



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

Material : **TUBE BUNDLE OF TREATED GAS TRIM COOLER**

Due Date:

Tender Enquiry No: **PROC/LF/PT/17606/19**

Bid Bond Value : RS.200,000/-

EVALUATION WILL BE CARRIED OUT ON FULL

Attachment(if any) : YES

Sr No	Description	Quantity	Make/Brand offered	Unit	Unit Price (PKR) Inclusive Of All Taxes Except GST	Unit Price (PKR) Inclusive of GST	Total Price (PKR) Inclusive of GST	Delivery Period Offered	deviation from Tender Spec. If Any
1	Tube bundle (U Type) of Treated Gas Trim Cooler as per attached TOR.	1		Number					
2	Complete Replacement of Existing & Hydrotesting/Installation/Commissioning Charges of New Tube Bundle.	1		Number					
3	Transportation/Freight Charges	1		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.
- DELIVERY TERM AS PER CLAUSE NO.9 OF TOR FROM LPO ISSUE.PAYMENT TERMS AS PER CLAUSE NO.8 OF TOR.

Discount (if any) shall only be entertained on Schedule of Requirement of Bidding Document (Financial Proposal). If the discount is mentioned elsewhere in the bid, the same shall not be entertained.



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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) _____



OIL & GAS DEVELOPMENT COMPANY LTD

TOR FOR

FABRICATION, SUPPLY, INSTALLATION & TESTING OF TUBE

BUNDLE OF TREATED GAS TRIM COOLER INSTALLED AT

KPD-TAY PLANT

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1.0 INTRODUCTION:

Oil and Gas Development Company Ltd (OGDCL) is Pakistan's National Oil & Gas Exploration and **Production Company. OGDCL is currently operating Country's largest Oil & Gas sector including** saleable Oil & Gas Processing Plants.

Kunnar-Pasakhi-Deep and Tando-Allah-Yar (KPD-TAY) is a Gas & LPG Processing Plant, located in Hyderabad District about 25 km away from Hyderabad and approx. 195 km from Karachi, Sindh Province of Pakistan. The Plant is comprised of two gas processing trains installed in the close proximity of oil wells. The processing plant is connected with the wells through gas gathering network which terminates into slug catcher at the process plant premises.

OGDCL intends to purchase tube bundle for treated gas trim cooler from an experienced and well reputed manufacturer / contractor / supplier to fulfil the operational requirement.

2.0 DEFINITIONS, ERRORS & CONFLICTS:

Owner /Company : Oil & Gas Development Company Limited (OGDCL)

Supplier /Contractor : Parties, which vendors and / or supplies material, equipment and services to perform the duties as specified by Company in the scope of supply.

2.1 Errors or Omissions.

2.1.1 **Review and comment by the Company at any Contractor / Supplier's drawings,** procedures or documents shall only indicate acceptance of general requirements and shall not relieve the Contractor / Supplier of its obligations to comply with the requirements of this specification and other related parts of the contract documents.

2.1.2 Any errors or omissions noted by the Contractor / Supplier in this Specification shall be immediately brought to the attention of the Company.

2.2 Conflicting Requirements.

In the event of conflict, inconsistency or ambiguity between this Specification, National Codes & Standards referenced in this Specification or any other documents, the Contractor/ Supplier shall refer to the Company whose decision shall prevail.

3.0 SCOPE OF SUPPLY:

3.1 The scope covers Fabrication, supply, installation & testing of U-type tube bundle of treated gas trim cooler installed at KPD-TAY Plant as per specification elaborated below in detail. All material & consumables required for fabrication of tube bundle is in Contractor scope.

3.2 Contractor shall also provide two complete set of channel head gaskets of heat exchanger, one will be used for hydro testing & second for the final box up.

4.0 REFERENCE STANDARD

ASME SEC VIII – Div 1 (2010 ED 2011ADD)

ASME SEC II

ASME SEC IX

5.0 GENERAL REQUIREMENTS:-

- a. All the specifications / dimensions should be as per attached drawings / TOR for fabrication of Treated Gas Trim Cooler tube bundle.
- b. Only U-stamp & R-Stamp authorized manufacturers will be considered for technical evaluation, valid certificate to be provided in the technical bid.
- c. Stage inspection (after shipment of material) and during fabrication will be carried out at manufacturer works by OGDCL representative.
- d. Contractor shall share the quality inspection plan prior to execution of job after issuance of purchase order, OGDCL shall mark hold points for inspection as per requirement.
- e. Tube material should be of American / European / Japanese origin, MTC to be provided during fabrication phase.
- f. Bidder shall prepare his own drawings for fabrication & same shall be handed over to OGDCL along with delivery of tube bundle.
- g. All bill of quantities (BOQ) related to the tube bundle mentioned in the drawings are included in the Contractor scope.
- h. The Contractor must make all necessary arrangements including fixture for transport of tube bundle to KPD-TAY Plant.
- i. Guarantee / warrantee of tube bundle for a period of one year after being taken into service or 18 months after shipment, whichever comes first.

6.0 CONTRACTOR RESPONSIBILITIES:

- a. The contractor shall be responsible for arrangement of all material, consumables required for fabrication of the tube bundle.
- b. The contractor shall be responsible for arrangement of all resources for fabrication, welding, NDT / inspection, U/R stamp required for the tube bundle.
- c. The contractor shall be responsible for safe transportation of the tube bundle to the KPD-TAY Plant.
- d. Complete replacement job of tube bundle (i.e. removal of existing / old tube bundle & installation of new tube bundle in the heat exchanger shell) along with hydro testing at KPD-TAY Plant as well as lifting/shifting with all tools and tackles is included in the Contractor scope.
- e. In case of any non-conformance observed during installation & hydro testing, Contractor shall immediately rectify / replace the same with in delivery period. Any delay in rectification will be liable to LDs as per OGDCL standard tender document.
- f. Hydro testing shall be carried out as per standard procedure at shell pressure.
- g. In case of any leakage observed, tube bundle will be hydro tested again & Contractor will be responsible to extend / provide all facilities, resources as per provided in the first hydro test.
- h. Contractor shall fabricate the tube bundle keeping in view all requirement of ASME U stamp & provide the ASME stamp name plate which indicates that tube bundle has been replaced. Contractor shall bear all cost incurred for inspection in order to conform it as U-stamp.
- i. All other tools, equipment and consumables which are not specified in clause 7.0 (OGDCL responsibilities) e.g. additional crane, pump, tube bundle puller / tube bundle extractor required for removing existing tube bundle and installation of new tube bundle will be included in contractor scope.

7.0 OGDCL RESPONSIBILITIES:

OGDCL will provide the following facilities during installation & hydro testing of tube bundle at KPD-TAY Plant.

- i. Isolation of the existing heat exchanger & purging.
- ii. OGDCL will provide 30 Ton Crane & 03-05 Ton Fork Lifter for tube bundle replacement activities.
- iii. Provide electricity & demineralized water for hydro testing of tube bundle.
- iv. Provide test ring for Hydro testing of tube bundle.
- v. All spiral wound gaskets for isolation & hydro testing of heat exchanger shall be arranged by OGDCL.
- vi. Provide Slings, shackles & chain blocks for rigging of tube bundle.
- vii. Boarding and lodging of contractor staff.

8.0 PAYMENT TERMS

Payment will be made against commissioning certificate & verified invoices at actual after completion of job i.e. fabrication, transportation to KPD-TAY Plant, successful installation and hydro testing of the tube bundle at KPD-TAY Plant.

9.0 DELIVERY SCHEDULE

- i. The tube bundle shall be delivered at KPD-TAY Plant after complete fabrication & NDT / Inspection within 150 days.
- ii. The installation of the tube bundle and hydro testing shall be completed within 30 days after receipt of tube bundle at KPD-TAY Plant.
- iii. However, the total duration of the project must not exceed 180 days. LDs will be imposed if total duration increases beyond 180 days.

10.0 TECHNICAL SPECIFICATIONS:

S. No	DESIGN PARAMETER	SHELL	TUBE
1	Service	Gas	Water
2	Operating Temperature (In/Out)	120.5°F(49.2°C)/115°F (46°C)	93°F (33.8°C)/115°F (46°C)
3	Operating Pressure	1035 psig (7.13 MPa)	50 psig (0.345 MPa)
4	Design Temperature	150°F (65.5°C)	150°F (65.5°C)
5	Design Pressure	1200psig (8.27MPa)	150 psig (1.034MPa)
6	Hydrostatic Test Temperature	70°F (21°C)	70°F (21°C)
7	Hydrostatic Test Pressure	1560 psig (10.75MPa)	195 psig (1.34MPa)
8	Number of Tubes	328	
9	Tube Material	SA179	
10	Tube Dimensions	3/4"x0.083"x141.732" (Ø19.05x2.1x3600 mm)	
11	Joint Style of Tube and Tube Sheet	Intensity Weld and Expansion	

TUBE:	
1	Material shall be SA-179 seamless tubes and purchasing shall be as per SA-450. Outer diameter shall be within $3/4 \pm 0.004$ " ($\text{Ø}19.05 \pm 0.1\text{mm}$) and thickness shall be $0.083 + 0.0157$ " ($2.1\text{mm} + 0.4\text{mm}$).
2	U Tubes shall be cold bended and roundness deviation of bended section shall be no more than 15% outer diameter of tube.
3	U Tube are not allowed to jointed.
4	Tubes and plates shall be strength welding with light expansion.
5	All spacer length allowance deviation shall be -0.04 " (1mm).
TUBESHEET:	
1	Material shall be as per SA266 Gr. 2N.
2	Plate sealing surface and axes shall be vertical and perpendicularity tolerance shall be 0.016 " (0.4).
3	Tube hole axes shall be strictly vertical to plate sealing face and perpendicularity tolerance shall be 0.0039 " (0.1).
4	After tubes drilled, no less than 96% bridge width shall be more than 0.301 " (7.65), min. bridge width shall be 0.18 " (4.575).
BAFFLE PLATE:	
1	Support plate shall be flat, flatness tolerance shall be no more than 0.118 " (3).
2	Remove all burr after drilling.
3	Limitation deviation of adjoining two holes centreline distance shall be ± 0.012 " (0.3).
4	Limitation deviation of 4% allowance adjoining two holes shall be ± 0.02 " (0.5).
5	Limitation deviation of any tube holes centreline distance shall be ± 0.039 " (1).
6	Material shall be as per SA 283 Gr. C.
MOUNTING PLATE:	
1	Support plate shall be flat, flatness tolerance shall be no more than 0.118 " (3).
2	Remove all burr after drilling.
3	Limitation deviation of adjoining two holes centreline distance shall be ± 0.012 " (0.3).
4	Limitation deviation of 4% allowance adjoining two holes shall be ± 0.02 " (0.5).
5	Limitation deviation of any tube holes centreline distance shall be ± 0.039 " (1).

6	Material shall be as per SA 283 Gr. C.
DRAW BAR:	
1	Dimension of screw shall be as per ASME B1. 13M-2005.
2	Material shall be as per SA 36.
3	Burr and iron scrap shall be removed when screw machine finished.
GASKET:	
1	The strap shall be overlay and wound with the filling material, contacting tightly, layers evenly, no wrinkle, space and bending.
2	Both surfaces of gasket shall be flat and smooth, with clear texture. Radial cut-through, indentation, concave or convex that weaken the sealing is not allowed.
3	Flatness against any reference surface shall not exceed 0.031" (0.8mm) . The flatness deviation shall not lie in the range less than 20°.

***For further detail please refer attached drawings.*

11.0 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 70 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 high pressure vessels especially heat exchangers and tube bundles. Contractor must submit a list of his clients to which equipment of similar nature has been supplied.
- iii. ASME U & R Stamp Certificates.
- iv. Certified copy of valid PEC Registration & ISO 9000 certification.
- v. 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.
- vi. Documentary proof of having provided satisfactory services for minimum 05 years in fabrication of high pressure vessels especially heat exchangers and tube bundles. Minimum five heat exchangers (shell & tube type) or U-tube bundles must be manufactured to qualify.
- vii. Method statement for fabrication of tube bundle.
- viii. Verifiable copy of purchase orders & satisfactory performance certificate from clients where Contractor has provided shell & tube type heat exchangers, U-tube bundles & pressure vessels.
- 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 Year experience in fabrication of high pressure vessels especially heat exchangers and tube bundles.	Contractor should provide evidence of experience.	30	15	Each year : 03 marks
	Shell & Tube Heat exchangers / U tube bundles manufacturing Experience.	Contractor should provide evidence of Shell & Tube Heat exchangers / U tube bundles manufacturing.	30	15	Each HE / U tube bundle: 03 marks
2.	Technical Compliance.	Contractor must fully comply with technical specifications mentioned in the TOR & Submit method statement.	20	20	Comply technical specifications : 15 marks Method statement: 05 Marks
3.	Certifications.	Contractor must provide valid ASME U & R-Stamp certificates.	10	10	ASME U Stamp: 05 marks. R Stamp: 05 marks. Certificate status in process will not be considered.
4.	Contractor facilities required for the replacement & Hydro testing of Tube bundle at KPD-TAY Plant.	Contractor should have or confirm to arrange the following: i. Tools to execute the replacement job. ii. Equipment / Machinery for Hydro testing of Tube Bundle at KPD-TAY.	10	10	Tools for replacement: 06 marks Equipment for Hydro testing: 04 marks

Total Marks = 100

Minimum Qualifying Marks= 70

Note:

All Contractors / Bidders are requested to provide all required documents in the technical bid, points calculation will be carried out as per available record / evidence in the bid.

Contractor should get minimum qualifying marks in each category as mentioned in above table. Contractor will not be qualified if above mentioned minimum qualifying marks in any category will not be

scored by the contractor. In addition, the total marks should also be not less than 70. Any contractor who will score less than 70 marks shall not be considered for qualification.

In case of JV, JV agreement to be provided by the contractor. Experience of lead partner will be considered for marks calculation.

