



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

Material : **TUBE BUNDLES FOR HEAT EXCHANGERS**

Due Date:

Tender Enquiry No: **PROC/LF/17970/2020**

Bid Bond Value : **EACH ITEM WISE**

EVALUATION WILL BE CARRIED OUT ON ITEM WISE

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 for Treated Gas Trim Cooler E-4403/E-5403 as per attached TOR.	1		Number					
	PACKING & TRANSPORTATION COST OF ITEM NO.1	1		Number					
	INSTALLATION & HYDRO TESTING COST OF ITEM NO.1	1		Number					
2.	Tube Bundle for Lean Amine Trim Cooler E-4405/E-5405,, including Floating Head Cover and Backing Device as per attached TOR.	2		Number					
	PACKING & TRANSPORTATION COST OF ITEM NO.2	2		Number					
	INSTALLATION & HYDRO TESTING COST OF ITEM NO.2	2		Number					
3.	Tube Bundle for Sales Gas Compressor Cooler E-4504/E-5504 as per attached TOR.	2		Number					
	PACKING & TRANSPORTATION COST OF ITEM NO.3	2		Number					
	INSTALLATION & HYDRO TESTING COST OF ITEM NO.3	2		Number					
4.	Tube Bundle for Inlet Gas Trim Cooler E-4401/E-5401 as per attached TOR.	1		Number					
	PACKING & TRANSPORTATION COST OF ITEM NO.4	1		Number					
	INSTALLATION & HYDRO TESTING COST OF ITEM NO.4	1		Number					
5.	Tube Bundle for Condensate Stabilizer Reboiler E-7101/E-7201 as per attached TOR.	1		Number					
	PACKING & TRANSPORTATION COST OF ITEM NO.5	1		Number					
	INSTALLATION & HYDRO TESTING COST OF ITEM NO.5	1		Number					



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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.
- BID VALIDITY 120 DAYS FROM TECHNICAL BID OPENING. PAYMENT TERMS AS PER CLAUSE NO.8 OF TOR. DELIVERY AS PER CLAUSE NO.9 OF TOR FROM LPO ISSUE DATE. EVALUATION WILL BE ON ITEM WISE I.E. TUBE BUNDLE COST+PACKING&TRANSPORTATION+INSTALLATION&HYDROTESTING COST OF EACH TUBE BUNDLE COMPARED SEPARATELY.

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.

BID BOND:

1. ITEM NO.1 = Rs.150,000/-
2. ITEM NO.2 = Rs.450,000/-
3. ITEM NO.3 = Rs.500,000/-
4. ITEM NO.4 = Rs.550,000/-
5. ITEM NO.5 = Rs.120,000/-

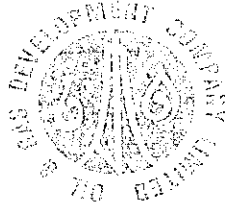
Mandatory Checklist

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



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

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"/>



OIL & GAS DEVELOPMENT COMPANY LTD

TOR FOR

FABRICATION, SUPPLY, INSTALLATION & TESTING OF
MISCELLANEOUS HEAT EXCHANGER TUBE BUNDLES
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 bundles for the following heat exchangers in mentioned quantities, from an experienced and well reputed manufacturer / contractor / supplier to fulfil the operational requirement.

Sr #	Description	QTY	UOM
1	Tube bundle for Treated Gas Trim Cooler (E-4403/5403)	1	No
2	Tube bundle, including Floating Head Cover and Backing Device, for Lean Amine Trim Cooler (E-4405/5405)	2	No
3	Tube bundle for Sales Gas Compressor Cooler (E-4504/5504)	2	No
4	Tube bundle for Inlet Gas Trim Cooler (E-4401/5401)	1	No
5	Tube bundle for Condensate Stabilizer Reboiler (E-7101/7201)	1	No

2.0 DEFINITIONS, ERRORS & CONFLICTS:

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

Supplier /Contactor : 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 prior bid submission.

