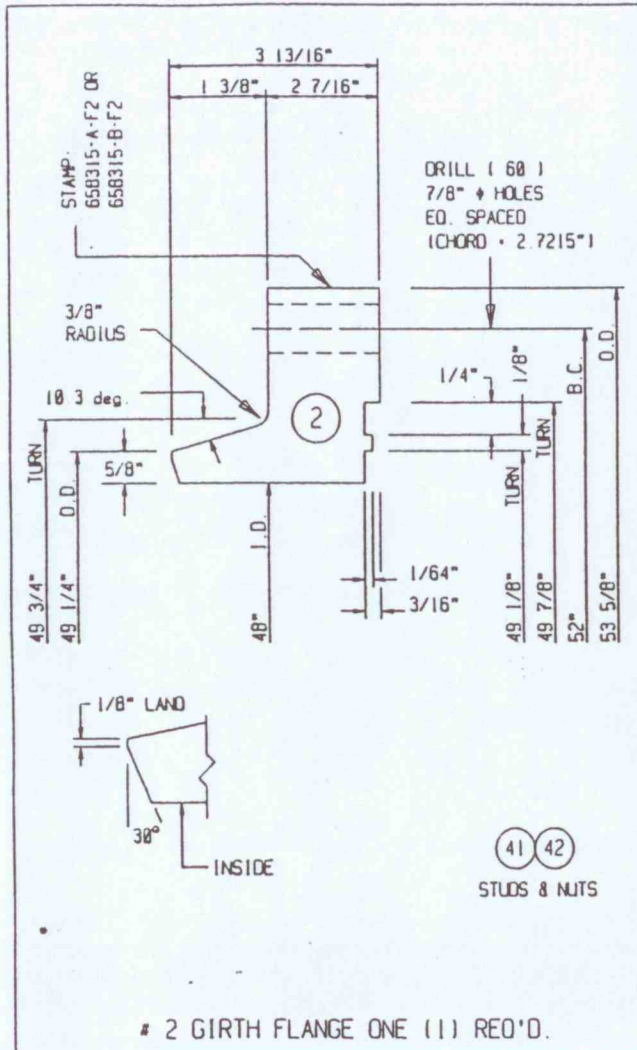
⚠ (40) ONE (1) - REQUIRED
REAR CHANNEL COVER GASKET
1/8" THK. SOFT STL. DOUBLE JACKETED
W/ FLEXIBLE GRAPHITE FILLER.

⚠ NOTES:

- 1) QUANTITIES SHOWN FOR ONE (1) SET
THREE (3) SETS REQUIRED TOTAL.
ONE (1) SET OF GASKETS TO BE USED IN EXCH. AND
TWO (2) SETS TO BE BOXED, MARKED WITH
P.O. & ITEM NO. & SHIPPED WITH EXCHANGER.
- 2) ALL JACKETED GASKETS TO HAVE
LAP OF GASKET NEAR SIDE.

						CUSTOMER: PETROSIN OHMSTEDE JOB NO.: 658315 P.O. NO.: P181/0002 ITEM NO.: 18-E-203/20-E-203 SERVICE: AMINE SOLUTION COOLER		
						121 UNITS REQ'D.		
1	RELEASE FOR FABRICATION	HS	DC	3-10-97	GASKET DETAILS			
0	FOR CUSTOMER APPROVAL	JJS	DC	1-14-97				
NO.	REVISIONS	BY	CHK.	DATE OK	OHMSTEDE	DRAWING NO. 658315	SHEET NO. 12	REV. 1

4



NOTES:
 11 MACHINE ALL GASKET SURFACES TO 125 - 250 AARH.
 21 ALL BOLT HOLES TO STRADDLE NATURAL CENTER LINES.

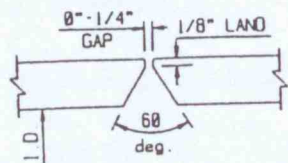
1	RELEASE FOR FABRICATION	MS	DC	3-10-97
8	FOR CUSTOMER APPROVAL	JLSS	DC	1-14-97
NO.	REVISIONS	BY	CHK.	DATE CHK.