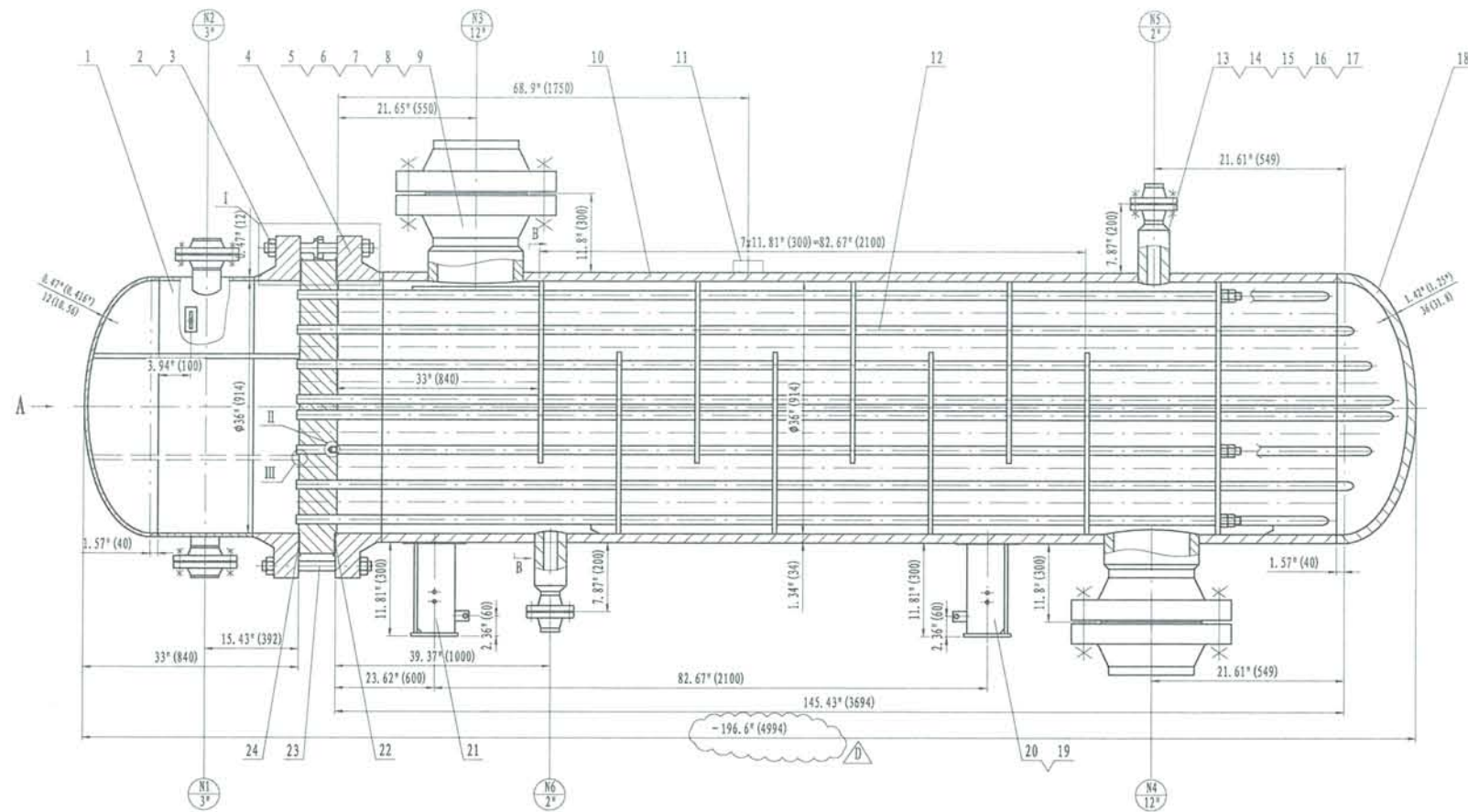
12.0 FINANCIAL BID FORMAT

Sr. No.	Description	Price in PKR
01.	Fabrication & supply of U-type tube bundle including all material & consumables required for fabrication of tube bundle including two set of channel head gaskets.	
02.	Services (For Complete Replacement Job including Hydro Testing)	
03.	Packing & Transportation Cost.	
	Total Cost	
Note:		
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., except Provincial Sales Tax (PST)/ Islamabad Capital Territory Sales Tax (ICT) on services in Pakistan.		
iii. Contract will be awarded to technically qualified and financially lowest evaluated bidder on complete package basis.		

13.0 Attachment:

Following drawings are attached with TOR.

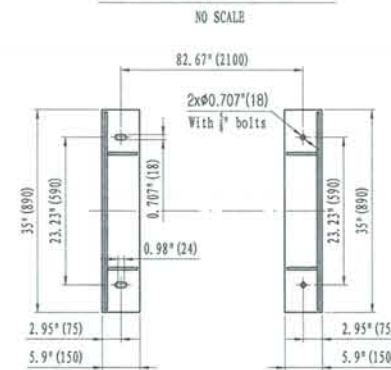
- i. Drawing No. KPD-A44-DWG-7-1.1
- ii. Drawing No. KPD-A44-DWG-7-1.2
- iii. Drawing No. KPD-A44-DWG-7-1.3
- iv. Drawing No. KPD-A44-DWG-7-1.4
- v. Drawing No. KPD-A44-DWG-7-2
- vi. Drawing No. KPD-A44-DWG-7-3
- vii. Drawing No. KPD-A44-DWG-7-4
- viii. Drawing No. KPD-A44-DWG-7-5
- ix. Drawing No. KPD-A44-DWG-7-6
- x. Drawing No. KPD-A44-DWG-7-7
- xi. Drawing No. KPD-A44-DWG-7-8



Technical requirements

- The design, fabrication, inspection, test and acceptance shall comply with ASME Sec. VIII-1 (2010ED 2011ADD) Rules for Construction of Pressure Vessels.
- Materials shall comply with ASME Sec. II Part A Ferrous Material Specifications and Part C Specifications for Welding Rods, Electrodes and Filler Metals. Shell side plate shall be conducted 0°C impact test.
- Welding shall comply with ASME Sec. IX Qualification Standard For Welding And Brazing Procedures, Welders, Brazers, And Welding And Brazing Operators.
- The equipment should meet the requirement of specification (165-4-SPW-057). Tube shall be SA-179 and purchasing shall be as per SA-450 and outer diameter shall be within ± 0.004 (± 0.10) and thickness shall be 0.083 ± 0.0157 (2.1mm \pm 0.4mm). One piece of butt welds shall be allowed for heat exchange tube which shall be ball passing tested and water pressure tested under 300psig (2.068MPa) pressure.
- All welding joints and fillet welds shall be full penetrated. All fillet welding height shall be as per thickness of the thinner piece unless indications; Category A, B weld joint internal surface of shell side shall be smooth.
- Welding between tubes and plates shall be strength welding with light expansion by argon arc at least twice and arcing point of the first and the second shall be stagger 120°.
- Welds on shell side inner surface shall be ground and shielded with base metal. No burr, welding spatter, dents and sharp shall be allowed on surface.
- Welding joint category A, B shall be 100% RT tested as per ASME-V Article II and results shall be as per ASME-VIII division I UW-51.
- Category C, D welding joints shall be 100% MT or PT tested as per ASME-VIII division I Appendix 6 or 8.
- Welding joints between plates and tubes shall be PT tested.
- Test pressure ring or tools shall be shell side tested, examining welding joint of tube and tube sheet. After shell side pressure test, 0.35bar (5.075psi) Helium leak test and tube side hydraulic test shall be conducted for welding joint of heat exchange tube and tube plate.
- Header shall be conducted heat treatment (TUBE SIDE);
- Tube side category A, B, C, D see PARTS DRAWING;
- Header lug shall be only for header lifting.

SADDLE ARRANGEMENT



DESIGN DATA

DESIGN STANDARD	ASME CODE SEC. VIII DIV. 1, 2010ED+2011ADD.	
CERTIFICATION MARK WITH U IDENTIFIER	YES	
NB REGISTER	NO	
TEMA CLASS	BEU/B	
DESIGN PARAMETER	SHELL	TUBE
SERVICE	GAS	WATER
DENSITY (IN/OUT)	lb/ft ³ (kg/m ³)	62.5/61.9 (1593.7/1548.4)
MEDIUM PROPERTY	EXPLOSIVE (OUT/LEVEL)	NON EXPLOSIVE
MAIN BODY MATERIAL	SA516 Gr. 70	SA179/SA516 Gr. 70
PIPE MATERIAL	SA105	SA105/SA106 GrB
DESIGN TEMPERATURE	°F (°C)	150 (65.5)
OPERATING TEMPERATURE (IN/OUT)	°F (°C)	120.5 (49.2)/115 (46)
MDMT AT PRESSURE	°F (°C)	32 (0)
HYDROSTATIC TEST TEMPERATURE	°F (°C)	70 (21)
OPERATING PRESSURE	psig (MPa)	1035 (7.13)
DESIGN PRESSURE	psig (MPa)	1200 (8.27)
MAX ALLOWANCE WORKING PRESSURE	psig (MPa)	1200 (8.27)
SAFETY VALVE SETTING PRESSURE	psig (MPa)	/
SAFETY VALVE MODEL	/	/
HYDROSTATIC TEST PRESSURE	psig (MPa)	1560 (10.75)
JOINT EFFICIENCY		1.0
CORROSION ALLOWANCE	in (mm)	0.118 (3)
DISTANCE NUMBER		1
POST WELD HEAT TREATMENT		YES
RT.		RT FULL/UW-51
MT OR PT.		FULL (C, D, E)/APPENDIX 6&8
HEAT EXCHANGE AREA	ft ² (m ²)	1466.5 (136.2)
TUBE SPEC	in (mm)	3/4"x0.083"x141.732" (ø19.05x2.1x3600) 328U
JOINT STYLE OF TUBE AND TUBESHEET		INTENSITY WELD AND EXPANSION
IMPACT TESTING		YES
TOTAL VOLUME	ft ³ (m ³)	61.48 (1.74)
SEISMIC ZONE		2A (0.15)
VESSEL WEIGHT	lb (kg)	19860 (9008)
DESIGN SERVICE LIFE	YEAR	25
INSULATION THICKNESS	in (mm)	/

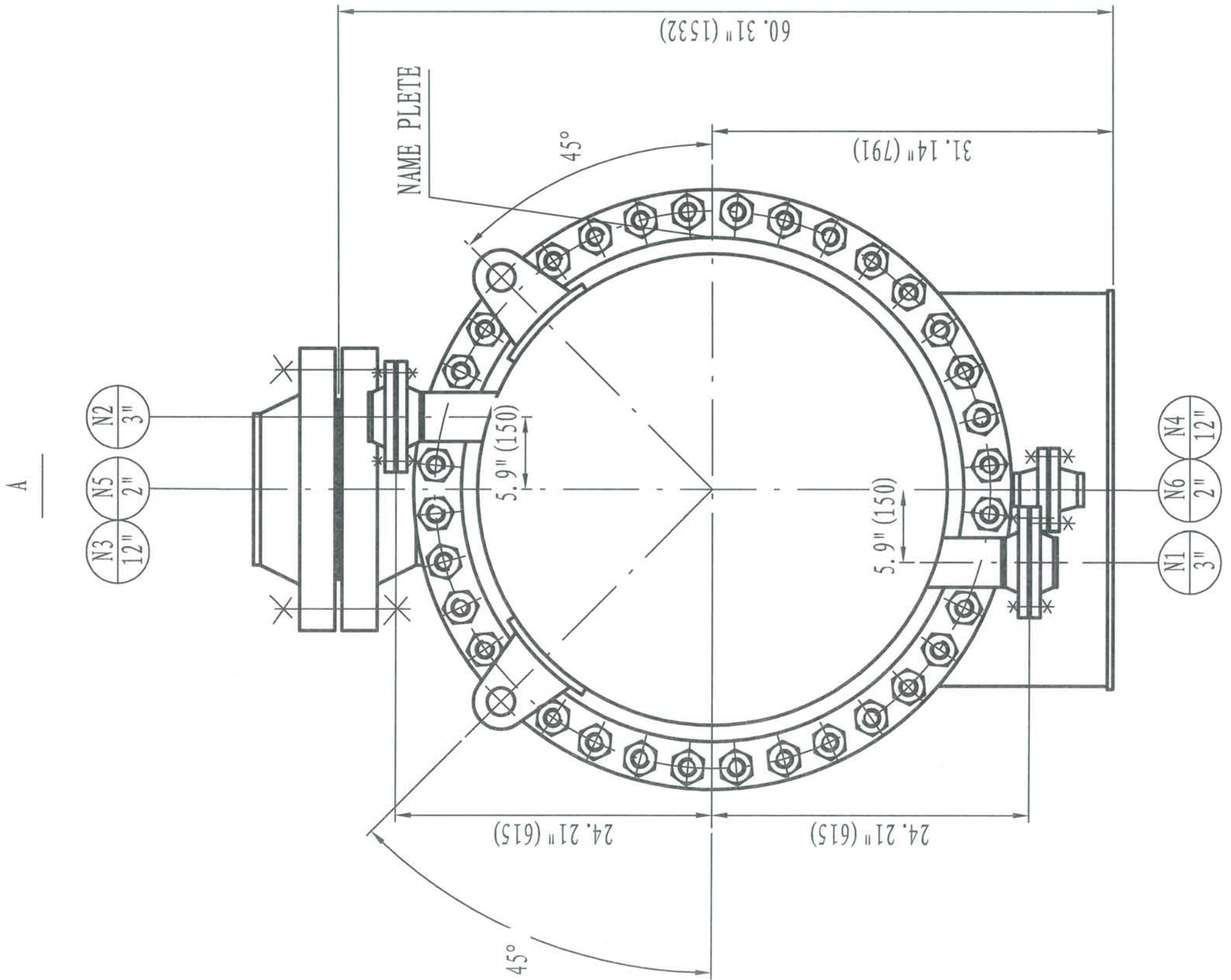
LIST OF NOZZLE

MARK	SIZE	FLANGE PER ASME B16.5-2009E RATING (CLASS)	TYPE	SEALING TYPE	ASME B31.10M-2006E	DESCRIPTION	REMARK
N1	3"	150#	WN	RF	Sch80	WATER INLET	
N2	3"	150#	WN	RF	Sch80	WATER OUTLET	
N3	12"	600#	WN	RF	/	GAS INLET	
N4	12"	600#	WN	RF	/	GAS OUTLET	
N5	2"	600#	WN	RF	/	VENT	
N6	2"	600#	WN	RF	/	DRAIN OUTLET	