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 heat exchanger tube bundles of Treated Gas Trim Cooler (1 No.), Lean Amine Trim Cooler (2 Nos.), Sales Gas Compressor

Cooler (2 Nos.), Inlet Gas Trim Cooler (1 No.) and Condensate Stabilizer Reboiler (01 Nos.) installed at KPD-TAY Plant as per specification elaborated below in detail. All material & consumables required for fabrication of tube bundles is in Contractor scope.

- 3.2 Contractor shall also provide two complete sets of channel head gaskets of heat exchangers as per attached drawings/specifications, against supply of each tube bundle, 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 listed tube bundles.
- b. Only U-stamp & R-Stamp authorized manufacturers will be considered for technical evaluation, valid copies of certificates 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, MTCs shall be provided prior to fabrication of material for OGDCL witness.
- f. Bidder shall prepare his own drawings for fabrication & same shall be handed over to OGDCL along with delivery of tube bundles.
- g. All bill of quantities (BOQ) related to the tube bundles mentioned in the drawings are included in the Contractor scope.
- h. The Contractor must make all necessary arrangements including fixture for transport of tube bundles to KPD-TAY Plant.
- i. Guarantee / warrantee of tube bundles for a period of one year after being taken into service or 18 months after shipment, whichever comes first for which PBG will be submitted for same period.

6.0 CONTRACTOR RESPONSIBILITIES:

- a. The contractor shall be responsible for arrangement of all material, consumables required for fabrication of the tube bundles.
- b. The contractor shall be responsible for arrangement of all resources for fabrication, welding, NDT / inspection, U/R stamp required for the tube bundles.
- c. The contractor shall be responsible for safe transportation of the tube bundles up to the KPD-TAY Plant.
- d. Complete replacement job of tube bundles (i.e. removal of existing / old tube bundles & installation of new tube bundles 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. Bidders are supposed to install & hydro test all tube bundles at site, however as per operational requirement or any other reason the availability of heat exchangers for installation activities is as elaborated below.

Exchangers readily available for replacement of Tube Bundles after arrival at site.	Tube Bundles subject to availability of Heat exchangers for Replacement of Bundles after arrival at site.
1. Tube bundle for Treated Gas Trim Cooler (E-4403/5403) .	1. Tube bundle for Inlet Gas Trim Cooler (E-4401/5401)
2. Tube bundle, including Floating Head Cover and Backing Device, for Lean Amine Trim Cooler (E-4405/5405).	2. Tube bundle for Condensate Stabilizer Reboiler (E-7101/7201)
3. Tube bundle for Sales Gas Compressor Cooler (E-4504/5504).	

Note: In case of non-availability of any heat exchanger for replacement of bundles then OGDCL will install those newly supplied bundles using its own resources at appropriate time (May be during ATA). However, OGDCL will inform bidder/supplier to depute his representative to witness installation and hydro testing activities and bidder shall depute his representative for the same without any additional charges. If any non-conformance will be observed during installation and hydrotesting which lies at the part of Contractor, then Contractor will be responsible to rectify the same within a week without any additional charges.

- f. 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.
- g. Hydro testing shall be carried out as per standard procedure at specified hydro test pressure of shell or tube whichever is higher.
- h. Bidder is not allowed to refuse for the execution of installation & hydro testing activities in any case if OGDCL will managed to spare the heat exchanger for replacement of tube bundle.
- i. In case of any leakage observed, tube bundle will be hydro tested again & Contractor will be responsible to extend / provide all facilities, resources & consumables as provided in the first hydro test.
- j. Contractor shall fabricate the tube bundles 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.
- k. All other tools, equipment and consumables which are not specified in clause 7.0 (OGDCL responsibilities) required for removing existing tube bundles and installation of new tube bundles and their testing will be included in contractor scope.

7.0 OGDCL RESPONSIBILITIES:

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

- i. Isolation of the existing heat exchanger & purging.
- ii. OGDCL will provide Crane & 03-05 Ton Fork Lifter for tube bundles replacement activities.