CUSTOMER: PETROSIN
 OHMSTEDE JOB NO.: 658315
 P.O. NO.: P181/0002
 ITEM NO.: 10-E-203/20-E-203 (2) UNITS REQ'D.
 SERVICE: AMINE SOLUTION COOLER

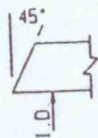
GIRTH FLANGES

OHMSTEDE	DRAWING NO. 658315	SHEET NO. 13	REV. 1
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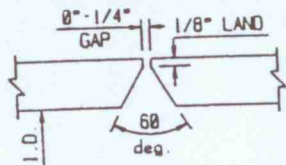
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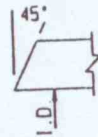
SHELL LONG. & GIRTH SEAMS



SHELL BOTH ENDS TO TUBESHEETS

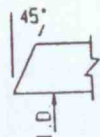


REAR CHAN LONG. & GIRTH SEAMS

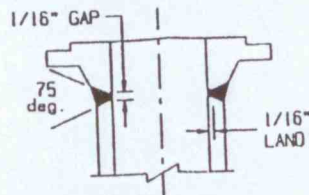


REAR CHAN END TO TUBESHEET

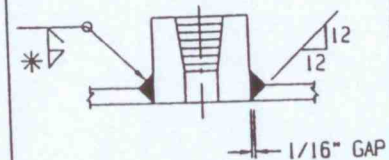
FRONT CHAN LONG. & GIRTH SEAMS



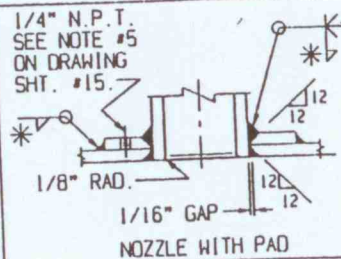
FRONT CHAN END TO TUBESHEET



WELD-NECK FLANGE



PIPE CPLG.



NOZZLE WITH PAD

GENERAL NOTES
 1) ALL WELDING TO BE IN ACCORDANCE W/ASME CODE (SECTION IX)
 * 2) ALL FILLET WELDS TO BE 3/8" UNLESS NOTED OTHERWISE.

NO.	REVISIONS	BY	CHK.	DATE
1	RELEASE FOR FABRICATION	MS	DC	3-10-97
0	FOR CUSTOMER APPROVAL	JSS	DC	1-14-97

CUSTOMER: PETROSIN
 OHMSTEDE JOB NO.: 658315
 P.O. NO.: P181/0002
 ITEM NO.: 10-E-203/20-E-203
 SERVICE: AMINE SOLUTION COOLER