14	KPD-A44-DWG-7-6	PIPE	2	SA105	2.53	5.06	
13	ASME B16.5-2009E	FLANGE WN2"-600 RF B=1.686"	4	SA105	9.9	39.6	COMPANTION
12	KPD-A44-DWG-7-4	BUNDLE	1	SUBASSEMBLY			8492
11	KPD-A44-DWG-7-2	NAME PLATE	1	SUBASSEMBLY			
10		SHELL 1005"x1.34"	1	SA516 Gr. 70	6010	1.157 (300mm)	
9	ASME B18.2.2-2010	HEX NUTS 1 1/4"-8UN-2B	80	SA 194 Gr. 2H	1.2	4.8	
8	ASME B18.2.1-2010	STD BOLTS 1 1/4"-8UN-2A X 9"	40	SA 193 Gr. B7	2.42	48.4	
7	ASME B16.20-2007	GASKET 12"-400-316L-F.G.	2	SS316L/F.G.			
6	KPD-A44-DWG-7-7	PIPE	2	SA105	230	460	
5	ASME B16.5-2009E	FLANGE WN12"-600 RF B=11.61"	4	SA105	226.2904	8	COMPANTION
4	KPD-A44-DWG-7-7	FLANGE I	1	SA266 Gr. 2N		1668	
3	ASME B18.2.2-2010	NUTS 1 3/4"-8UN-2B	64	SA 194 Gr. 2H	2.46	256.2	
2	KPD-A44-DWG-7-3	SHOULDER STD	2	SA 193 Gr. B7	19.2	38.4	
1	KPD-A44-DWG-7-5	CHANNEL	1	SUBASSEMBLY		2207	

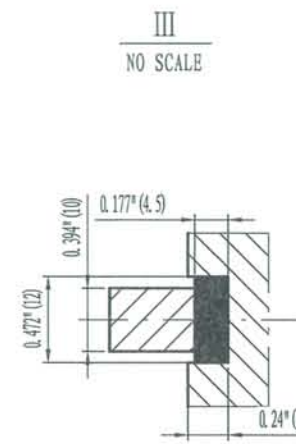
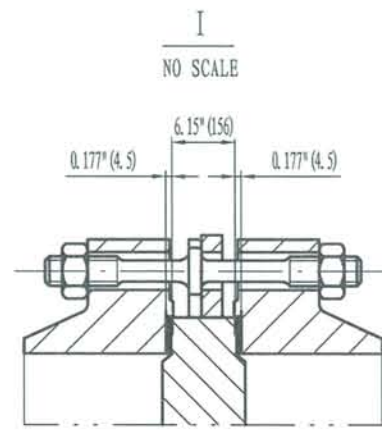
24	KPD-A44-DWG-7-7	GASKET	1	316L/F.G.			
23	ASME B18.2.1-2010	STD BOLTS 1 3/4"-8UN-2A X 20.5"	30	SA 193 Gr. B7	10.2	306	
22	KPD-A44-DWG-7-7	GASKET	1	316L/F.G.			
21	KPD-A44-DWG-7-7	SADDLE SUPPORT S	1	SUBASSEMBLY		105.6	
20	KPD-A44-DWG-7-7	EARTH PLATE	2	SA240 304	0.44	0.88	
19	KPD-A44-DWG-7-7	SADDLE SUPPORT F	1	SUBASSEMBLY		105.6	
18	KPD-A44-DWG-7-7	ELLIPTICAL HEAD I	1	SA516 Gr. 70		612	
17	ASME B18.2.2-2010	HEX NUTS 5/8"-UNC-2B	32	SA 194 Gr. 2H	0.1	3.2	
16	ASME B18.2.1-2010	STD BOLTS 5/8"-UNC-2A L=4.5"	16	SA 193 Gr. B7	0.3	4.8	
15	ASME B16.20-2007	GASKET 2"-400-316L-F.G.	2	SS316L/F.G.			

Oil and Gas Development Company Limited
 KPD-TAY Gas Processing and LPG Recovery Plant
 Description: General Drawing For Treated Gas Trim Cooler
 Equipment Tag: E-4403/5403
 Drawing No: KPD-A44-DWG-7-1.1
 Location: Amine Unit

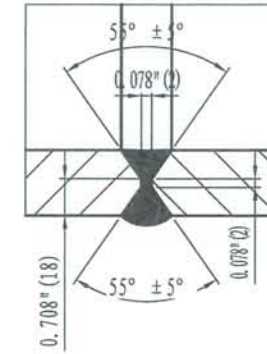


Oil and Gas Development Company Limited
 KPD-TAY Gas Processing and LPG Recovery Plant
 Description: General Drawing For Treated Gas Trim Cooler
 Equipment Tag: E-4403/5403
 Drawing No: KPD-A44-DWG-7-1.2
 Location: Amine Unit

REV	C	SCALE	1: 10	TOTAL	1 PAGES	1	PAGE
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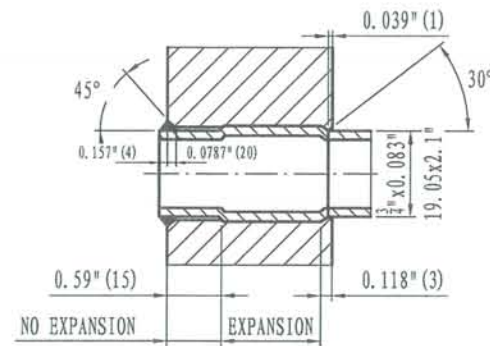


WELD SHELL TYPE OF A/B
NO SCALE

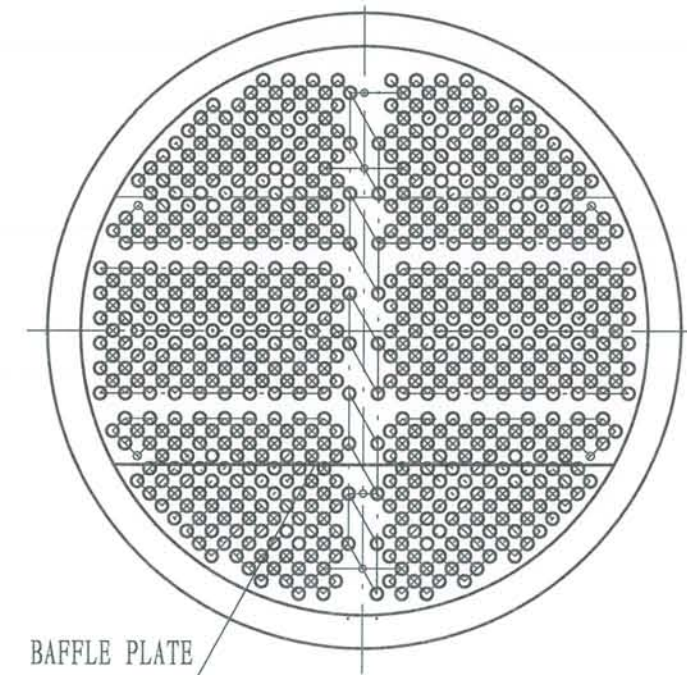
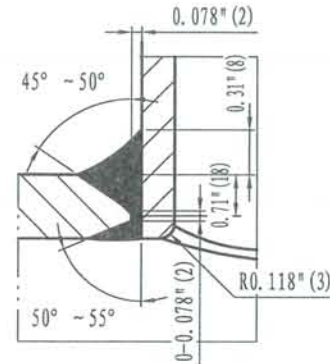


B-B

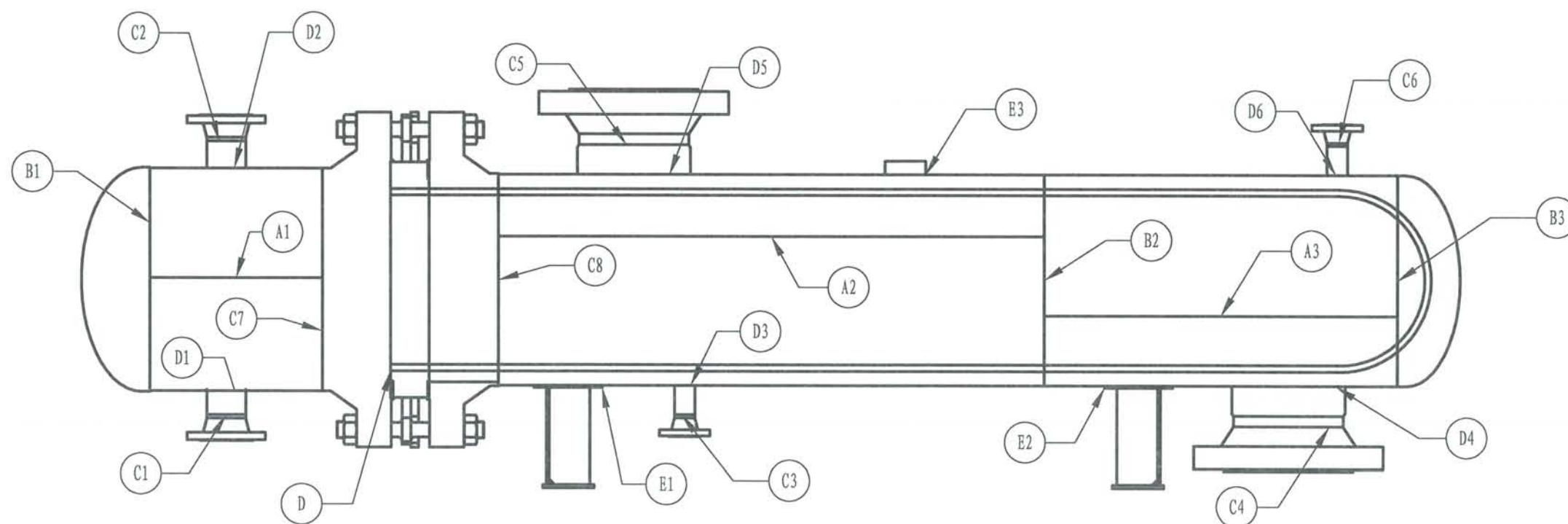
WELD TYPE OF TUBE AND TUBESHEET
NO SCALE