- iii. Crane will be provided by OGDCL, however, the successful bidder will submit rigging study and may visit site for rigging study.
- iv. Provide electricity & demineralized water for hydro testing of tube bundles.
- v. Provide test ring for Hydro testing of tube bundles.
- vi. All spiral wound gaskets for isolation & hydro testing of heat exchanger shall be arranged by OGDCL.
- vii. Provide Slings, shackles & chain blocks for rigging of tube bundles.
- viii. Boarding and lodging of contractor staff.

8.0 PAYMENT TERMS

- 1. 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 bundles at KPD-TAY Plant.
- 2. Payment of complete tube bundle along with transportation cost will be released if OGDCL will not be in position to allow the bidder for installation & hydro testing of the supplied tube bundle due to any operational constrain or any other reason. Services cost will not be paid in this regard. In said case material delivery acceptance certificate will be issued by OGDCL for payment purpose.

9.0 DELIVERY SCHEDULE

- i. The tube bundles shall be delivered at KPD-TAY Plant after complete fabrication & NDT / Inspection within 150 days.
- ii. The installation of the tube bundles and hydro testing shall be completed within 30 days after receipt of tube bundles 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:

TREATED GAS TRIM COOLER TUBE BUNDLE (E-4403/E-5403) (1 No.)			
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 U-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
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TUBE:

1	Material shall be SA-179 seamless tubes and purchasing shall be as per SA-450. Outer diameter shall be within $3/4" \pm 0.004"$ ($\varnothing 19.05 \pm 0.1\text{mm}$) 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 $0.016"$ (0.4mm).
3	Tube hole axes shall be strictly vertical to plate sealing face and perpendicularity tolerance shall be $0.0039"$ (0.1mm).
4	After tubes drilled, no less than 96% bridge width shall be more than $0.301"$ (7.65mm), min. bridge width shall be $0.18"$ (4.575mm).

BAFFLE PLATE I / II & MOUNTING PLATE:

1	Support plate shall be flat, flatness tolerance shall be no more than $0.118"$ (3mm).
2	Remove all burr after drilling.
3	Limitation deviation of adjoining two holes centreline distance shall be $\pm 0.012"$ (0.3mm).
4	Limitation deviation of 4% allowance adjoining two holes shall be $\pm 0.02"$ (0.5mm).
5	Limitation deviation of any tube holes centreline distance shall be $\pm 0.039"$ (1mm).
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.

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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°.

LEAN AMINE TRIM COOLER TUBE BUNDLES WITH FLOATING HEAD COVER AND BACKING DEVICE (E-4405/E-5405) (2 Nos.)			
S. No	DESIGN PARAMETER	SHELL	CHANNEL
1	Service	Lean Amine	Cooling Water
2	Operating Temperature (In/Out)	130.6°F(55°C)/120°F(49°C)	93°F (34°C)/115°F (46°C)
3	Operating Pressure	95 psig (0.66 MPa)	50 psig (0.345 MPa)
4	Design Temperature	150°F (65.5°C)	150°F (65.5°C)
5	Design Pressure	200psig (1.38MPa)	150 psig (1.03MPa)
6	Hydrostatic Test Temperature	70°F (21°C)	70°F (21°C)
7	Hydrostatic Test Pressure	260 psig (1.79MPa)	260 psig (1.79MPa)
8	Number of Tubes	1600	
9	Tube Material	SA179	
10	Tube Dimensions	3/4"x0.083"x196.85" (Ø19.05mmx2mmx5000 mm) Straight Tubes	
11	Joint Style of Tube and Tube Sheet	Intensity Weld and Expansion	
TUBE:			
1	Material shall be SA-179 seamless tubes. Outer diameter shall be within 3/4"±0.004" (Ø19.05±0.1mm) and thickness shall be 0.083"+0.0166" (2.1mm+0.4mm).		
2	Connection between tube plate and tube shall be strength welding with light expansion.		
3	All spacer length allowance deviation shall be -0.04" (-1mm).		
TUBESHEETS (STATIONARY & FLOATING):			
1	Material shall be as per SA266 Gr. 2N.		
2	Plate sealing surface and axes shall be vertical and perpendicularity tolerance shall be 0.0157" (0.4mm).		
3	Tube hole shall be strictly vertical with plate sealing surface and perpendicularity tolerance shall be 0.0039" (0.1mm) for floating tube sheet & 0.4mm for stationary tube sheet.		
4	For no less than 96% plate drill (drill lateral), allowance hole width shall be no less than 0.196" (4.97mm). For no more than 4%, min allowance hole width shall be 0.121" (3.08mm).		
TRANSVERSE BAFFLE I / II & SUPPORT PLATE:			