WELD & BEVEL DETAILS		
DRAWING NO.	SHEET NO.	REV
658315	14	1

GENERAL NOTES

1. ALL BOLT HOLES SHALL STRADDLE NORMAL CENTERLINES EXCEPT AS NOTED.
2. ALL EXTERNAL BOLTING SHALL BE COATED FULL LENGTH WITH AN ANTI-SEIZE COMPOUND.
3. ALL MACHINED SURFACES AND THREADED CONNECTIONS SHALL BE COATED WITH A READILY REMOVABLE RUST PREVENTATIVE.
4. THE INSIDE AND OUTSIDE OF THE EXCHANGER SHALL BE CLEAN AND FREE OF ALL SLAG, LOOSE SCALE, DIRT, GRIT, WELD SPLATTER, PIECES OF METAL, PAINT, OIL, AND OTHER FOREIGN MATTER BEFORE HYDROTESTING AND PAINTING. THE EXCHANGER SHALL BE THOROUGHLY DRIED INSIDE AND OUTSIDE AFTER HYDROTEST. SURFACE PREPARATION AND PAINTING MATERIALS SHALL BE KEPT OUT OF THE EXCHANGER.
5. SUPPORT & NOZZLE PADS SHALL BE PROVIDED WITH A 1/4" NPT TEST HOLE. PADS SHALL BE AIR AND SOAP SUDS TESTED AT 25 PSIG PRIOR TO HYDROTEST. TEST HOLES SHALL BE PLUGGED WITH HEAVY GREASE PRIOR TO SHIPMENT.
- ⚠ 6. ALL THREADED CONNECTIONS SHALL BE PLUGGED TO PREVENT DAMAGE. ALL FLANGED OPENINGS SHALL BE BLINDED. SEE NOTE (B) ON DWG. SHT. #16.
7. THE EXCHANGER ITEM NO. AND THE OHMSTEDE SERIAL NO. SHALL BE DIE-STAMPED ON THE PERIPHERAL EDGE OF EACH BODY FLANGE AND TUBESHEET. THE EXCHANGER ITEM NO., THE PURCHASE ORDER NO., AND THE EXCHANGER SHIPPING WEIGHT SHALL BE STENCILED ON THE SIDE OF THE SHELL IN A CONSPICUOUS LOCATION, IN LETTERS AT LEAST 3" HIGH.
8. AS A MINIMUM, A HELIUM LEAK TEST AT 5 PSIG WILL BE PERFORMED TO VERIFY TUBE-TO-TUBESHEET JOINTS.
9. ALL MATING BODY FLANGES AND TUBESHEETS SHALL BE MATCH MARKED FOR PERMANENT ASSEMBLY REFERENCE.
- ⚠ 10. HYDROTEST PRESSURE SHALL BE HELD FOR A PERIOD OF ONE (1) HOUR MINIMUM. HYDROTEST SHALL BE CONDUCTED USING POTABLE WATER. MINIMUM WATER TEMPERATURE FOR HYDROTEST SHALL BE 60 DEG. F. THE SHELLSIDE AND THE TUBESIDE SHALL BE TESTED SEPARATELY IN SUCH A MANNER THAT LEAKS AT THE TUBE JOINTS CAN BE DETECTED FROM AT LEAST ONE SIDE.
- ⚠ 11. EXPORT SKIDS REQUIRED.
12. GASKET CONTACT SURFACES (OTHER THAN NOZZLES) SHALL HAVE A FINISH EQUIVALENT TO 125 - 250 AARB. THE FLATNESS TOLERANCE (MAXIMUM DEVIATION FROM A PLANE) ON PERIPHERAL GASKET CONTACT SURFACES SHALL BE 1/32", AS DETERMINED BY THE USE OF A STRAIGHTEDGE. GIRTH FLANGE TOLERANCE SHALL BE MEASURED AFTER THE FLANGE HAS BEEN WELDED TO THE CYLINDER OR HEAD. FLATNESS TOLERANCE ON THE TUBESHEET SHALL BE MEASURED AFTER THE TUBES HAVE BEEN ROLLER EXPANDED.
13. FINAL VISUAL WELD INSPECTION SHALL BE PERFORMED AFTER ANY REQUIRED PHWT.
14. IF FULL RADIOGRAPHY IS NOT SPECIFIED, AT LEAST ONE SPOT RADIOGRAPH SHALL BE MADE OF EACH CATEGORY A AND B JOINT AS DEFINED BY ASME CODE, SECTION VIII, DIV. 1. NOZZLE WELDS ARE EXCLUDED FROM THIS REQUIREMENT.
15. SPOT RADIOGRAPHS SHALL INCLUDE EACH START AND STOP OF WELDS MADE BY THE AUTOMATIC SUBMERGED ARC WELDING PROCESS.
16. SPOT RADIOGRAPHS SHALL BE AT LEAST 10" LONG, OR SHALL BE FULL LENGTH WHERE THE WELD IS LESS THAN 10" LONG. SPOT RADIOGRAPHS SHALL MEET THE SLAG AND POROSITY STANDARDS OF ASME CODE SECTION VIII, DIV. 1, FOR FULLY RADIOGRAPHED JOINTS.
17. HT EXAMINATIONS AND ACCEPTANCE CRITERIA SHALL BE PER ASME CODE SECTION VIII, DIV. 1, APPENDIX 6. PT EXAMINATIONS AND ACCEPTANCE CRITERIA SHALL BE PER ASME CODE SECTION VIII, DIV. 1, APPENDIX 8.
18. REQUIREMENTS FOR WELD HARDNESS EXAMINATIONS ARE AS FOLLOWS: WELD METAL AND HEAT AFFECTED ZONE OF PRESSURE-RETAINING WELDS IN COMPONENTS MADE OF P-1 MATERIALS SHALL BE EXAMINED. EXAMINATIONS SHALL BE MADE AFTER ANY REQUIRED PHWT. HARDNESS TESTS SHALL BE MADE USING A 10 MM BALL. HARDNESS SHALL NOT EXCEED 200 BHN FOR P-1 MATERIALS. ONE LONG. WELD, ONE CIRC. WELD, AND EACH CONNECTION-TO-COMPONENT WELD WHERE THE CONNECTION IS 2" NPS OR LARGER, SHALL BE EXAMINED. IF MORE THAN ONE WELD PROCEDURE IS USED TO FABRICATE LONG. OR CIRC. WELDS, HARDNESS READINGS SHALL BE MADE OF WELDS DEPOSITED BY EACH WELD PROCEDURE.
19. STENCIL "DO NOT WELD OR BURN" (IN TWO PLACES 180 deg. APART, AS A MINIMUM) ON EQUIPMENT THAT HAS BEEN POST WELD HEAT TREATED.

						CUSTOMER: PETROSIN
						OHMSTEDE JOB NO.: 658315
						P.O. NO.: P181/0002
						ITEM NO.: 10-E-203/20-E-203
						SERVICE: AMINE SOLUTION COOLER
						(2) UNITS REQ'D.
						GENERAL NOTES
1	RELEASE FOR FABRICATION	MS	DC	3-18-97		
0	FOR CUSTOMER APPROVAL	JJS	DC	1-14-97		
NO.	REVISIONS	BY	CHK.	DATE	CHK.	
						OHMSTEDE
						DRAWING NO. 658315
						SHEET NO. 15
						REV. 1