WELD OF NOZZLE N3-N6 AND SHELL
NO SCALE



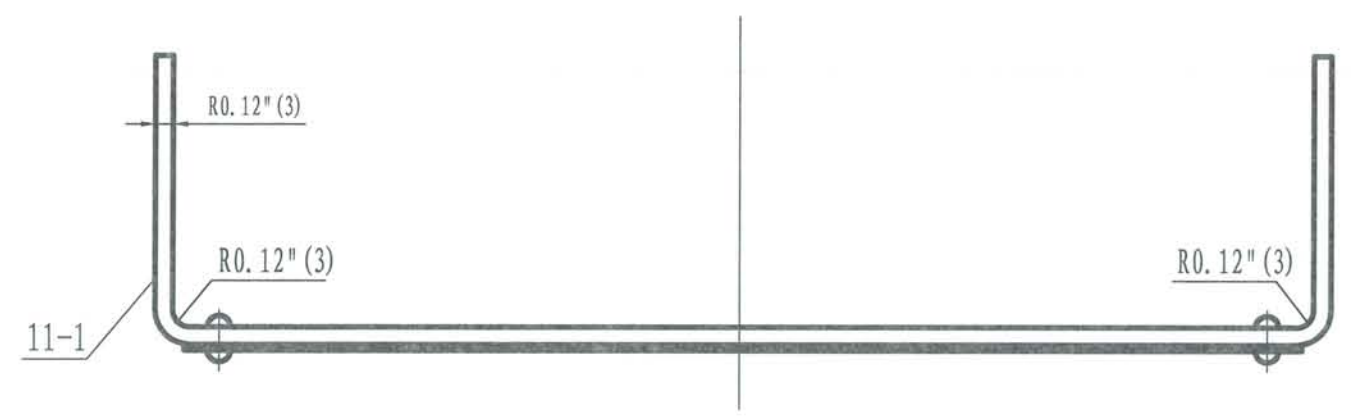
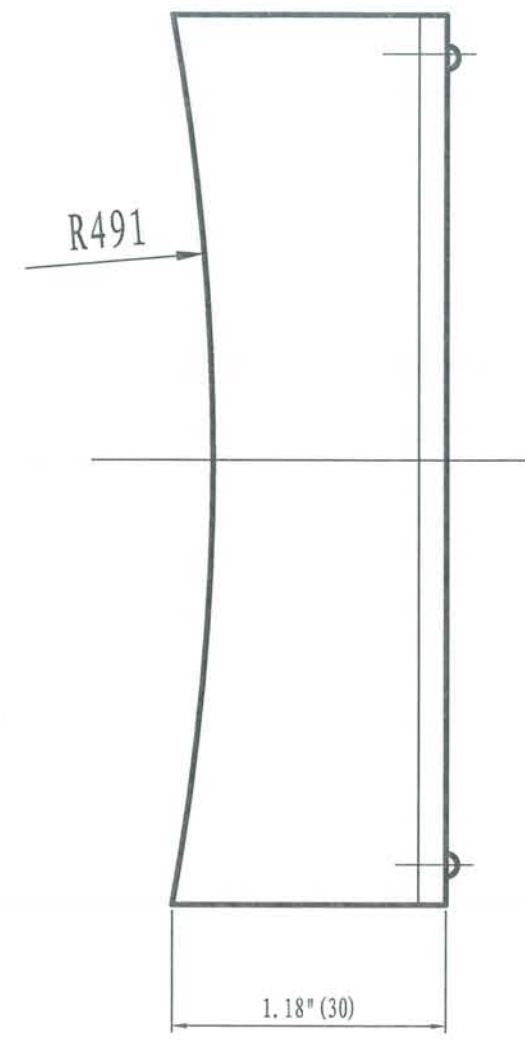
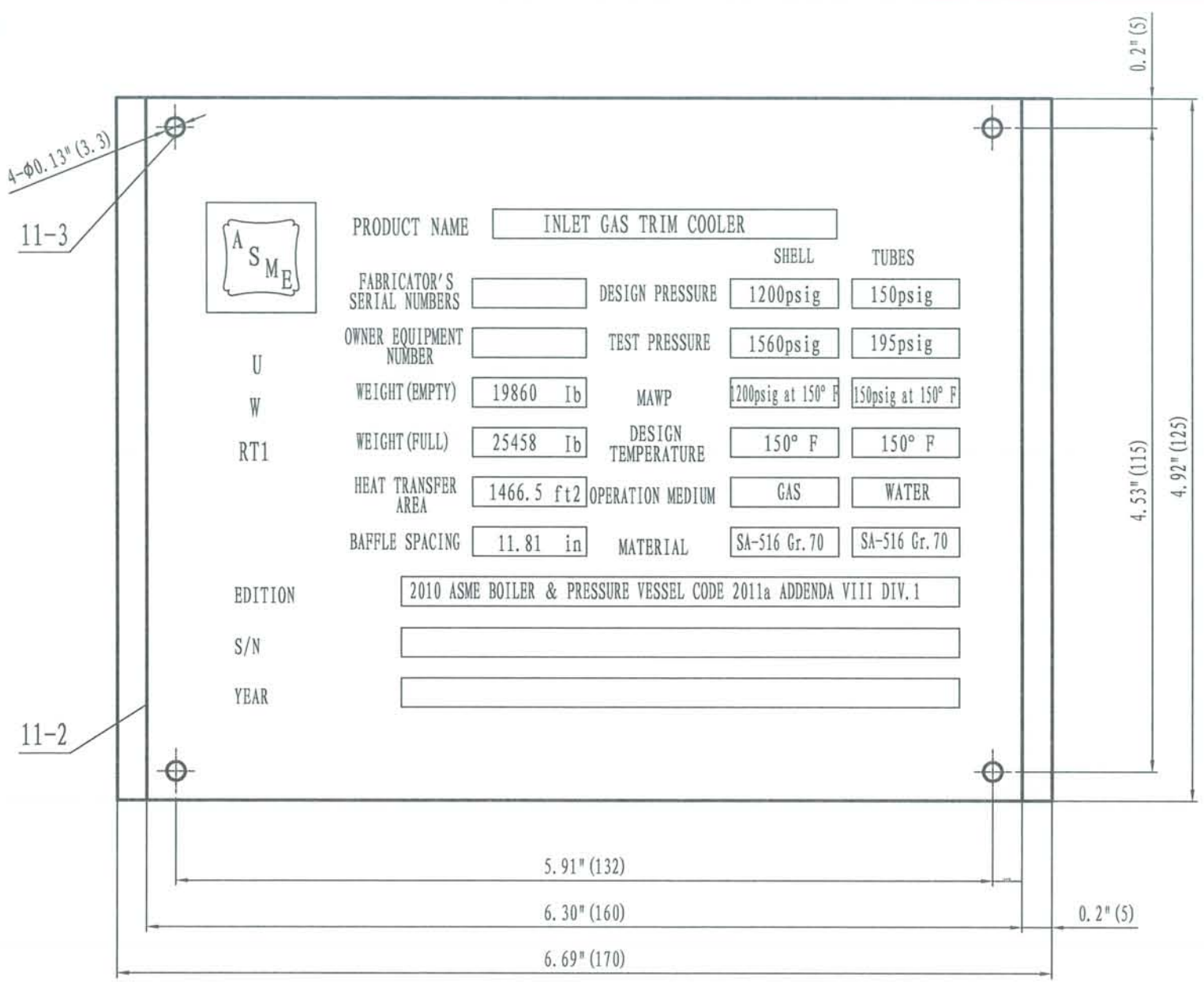
Oil and Gas Development Company Limited
KPD-TAY Gas Processing and LPG Recovery Plant
Description: General Drawing for Treated Gas Trim Cooler
Equipment Tag: E-4403/5403
Location: Amine Unit
Drawing No: KPD-A44-DWG-7-1.3



Oil and Gas Development Company Limited
KPD-TAY Gas Processing and LPG Recovery Plant
Description: General Drawing for Treated Gas Trim Cooler
Equipment Tag: E-4403/5403
Location: Amine Unit
Drawing No: KPD-A44-DWG-7-1.4

			REV	C	SCALE	1: 10	TOTAL	1 PAGES	1 PAGE
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others: 12.5



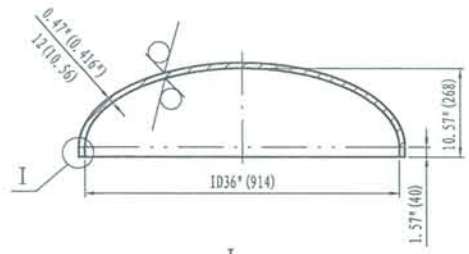
11-3		RIVET φ 0.12" × 0.59" (φ 3x15)	4	LY1			
11-2		NAME PLATE δ=0.078" (2)	1	SA-240 316		0.154	
11-1		NAME PLATE SUPPORT δ=0.12" (3)	1	SA-240 304		1.1	
ITEM	DWG. NO. OR. STD. NO.	PARTS. NAME	QTY	MATERIAL	SINGLE WEIGHT (1b)	TOTAL WEIGHT (1b)	REMARKS

- Technical requirement
1. All marks in nameplate shall higher than 0.197" (5mm).
 2. Depth of characters in nameplate shall be 0.008" (0.2mm).
 3. The third party stamp shall be stamped with the third inspector.
 4. The owner equipment number filled according to the actual when manufacturing
 5. All blanks shall be filled by the manufacturer.

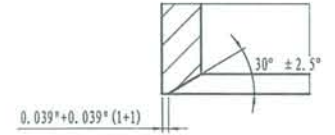
Oil and Gas Development Company Limited
KPD-TAY Gas Processing and LPG Recovery Plant
Description: General Drawing for Treated Gas Trim Cooler
Equipment Tag: E-4403/5403
Location: Amine Unit
Drawing No: KPD-A44-DWG-7-2

		REV	C	SCALE	1:2	TOTAL	1 PAGES	1 PAGE
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others: 25



I
NO SCALE

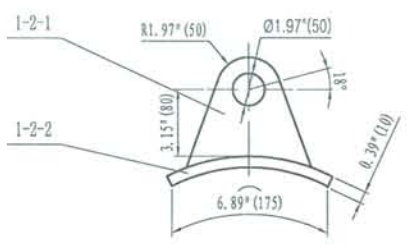


Technical requirements

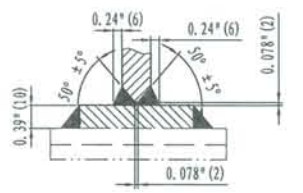
- Header material shall be SA516 Gr70 as per general assembly drawing requirements;
- Fabrication of head shall be as per G-79, UG-81, UCS-79;
- Min. thickness of head shaped shall be 0.416 (10.56);

1-1	ELLIPSOIDAL HEAD II	SA516 Gr70	211		KPD-A44-DWG-7-3	KPD-A44-DWG-7-3
ITEM	PARTS.NAME	MAT'L	MASS	SCALE	DWG NO.	ASSY. DWG NO.

others: 25

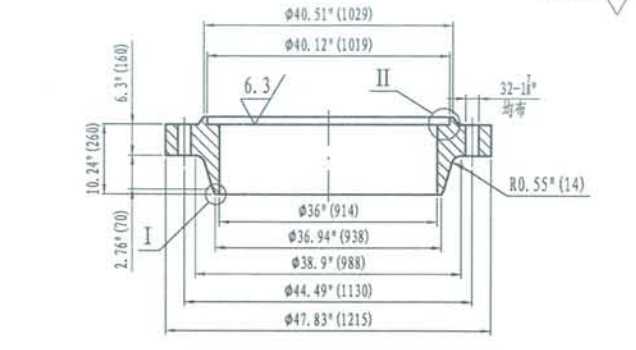


LIFTING LUG TO BASE PLATE WELDING DETAIL
NO SCALE



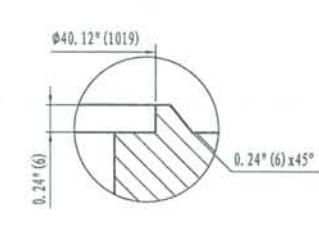
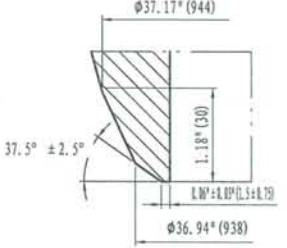
1-2-2	BASE PLATE 6.89 x 2.36 x 0.39	1	SA516 Gr.70	1.8		
1-2-1	LIFTING LUG δ=0.71"	1	SA283 Gr.C	9.7		
ITEM	PARTS.NAME	MAT'L	MASS	SCALE	DWG NO.	ASSY. DWG NO.

others: 12.5



I
NO SCALE

II
NO SCALE

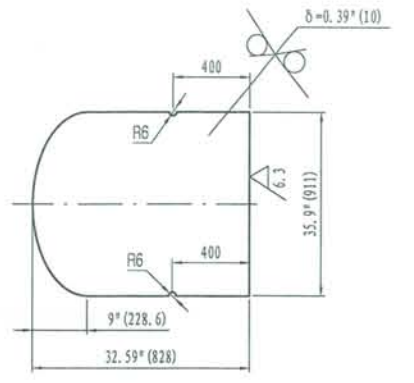


Technical requirements

- Material shall be as per SA266 Gr.2N; per ASME II.
- Chrod length tolerance of studs hole circle diameter and adjoining holes shall be ±0.024 (0.6), any two hole chord tolerance shall be ±0.059 (1.5);
- Flange seal surface shall be machined secondly when header welded and heat treatment;
- Fabrication, inspection and acceptance of flange shall be as per ASME B16.47-1996.

1-8	FLANGE II	SA266 Gr.2N	1500		KPD-A44-DWG-7-3	KPD-A44-DWG-7-3
ITEM	PARTS.NAME	MAT'L	MASS	SCALE	DWG NO.	ASSY. DWG NO.

others: 25

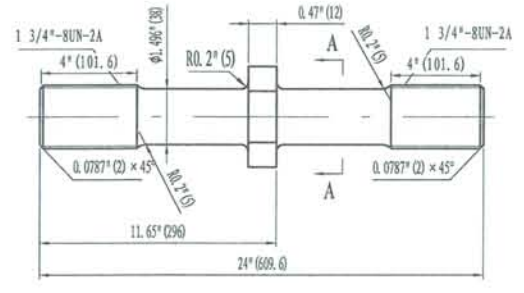


Technical requirements

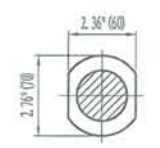
- Welding between pass partition plate and header shell shall be two-side continuously welded;
- Plate face shall be machined secondly after welded and heat treated.

1-10	PASS PARTITION PLATE I	SA283 Gr.C	122.6		KPD-A44-DWG-7-3	KPD-A44-DWG-7-3
ITEM	PARTS.NAME	MAT'L	MASS	SCALE	DWG NO.	ASSY. DWG NO.

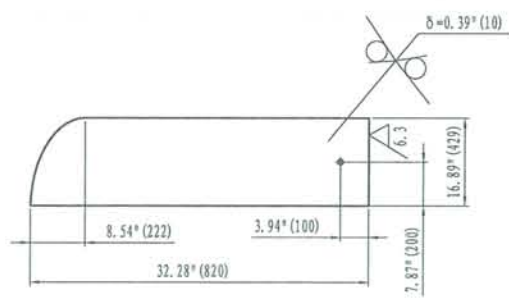
others: 25



A-A
NO SCALE



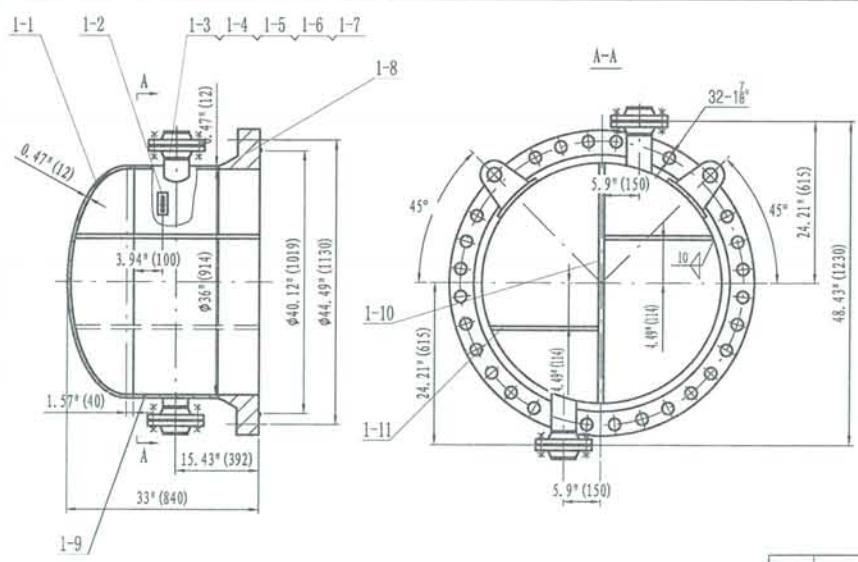
2	SHOULDER STUD	SA 193 Gr. B7	19.2		KPD-A44-DWG-7-3	KPD-A44-DWG-7-1
ITEM	PARTS.NAME	MAT'L	MASS	SCALE	DWG NO.	ASSY. DWG NO.