1	Support plate and transverse baffles shall be flat and flatness tolerance shall be 3mm.
2	Remove all burr after drilling.
3	Limitation deviation of adjoining tube hole centreline distance shall be ± 0.012 " (0.3mm).
4	For Support Plate & Transverse Baffle II, Limitation deviation of 4% adjoining tube hole centreline shall be ± 0.02 " (0.5mm), any two tube holes centreline distance shall be ± 0.04 " (1.0mm).
5	Material shall be as per SA 36.

TIE-RODS:

1	Screw dimension shall be as per ISO724:1993, screw dimension tolerance shall be as per ISO965-1: 1998 6g.
2	Material shall be as per SA 36.
3	Burr and iron scrap shall be removed when screw machine finished.
4	Crack, damage and burr shall be not allowed, the others shall be as per ISO 6157-1; 1988 Fastens Surface Defects Part One: Bolts, General specification.

GASKET:

1	Fabrication and Acceptance of gasket shall be as per ASME B16.20-2007.
2	Tooth Pad parts and wound gasket shall be inner ring point welding.

FLOATING HEAD COVER AND BACKING DEVICE:

1	All material and dimensions of Floating Head Cover Flange, Dish Head and Backing Device shall be as per provided drawings.
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SALES GAS COMPRESSOR COOLER TUBE BUNDLES (E-4504/E-5504) (2 Nos.)

S. No	DESIGN PARAMETER	SHELL	TUBE
1	Service	Cooling Water	Sales Gas
2	Operating Temperature (In/Out)	93°F(34°C)/115°F (46.1°C)	136.78°F(58.2°C)/111.98°F (44.4°C)
3	Operating Pressure	50 psig (0.345 MPa)	508.2 psig (3.5 MPa)
4	Design Temperature	150°F (65.5°C)	200°F (93.3°C)
5	Design Pressure	150psig (1.03MPa)	600 psig (4.14MPa)
6	Hydrostatic Test Temperature	70°F (21°C)	70°F (21°C)
7	Hydrostatic Test Pressure	195 psig (1.34MPa)	780 psig (5.38MPa)
8	Number of U-Tubes	434	

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9	Tube Material	SA179
10	Tube Dimensions	3/4"x0.083"x196.85" (Ø19.05x2x5000 mm)
11	Joint Style of Tube and Tube Sheet	Intensity Weld and Expansion

TUBE:

1	1	Tubes shall be SA-179 cold forming seamless tubes. Outer Diameter and deviation will be 3/4"±0.004" (Ø19.05±0.1mm).
2	2	U Tubes shall be cold bended and roundness deviation of bended section shall be no more than 15% of heat tube nominal outer diameter.
3	3	U Tube shall not be split joint.
4	4	All requirements as per General Drawing.

TUBESHEET:

1	1	Material shall be as per SA266 Gr. 2.
2	2	Plate sealing surface and axes shall be vertical and perpendicularity tolerance shall be 0.25mm.
3	3	Tube hole axes shall be strictly vertical to plate sealing face and perpendicularity tolerance shall be 0.06mm.
4	4	After tubes drilled, no less than 96% bridge width shall be more than 4.76mm min. bridge width shall be 2.98mm.

TRANSVERSE BAFFLE & SUPPORT PLATE:

1	1	Baffle Plate and Support Plate shall be steady, flat face deviation shall not be more than 3mm.
2	2	Remove all burr after drilling of pipe holes.
3	3	Distance Limit Deviation of two adjacent holes is ±0.3mm, 4% of two holes adjacent limit deviation is ±0.5mm, any two pipe holes limit deviation is ±1mm.
4	4	Material shall be as per SA 283 Gr. C.

TIE ROD:

1	1	Dimension of screw thread shall be as per ASME B1. 3-2007.
2	2	Material shall be as per SA 36.
3	3	Burr, iron scruff etc. shall be removed after processing.

GASKET:

1	1	Type of gasket is spiral gasket, Inner ring is SA-240 316L, filling with flexible graphite.
2	2	Defects, twists, deformation, which may affect the tightness of the gasket are not allowed.
3	3	Fabrication, inspection and acceptance shall comply with ASME B16.20-2007.

INLET GAS TRIM COOLER TUBE BUNDLE (E-4401/5401) (1 No.)

S. No	DESIGN PARAMETER	SHELL	TUBE
1	Service	Water	Gas
2	Operating Temperature (In/Out)	93°F(33.8°C)/115°F (46°C)	140°F (60°C)/110°F (43.3°C)
3	Operating Pressure	50 psig (0.345 MPa)	1045 psig (7.2 MPa)
4	Design Temperature	150°F (65.5°C)	200°F (93.3°C)
5	Design Pressure	150psig (1.03MPa)	1200 psig (8.27MPa)
6	Hydrostatic Test Temperature	70°F (21°C)	70°F (21°C)
7	Hydrostatic Test Pressure	195 psig (1.34MPa)	1560 psig (10.75MPa)
8	Number of U-Tubes	635	
9	Tube Material	SA-213 TP-316L	
10	Tube Dimensions	3/4"x0.065"x196.85" (Ø19.05x1.651x5000 mm) (635 U)	
11	Joint Style of Tube and Tube Sheet	Intensity Weld and Expansion	

TUBE:

- 1 | Material shall be SA-213 TP316L seamless tubes and purchasing shall be as per SA-1016. Outer diameter shall be within 3/4"±0.004" (Ø19.05±0.1mm) and thickness shall be 0.065"+0.013" (1.65mm+0.33mm).
- 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 allowed to jointed.
- 4 | All requirements as per General Drawing.

TUBESHEET:

- 1 | Material shall be as per SA266 Gr. 2N + SS316L.
- 2 | Plate sealing surface and axes shall be vertical and perpendicularity tolerance shall be 0.016" (0.4mm).
- 3 | Tube hole axes shall be strictly vertical to plate sealing face and perpendicularity tolerance shall be 0.0039" (0.1mm).

BAFFLE PLATES I, II & III:

- 1 | Support plate shall be flat, flatness tolerance shall be no more than 0.118" (3mm).
- 2 | Remove all burr after drilling.

3	Limitation deviation of adjoining two holes centreline distance shall be $\pm 0.012"$ (0.3mm).
4	Limitation deviation of 4% allowance adjoining two holes shall be $\pm 0.02"$ (0.5mm).
5	Limitation deviation of any tube holes centreline distance shall be $\pm 0.039"$ (1mm).
6	Material shall be as per SA 283 Gr. D.
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°.

CONDENSATE STABILIZER REBOILER TUBE BUNDLE (E-7101/E-7201)			
(1No.)			
S. No	DESIGN PARAMETER	SHELL	TUBE
1	Service	Condensate Stabilizer Bottom	Hot Oil
2	Operating Temperature (In/Out)	326.04°F/429.98°F	615°F/530°F
3	Operating Pressure	355 psig	50 psig
4	Design Temperature	600°F	650°F
5	Design Pressure	600psig	125 psig
6	Hydrostatic Test Pressure	804.124 psig	172.872 psig
7	Number of U-Tubes	140	
8	Tube Material	SA179	
9	Tube Dimensions	0.75"x0.083"(Ø19.05x2.1) (Lengths as per attached drawings)	
10	Joint Style of Tube and Tube Sheet	Strength Welded and Lightly Expanded	