Technical requirements

- Welding between pass partition plate and header shell shall be two-side continuously welded;
- Plate face shall be machined secondly after welded and heat treated.

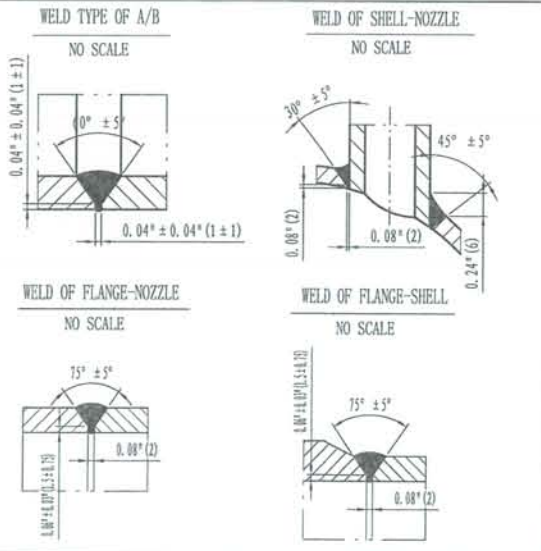
1-11	PASS PARTITION PLATE II	SA283 Gr.C	57.3		KPD-A44-DWG-7-3	KPD-A44-DWG-7-3
ITEM	PARTS.NAME	MAT'L	MASS	SCALE	DWG NO.	ASSY. DWG NO.



Technical requirements

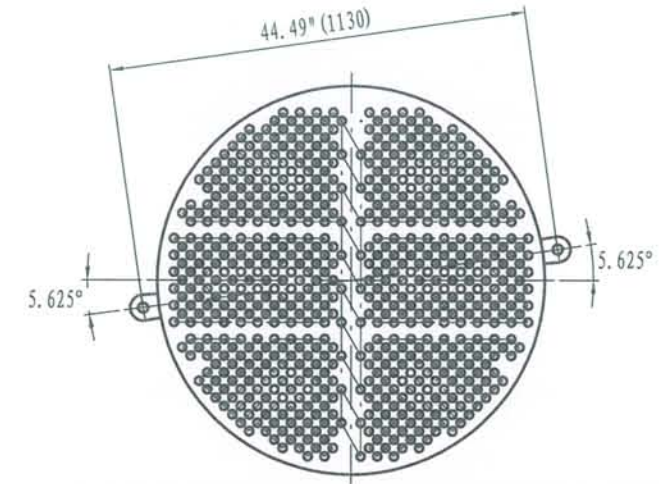
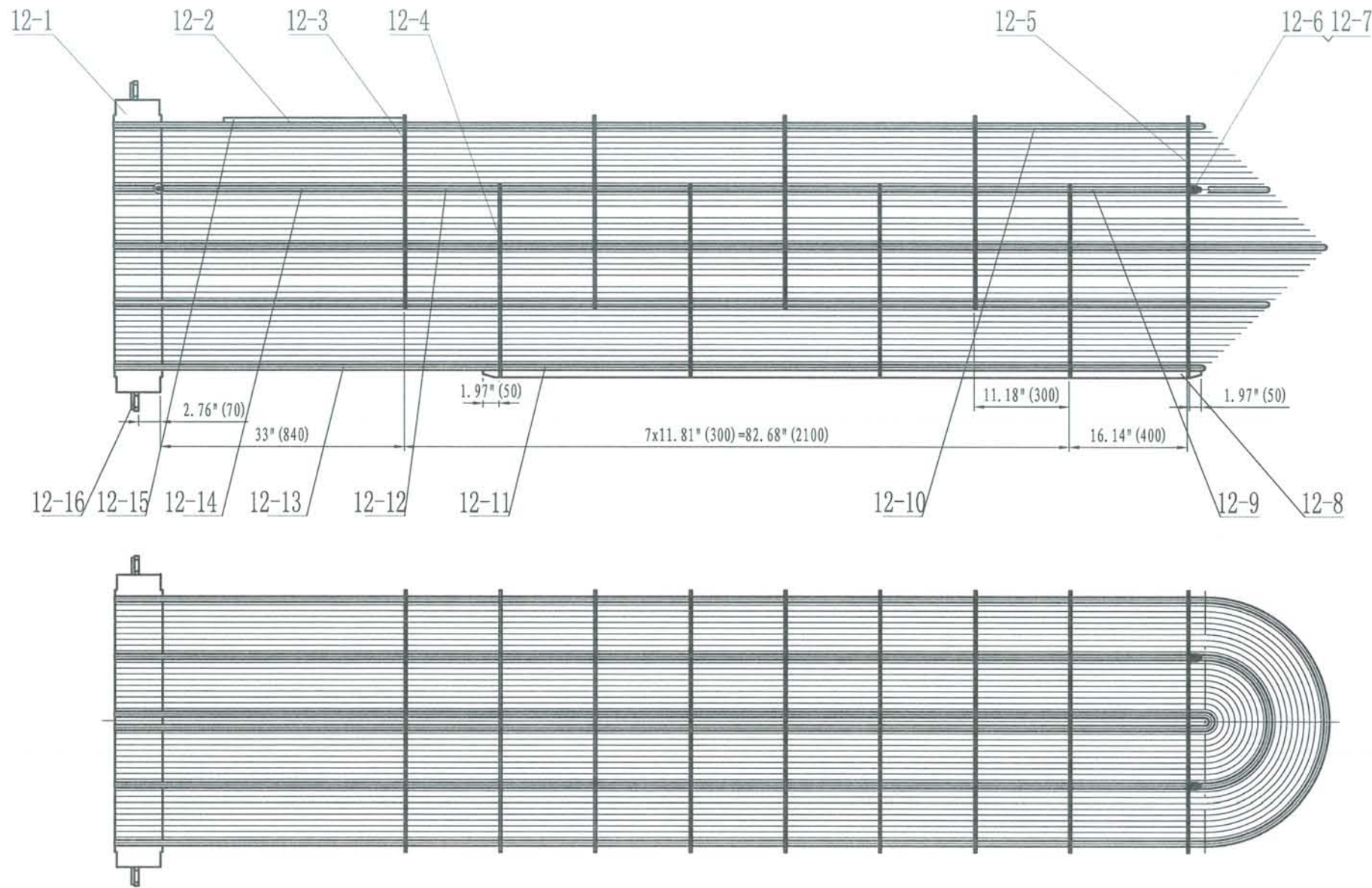
- Welding joints between flange to shell shall be full penetrated with full and complete welds no allowing any pits and other defects which
- Chord length tolerance of stud hole circle diameter and adjoining two stud hole shall be ±0.6mm, and any two stud hole chord length tolerance shall be ±1mm;
- PWHT shall be conducted to header;
- Flange sealing surface shall be machined secondly after heat treatment;
- Other requirements see general drawing.

1-11	KPD-A44-DWG-7-3	PASS PARTITION PLATE II	2	SA283 Gr.C	57.3	114.6
1-10	KPD-A44-DWG-7-3	PASS PARTITION PLATE I	1	SA283 Gr.C		122.6
1-9		SHELL 1036 x 0.47"	1	SA516 Gr.70		178.5
1-8	KPD-A44-DWG-7-3	FLANGE II	1	SA266 Gr.2N		1500
1-7	ASME B16.2.2-2010	HEX NUTS 5/8"-UNC-2B	16	SA 194 Gr. 2H	0.1	1.6
1-6	ASME B16.2.1-2010	STUD BOLTS 5/8"-UNC-2A L=4.75"	8	SA 193 Gr. B7	0.3	2.4



1-5	ASME B16.20-2007	GASKET 3"-150-316L-F.G.	2	SS316L/F.G.			
1-4	ASME B36.10M-2004	PIPE 3"-Sch80	2	SA106 Gr.B	3.5	7	
1-3	ASME B16.5-2009E	FLANGE WN3-150 RF Sch. 80	4	SA105	11.5	46	
1-2	KPD-A44-DWG-7-3	LIFTING LUG	2	SUBASSEMBLY	11.5	23	
1-1	KPD-A44-DWG-7-3	ELLIPSOIDAL HEAD II	1	SA516 Gr.70		211	
ITEM	DWG. NO. OR. STD. NO.	PARTS.NAME	QTY	MATERIAL	SINGLE WEIGHT (1b)	TOTAL WEIGHT (1b)	REMARKS
1		CHANNEL	SUBASSEMBLY	2007			
ITEM	PARTS.NAME	MAT'L	MASS	SCALE	DWG NO.	ASSY. DWG NO.	

Oil and Gas Development Company Limited
KPD-TAY Gas Processing and LPG Recovery Plant
Description: General Drawing for Treated Gas Trim Cooler
Equipment Tag: E-4403/5403
Location: Amine Unit
Drawing No: KPD-A44-DWG-7-3

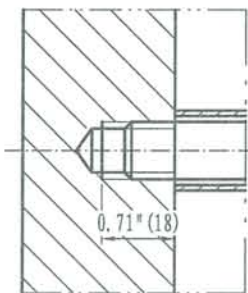


Technical requirements

1. Tubes shall be SA-179 seamless tube and purchasing shall be as per A-450. Outer diameter shall be within $\frac{3}{4}'' \pm 0.004''$ ($\phi 19.05 \pm 0.1mm$) and thickness shall be $0.083'' + 0.0157''$ ($2.1mm + 0.4mm$);
2. Tubes and plates shall be strength welding with light expansion;
3. All spacer length allowance deviation shall be $-0.04''$ (1mm);
4. Other requirements see general drawing.

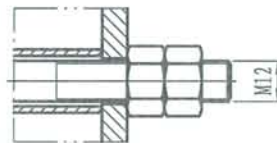
DRAW BAR, TUBE, TUBESHEET CONNECTION DIAGRAM

NO SCALE



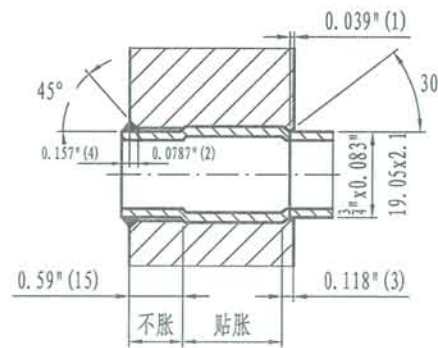
DRAW BAR, TUBE, BAFFLE PLATE CONNECTION DIAGRAM

NO SCALE



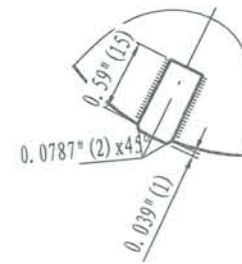
TUBE, TUBESHEET CONNECTION DIAGRAM

NO SCALE



LOCKING THE EAR BAFFLE PLATE CONNECTION DIAGRAM

NO SCALE

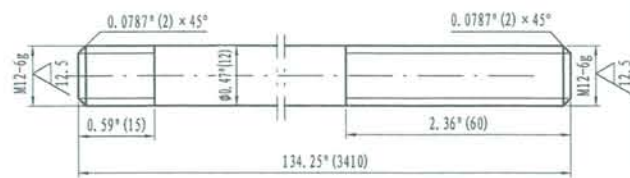


12-12		TUBE3/4"x0.083"	28	SA179	0.62	17.3	L=11.42"
12-11		TUBE3/4"x0.083"	12	SA179	1.3	15	L=23.23"
12-10		TUBE3/4"x0.083"	2	SA179	1.4	2.8	L=27.17"
12-9		TUBE3/4"x0.083"	6	SA179	0.77	0.46	L=15.35"
12-8	KPD-A44-DWG-7-6	SLIDE	2	SA283 Gr.C	7.7	15.4	
12-7	ASMEB18.2.4.1M-2002	NUTS M12	16	SA194 Gr.2H			
12-6	KPD-A44-DWG-7-5	DRAW BAR	8	SA36	7	56	
12-5	KPD-A44-DWG-7-5	MOUNTING PLATE	1	SA283 Gr.C		83	
12-4	KPD-A44-DWG-7-5	BAFFLE PLATE II	4	SA283 Gr.C	65	260	
12-3	KPD-A44-DWG-7-5	BAFFLE PLATE I	4	SA283 Gr.C	65	260	
12-2	KPD-A44-DWG-7-5	TUBE	1	SUBASSEMBLY		5207	
12-1	KPD-A44-DWG-7-5	TUBESHEET	1	SA266 Gr.2N		1698	
ITEM	DWG. NO. OR. STD. NO.	PARTS. NAME	QTY	MATERIAL	SINGLE WEIGHT	TOTAL WEIGHT (1b)	REMARKS
12	BUNDLE	SUBASSEMBLY	7637	---	KPD-A44-DWG-7-4	KPD-A44-DWG-7-1.1	
ITEM	PARTS. NAME	MAT'L	MASS	SCALE	DWG NO.	ASSY. DWG NO.	

12-16	KPD-A44-DWG-7-6	LOCKING THE EAR	2	SA516 Gr.70	3.97	7.93	
12-15		STRIKING PLATE 12.8"x22"x0.24" (325x560x6)	1	SA240 316L		18.9	
12-14		TUBE3/4"x0.083"	6	SA179	1.6	9.7	L=32.83"
12-13		TUBE3/4"x0.083"	2	SA179	2.2	4.4	L=44.45"

Oil and Gas Development Company Limited
 KPD-TAY Gas Processing and LPG Recovery Plant
 Description: General Drawing for Treated Gas Trim Cooler
 Equipment Tag: E-4403/5403
 Location: Amine Unit
 Drawing No: KPD-A44-DWG-7-4

REV	C	SCALE	TOTAL 7 PAGES	3 PAGE
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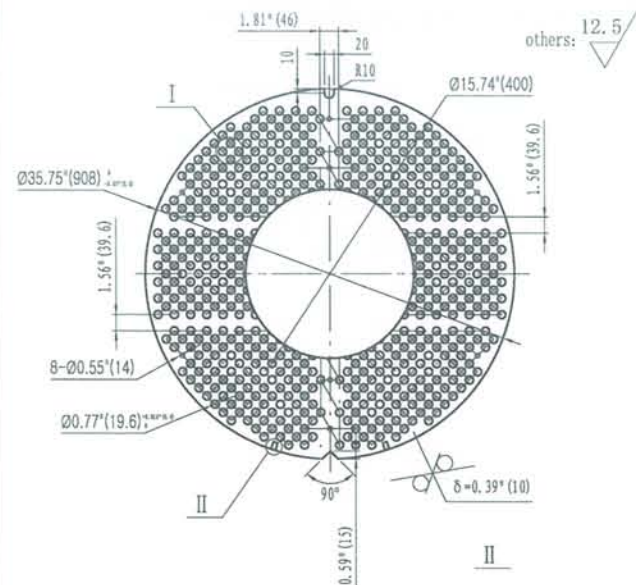


others: ∇

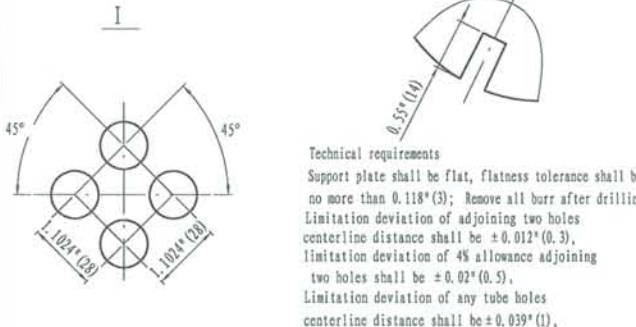
Technical requirements

1. Dimensional of screw shall be as per ASME B1.13M-2005
2. Burr and iron scrap shall be removed when screw machine finished.

12-6	DRAW BAR	SA36	7		KPD-A44-DWG-7-5	KPD-A44-DWG-7-4
ITEM	PARTS.NAME	MAT'L	MASS	SCALE	DWG.NO.	ASSY. DWG.NO.

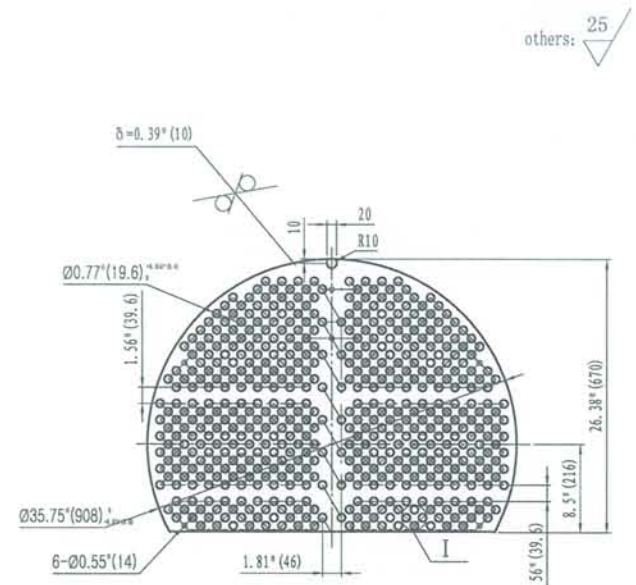


others: ∇

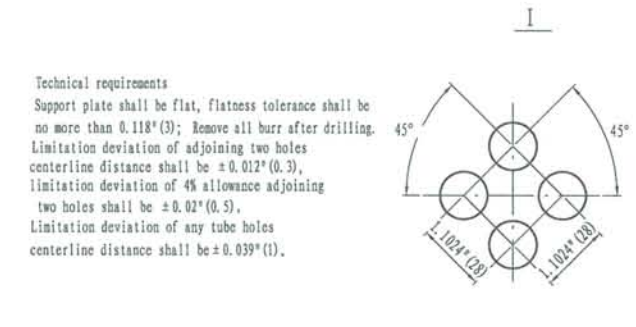


Technical requirements
Support plate shall be flat, flatness tolerance shall be no more than 0.118\" (3); Remove all burr after drilling. Limitation deviation of adjoining two holes centerline distance shall be ± 0.012 \" (0.3), limitation deviation of 4% allowance adjoining two holes shall be ± 0.02 \" (0.5), Limitation deviation of any tube holes centerline distance shall be ± 0.039 \" (1).

12-5	MOUNTING PLATE	SA283 GrC	83		KPD-A44-DWG-7-5	KPD-A44-DWG-7-4
ITEM	PARTS.NAME	MAT'L	MASS	SCALE	DWG.NO.	ASSY. DWG.NO.

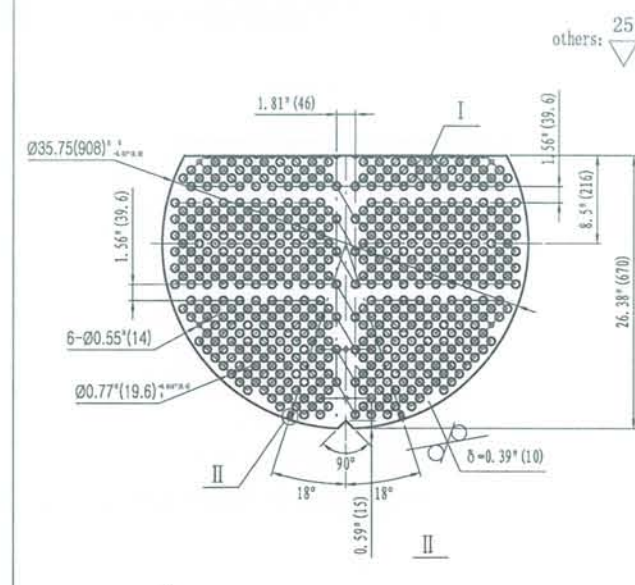


others: ∇

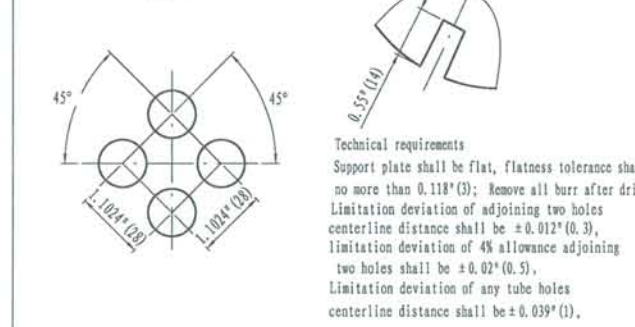


Technical requirements
Support plate shall be flat, flatness tolerance shall be no more than 0.118\" (3); Remove all burr after drilling. Limitation deviation of adjoining two holes centerline distance shall be ± 0.012 \" (0.3), limitation deviation of 4% allowance adjoining two holes shall be ± 0.02 \" (0.5), Limitation deviation of any tube holes centerline distance shall be ± 0.039 \" (1).

12-3	BAFFLE PLATE I	SA283 GrC	65		KPD-A44-DWG-7-5	KPD-A44-DWG-7-4
ITEM	PARTS.NAME	MAT'L	MASS	SCALE	DWG.NO.	ASSY. DWG.NO.

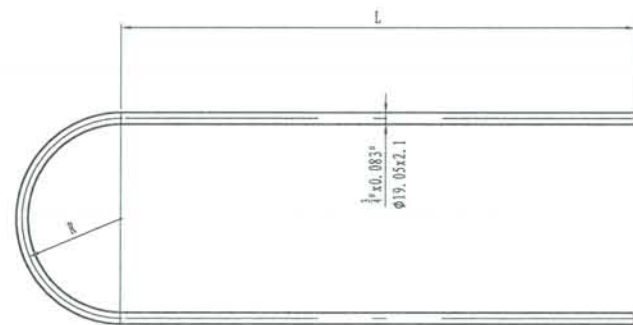


others: ∇



Technical requirements
Support plate shall be flat, flatness tolerance shall be no more than 0.118\" (3); Remove all burr after drilling. Limitation deviation of adjoining two holes centerline distance shall be ± 0.012 \" (0.3), limitation deviation of 4% allowance adjoining two holes shall be ± 0.02 \" (0.5), Limitation deviation of any tube holes centerline distance shall be ± 0.039 \" (1).

12-4	BAFFLE PLATE II	SA283 GrC	65		KPD-A44-DWG-7-5	KPD-A44-DWG-7-4
ITEM	PARTS.NAME	MAT'L	MASS	SCALE	DWG.NO.	ASSY. DWG.NO.

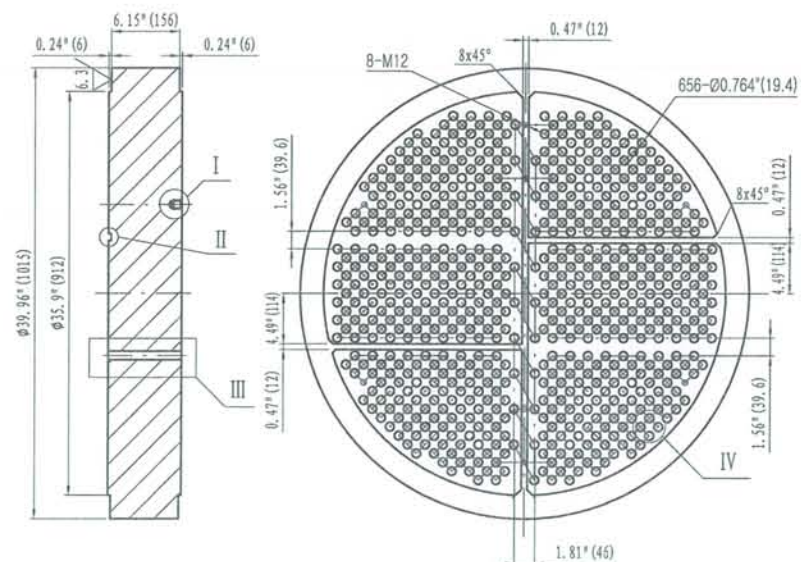


序号	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	TOTAL
L	140.43	141.73	141.73	141.73	141.73	141.73	141.73	141.73	141.73	141.73	141.73	141.73	141.73	141.73	141.73	141.73	141.73	141.73	141.73	141.73	141.73	328
R	1.8	1.69	2.46	3.24	4.02	4.8	5.58	6.36	7.14	7.92	8.7	9.48	10.26	11.04	11.82	12.6	13.38	14.16	14.94	15.72	16.5	477
总长	286.5	288.74	291.18	293.62	296.1	298.54	300.98	303.43	305.87	308.3	310.75	313.23	315.67	318.11	320.6	323	325.47	328.3	330.51	332.8	335.28	4777
数量	10	19	21	19	21	19	20	19	20	17	18	17	18	15	16	13	14	9	10	7	6	328
单重1b	14.06	14.17	14.3	14.41	14.55	14.66	14.79	14.9	15	15.15	15.28	15.39	15.49	15.63	15.74	15.87	15.98	16.13	16.24	16.36	16.49	4777
总重1b	140.6	269.3	314.6	273.8	320.1	278.5	295.8	253.3	300	257.6	259.7	278.8	281.3	234.4	251.8	206.3	223.7	145.2	162.4	114.5	98.94	4777

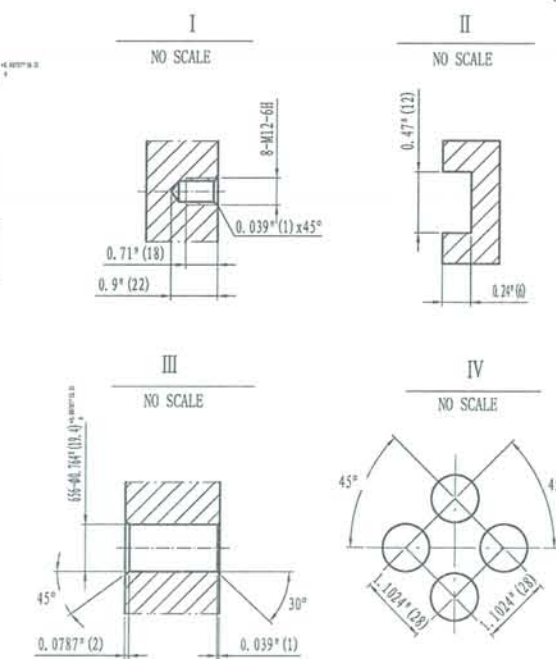
Technical requirements

1. Tubes shall be SA-179 seamless tubes and purchasing shall be as per SA-450. Outer diameter shall be within $3/4 \pm 0.004$ \" ($\phi 19.05 \pm 0.1mm$) and thickness shall be 0.083 ± 0.0157 \" ($2mm \pm 0.4mm$).
2. U tubes shall be cold bended and roundness deviation of bended section shall be no more than 1% outer diameter of tube;
3. U tube are not allowed to jointed;
4. Other requirements see general drawing.

12-2	TUBE	SA179	5207		KPD-A44-DWG-7-5	KPD-A44-DWG-7-4
ITEM	PARTS.NAME	MAT'L	MASS	SCALE	DWG.NO.	ASSY. DWG.NO.