5

TUBE:	
1	Material shall be SA-179, 0.75"x0.083" (Ø19.05x2.1) (Lengths as per attached drawings).
2	Tubes and Tube Sheet Joint shall be Strength Weld and Lightly Expanded.
3	Joints of Tube to Tube sheet should be conducted by a 100% PT examination according to APP.8 in ASME VIII-1.
TUBESHEET:	
1	Material shall be as per SA266 Gr. 2.
2	The forging should be fabricated and inspected according to SA-266-2, Forging cannot be welding joint.
3	Sealing surface of the tube sheet must be vertical to the axis, squareness tolerance is 0.0118" (0.3mm).
4	The tube holes must be vertical to sealing surface of tube sheet, tolerance is 0.00472" (0.12mm). No permission of through fore-and-aft streak on hole surface.
5	After drilling, the width of hole bridge must be > 0.1237" (4.872mm) for > 96%, permitted min. bridge width is 0.1918" (2.95mm)
6	Tolerance between bolt cr. Hole circle diameter and chord length of two adjacent holes shall be ±0.0236" (0.6mm), tolerance of chord length between any two adjacent holes shall be ±0.059" (1.5mm).
7	There is no permission for rifts and flaws which can reduce the flange's intensity or reliable joints in the seal surface and outside of tube sheet.
SUPPORT PLATE:	
1	The baffle shall be planished, the flatness is 0.118" (3mm).
2	Tolerance of adjacent tube holes centres distance is ±0.0118" (±0.3mm), permit 4% is ±0.0197" (±0.5mm), arbitrary two tube holes is ±0.0394" (±1mm).
3	After drilling the hole edge shall be chamfered off 0.0196"x45° (0.5mmx45°).
4	The sharp angle of baffle outer circle must be abate.
GASKET:	
1	Material shall be 316L+graphite (as per attached drawing).
2	The manufacturing of this piece, examination and acceptance will be according to ASME B16.20 standard performance.
3	Parts of the strip for S-30408, filled with flexible graphite for the band the ring to enhance the wound pad.

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

Je

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, 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 & pressure vessels.
- ix. Contractor declared as black listed at PPRA website will not be entertained.

Annexure-A

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, heat exchangers and tube bundles.	Contractor should provide evidence of experience.	30	15	Each year : 03 marks
	Shell & Tube Heat exchangers / U tube bundles / Floating Head Tube Bundles manufacturing Experience.	Contractor should provide evidence of Shell & Tube Heat exchangers / U tube bundles & Floating Head Tube Bundles manufacturing Experience.	30	15	Each HE / U tube / Floating Head bundle: 03 marks

Sr No	Evaluation Item	Description of Criteria	Max Marks	Min Marks	Remarks
2.	Technical Compliance.	Contractor must fully comply with technical specifications mentioned in the TOR & Submit method statement.	15	15	Comply technical specifications : 10 marks Method statement: 05 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.	Contractor facilities required for the replacement & Hydro testing of Tube bundles 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 Bundles 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 the 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 technical 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