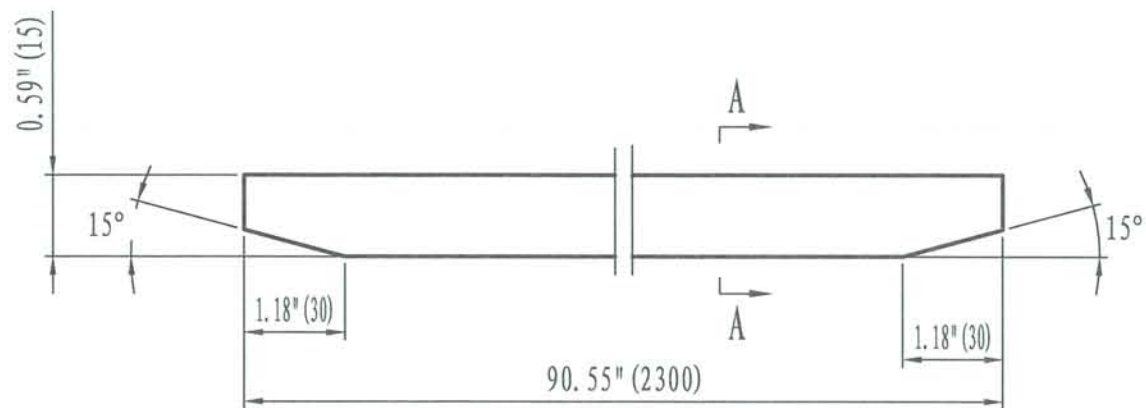
ALL: ∇



Technical requirements
1. Material shall be as per SA266 Gr. 2N;
2. Plate sealing surface and axes shall be vertical and perpendicularity tolerance shall be 0.016\" (0.4);
3. Tube hole axes shall be strictly vertical to plate sealing face and perpendicularity tolerance shall be 0.0039\" (0.1);
4. After tubes drilled, no less than 96% bridge width shall be more than 0.301\" (7.65), min. bridge width shall be 0.18\" (4.575);

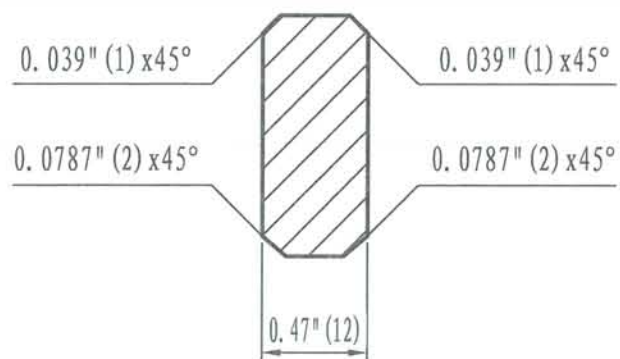
12-1	TUBESHEET	SA266 Gr. 2N	1698		KPD-A44-DWG-7-5	KPD-A44-DWG-7-4
ITEM	PARTS.NAME	MAT'L	MASS	SCALE	DWG.NO.	ASSY. DWG.NO.

Oil and Gas Development Company Limited
KPD-TAY Gas Processing and LPG Recovery Plant
Description: General Drawing for Treated Gas Trim Cooler
Equipment Tag: E-4403/5403
Location: Amine Unit
Drawing No: KPD-A44-DWG-7-5

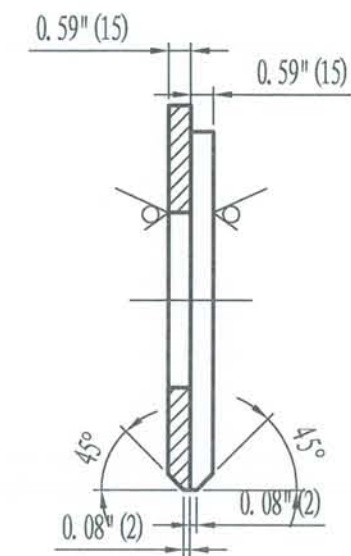
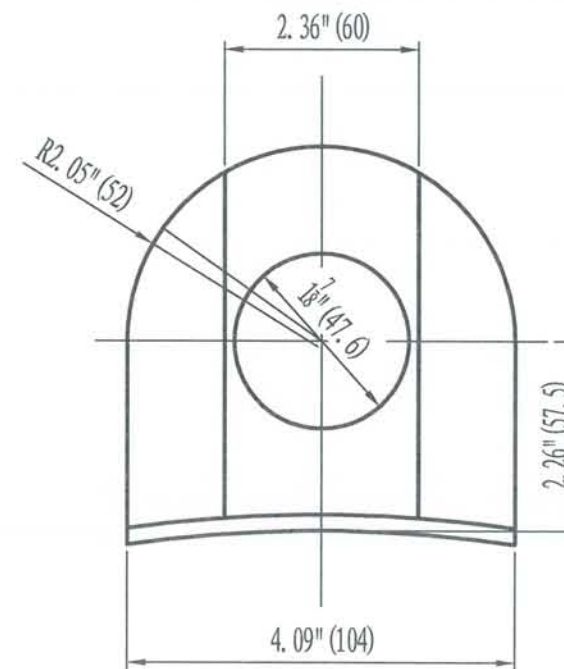


A-A

NO SCALE



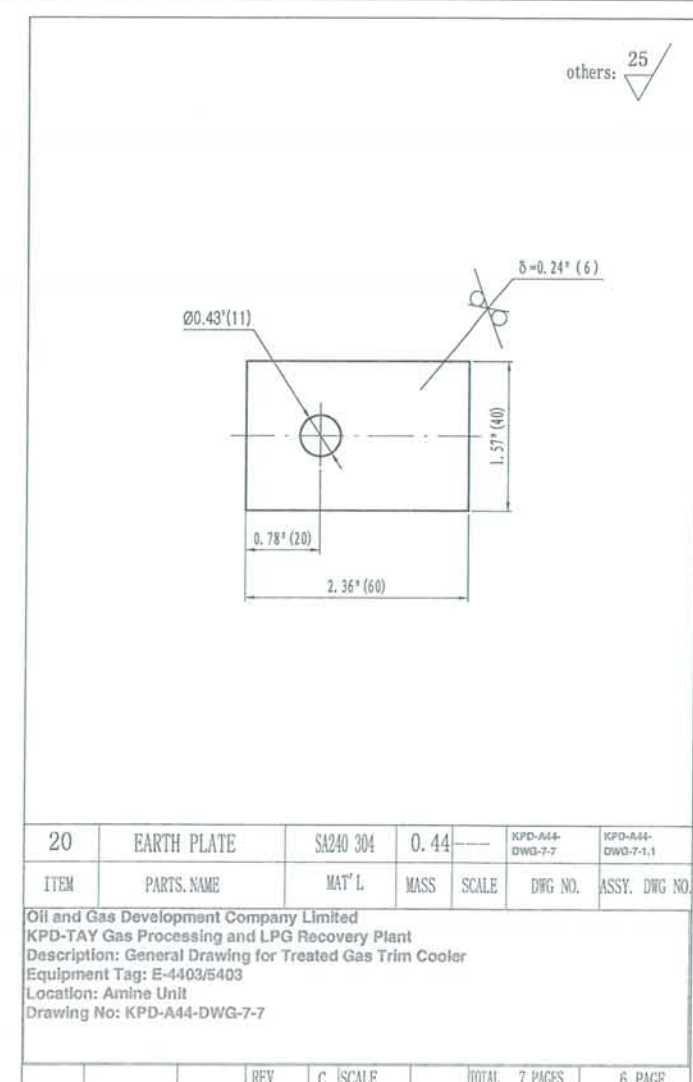
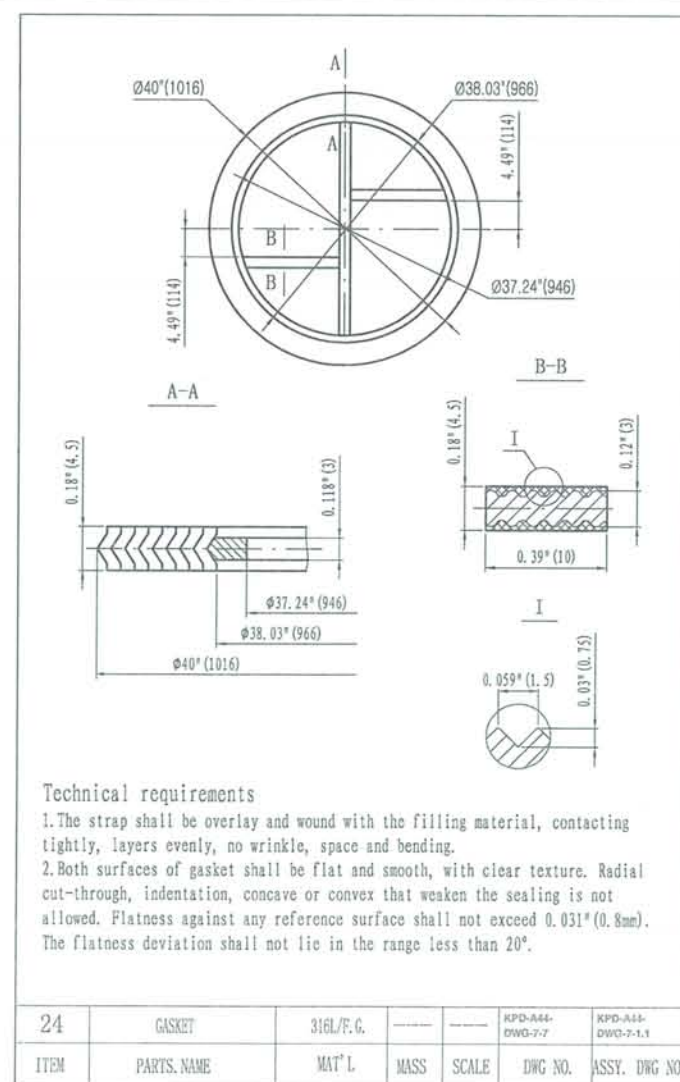
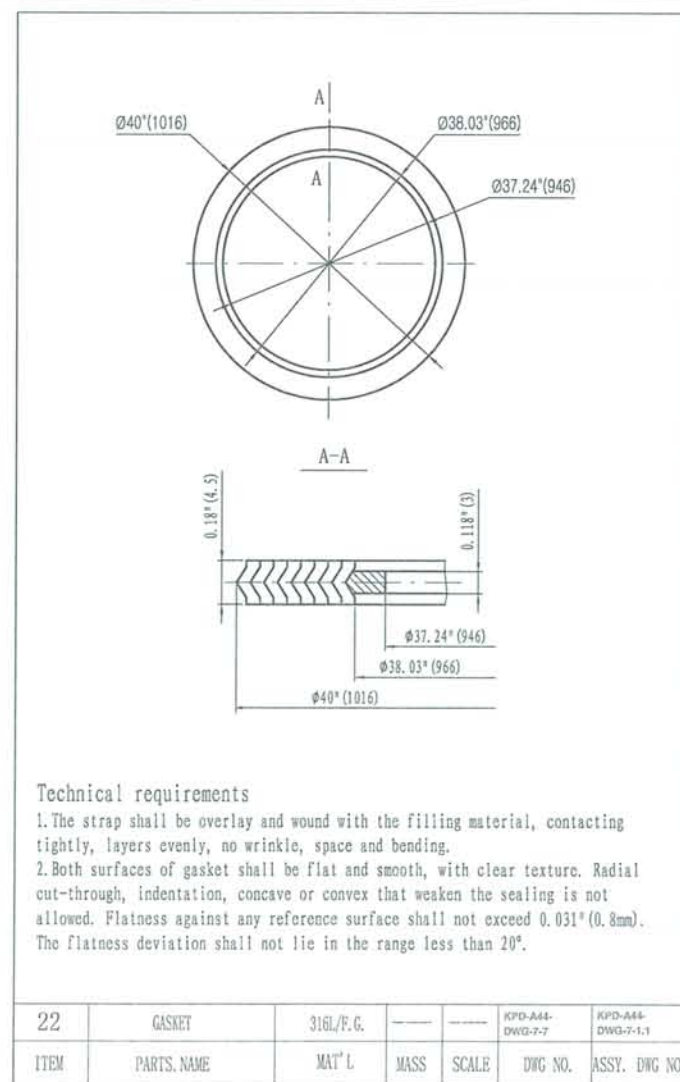
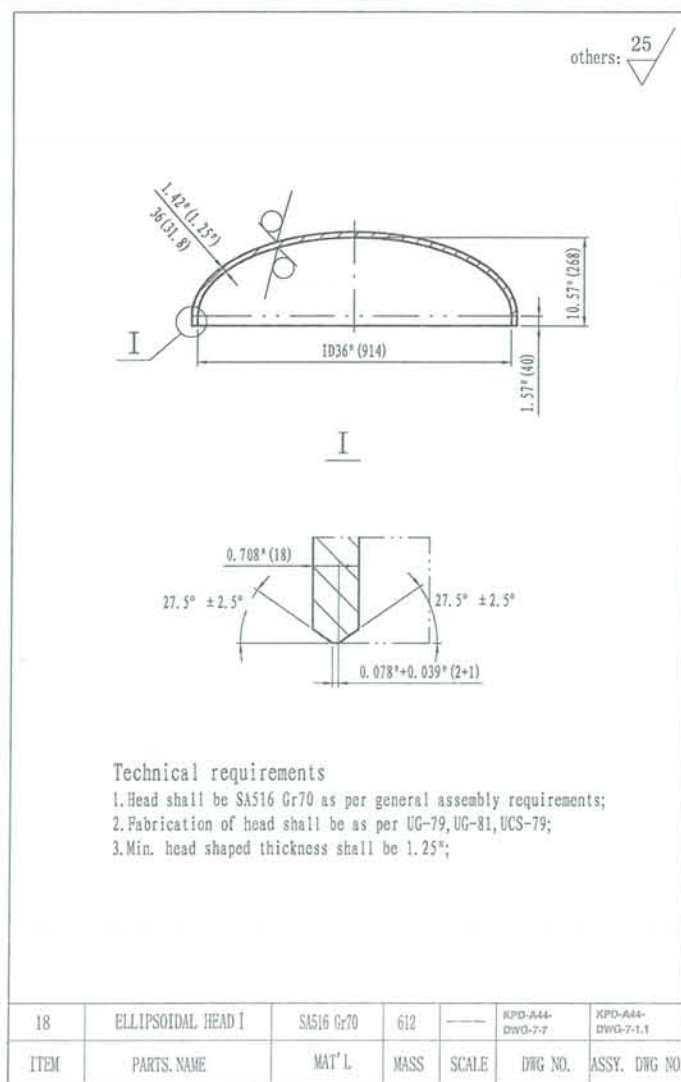
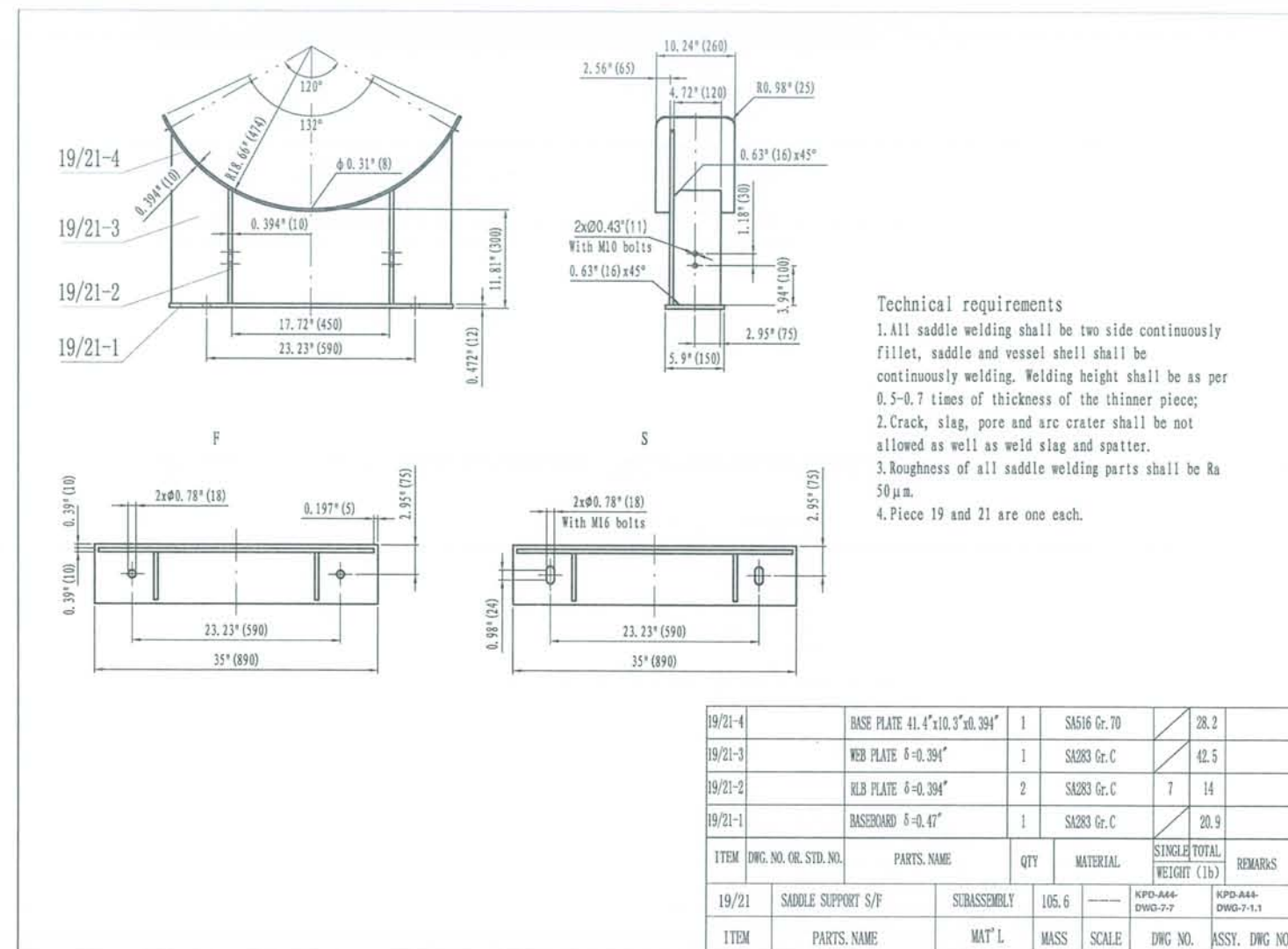
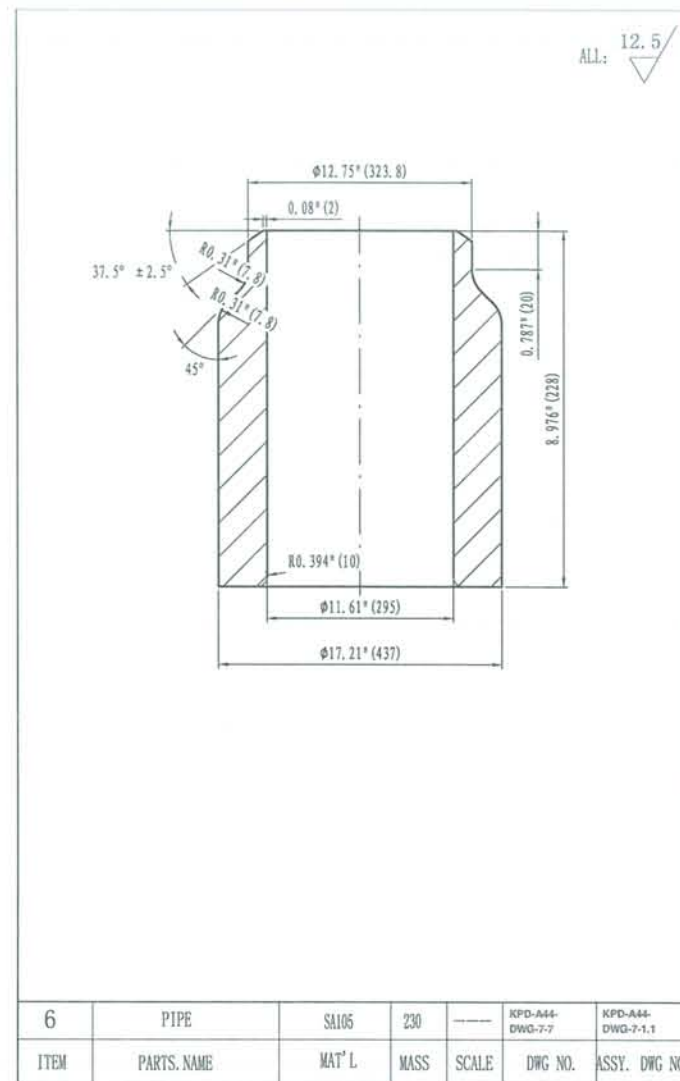
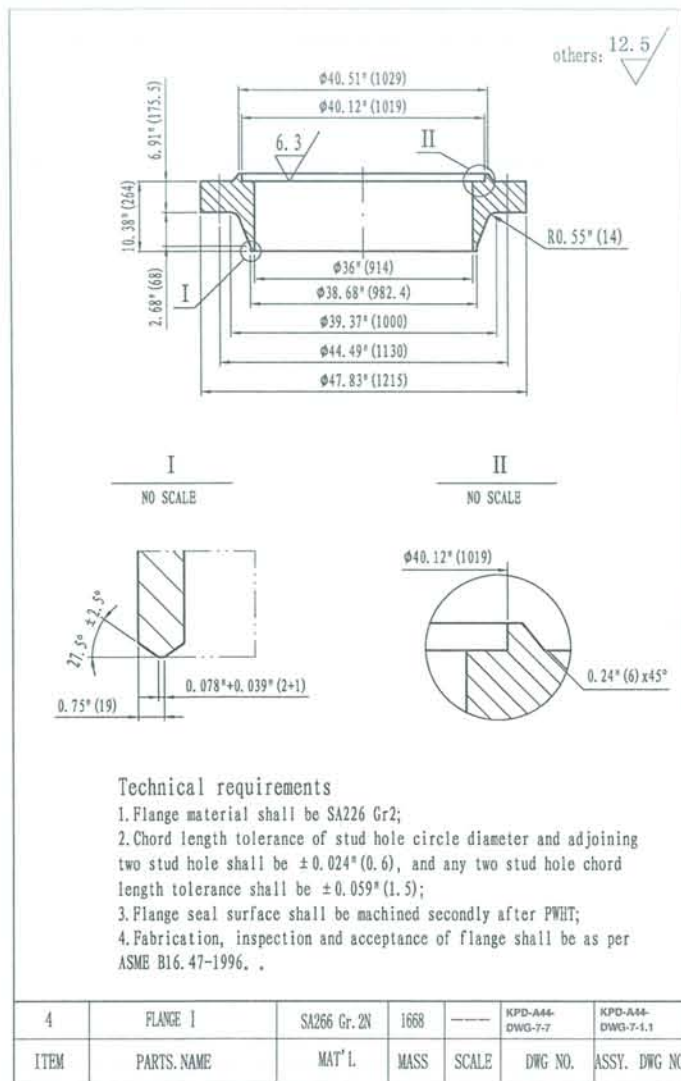
12-7	SLIDE	SA283 GrD	7.7	---	KPD-A44-DWG-7-6	KPD-A44-DWG-7-4
ITEM	PARTS. NAME	MAT' L	MASS	SCALE	DWG NO.	ASSY. DWG NO.

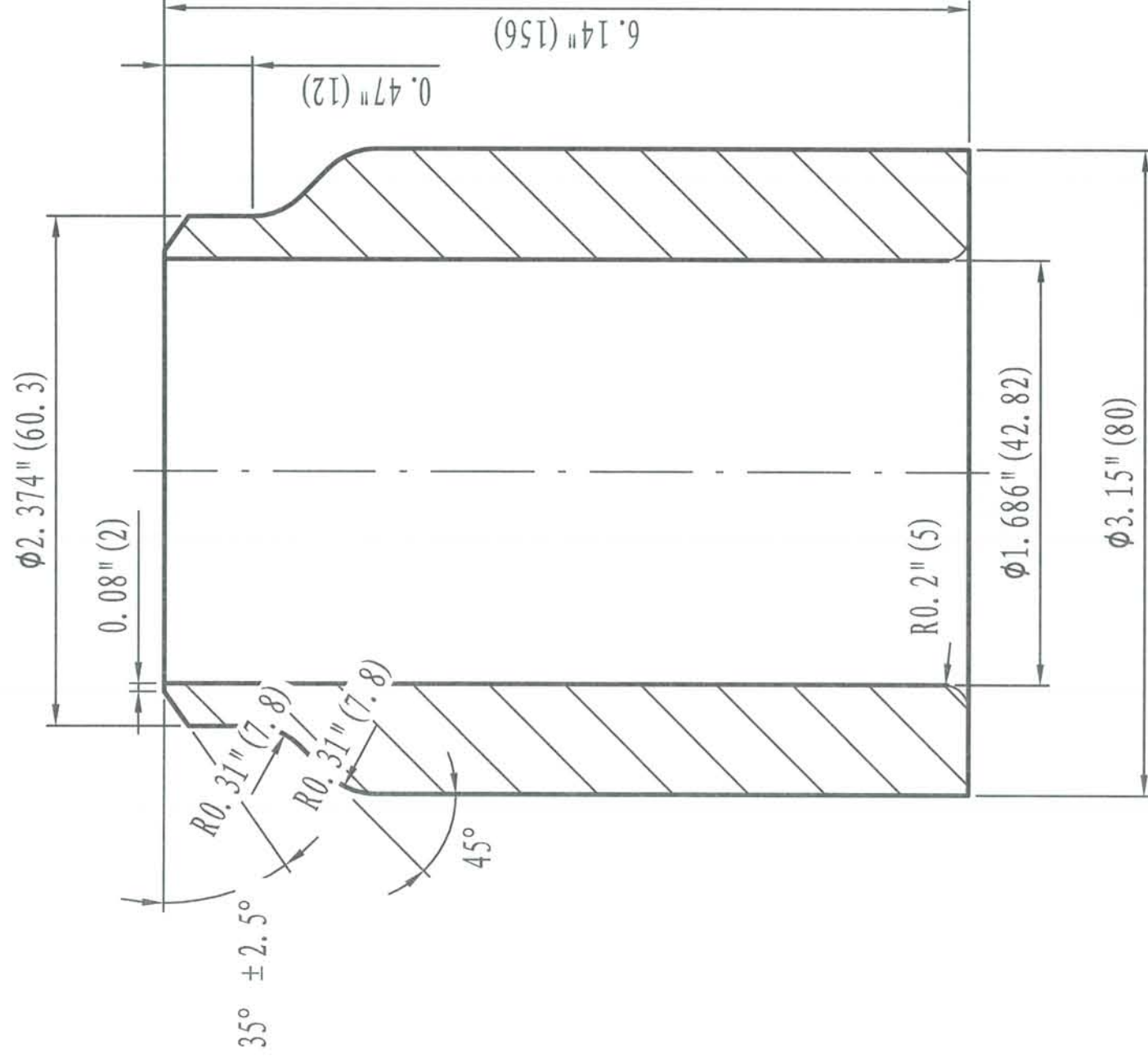


12-16	LOCKING THE EAR	SA516 Gr. 70	3.97	---	KPD-A44-DWG-7-6	KPD-A44-DWG-7-4
ITEM	PARTS. NAME	MAT' L	MASS	SCALE	DWG NO.	ASSY. DWG NO.

Oil and Gas Development Company Limited
 KPD-TAY Gas Processing and LPG Recovery Plant
 Description: General Drawing for Treated Gas Trim Cooler
 Equipment Tag: E-4403/5403
 Location: Amine Unit
 Drawing No: KPD-A44-DWG-7-6

			REV	C	SCALE	TOTAL 7 PAGES	5 PAGE
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14	PIPE	SA105	2.53	---	KPD-DWG-A44-7-8	KPD-DWG-A44-7-1.1
ITEM	PARTS. NAME	MAT'L	MASS	SCALE	DWG NO.	ASSY. DWG NO.

Oil and Gas Development Company Limited
KPD-TAY Gas Processing and LPG Recovery Plant
Description: General Drawing for Treated Gas Trim Cooler
Equipment Tag: E-4403/5403
Location: Amine Unit
Drawing No: KPD-A44-DWG-7-8

	REV	C	SCALE	TOTAL	7 PAGES	7	PAGE
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