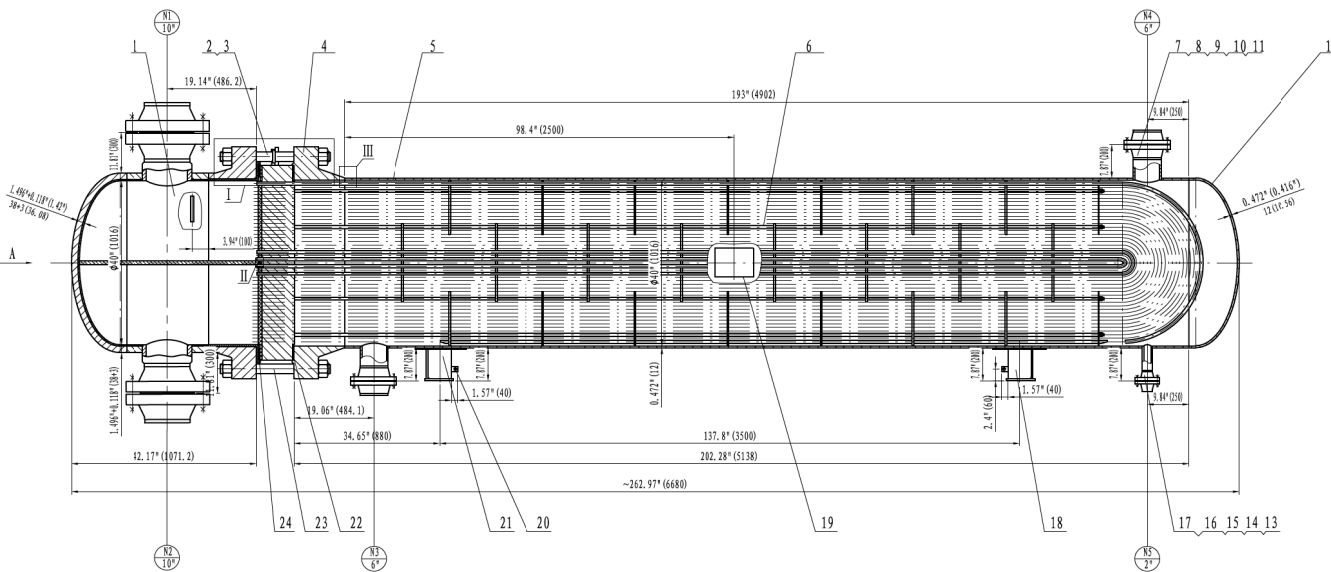
Sr. No.	Description	Qty Required	Unit Rate (PKR)	Total Amount (PKR)
01.	Fabrication & supply of Treated Gas Trim Cooler (E-4403/5403) Tube Bundle including all material & consumables required for fabrication of tube bundles including two sets of heat exchanger channel head gaskets (as per attached drawings) against supply of each tube bundle.	01 No.		
1.1	Packing & Transportation Cost for Treated Gas Trim Cooler (E-4403/5403) Tube Bundle.	01 No.		
1.2	Services Cost for Treated Gas Trim Cooler (E-4403/5403) Tube Bundle (For Complete Replacement Job including Hydro Testing).	01 No.		
Total Cost of item No. 01				
02.	Fabrication & supply of Lean Amine Trim Cooler (E-4405/5405) Tube Bundles along with floating head cover & backing device including all material & consumables required for fabrication of tube bundles including two sets of heat exchanger channel head gaskets (as per attached drawings) against supply of each tube bundle.	02 Nos.		
2.1	Packing & Transportation Cost for Lean Amine Trim Cooler (E-4405/5405) Tube Bundles.	02 Nos.		
2.2	Services Cost for Lean Amine Trim Cooler (E-4405/5405) Tube Bundles (For Complete Replacement Job including Hydro Testing).	02 Nos.		
Total Cost of item No. 02				
03.	Fabrication & supply of Sales Gas Compressor Cooler (E-4504/5504) Tube Bundles including all material & consumables required for fabrication of tube bundles including two sets of heat exchanger channel head gaskets (as per attached drawings) against supply of each tube bundle.	02 Nos.		
3.1	Packing & Transportation Cost for Sales Gas Compressor Cooler (E-4504/5504) Tube Bundles.	02 Nos.		
3.2	Services Cost for Sales Gas Compressor Cooler (E-4504/5504) Tube Bundles (For Complete Replacement Job including Hydro Testing).	02 Nos.		
Total Cost of item No. 03				
04.	Fabrication & supply of Inlet Gas Trim Cooler (E-4401/5401) Tube Bundle including all material & consumables required for fabrication of tube bundles including two sets of heat exchanger channel head gaskets (as per attached drawings) against supply of each tube bundle.	01 No.		
4.1	Packing & Transportation Cost for Inlet Gas Trim Cooler (E-4401/5401) Tube Bundle.	01 No.		

4.2	Services Cost for Inlet Gas Trim Cooler (E-4401/5401) Tube Bundle (For Complete Replacement Job including Hydro Testing).	01 No.		
Total Cost of item No. 04				
05.	Fabrication & supply of Condensate Stabilizer Reboiler (E-7101/7201) tube Bundle including all material & consumables required for fabrication of tube bundles including two sets of heat exchanger channel head gaskets (as per attached drawings) against supply of each tube bundle.	01 No.		
5.1	Packing & Transportation Cost for Condensate Stabilizer Reboiler (E-7101/7201) Tube Bundle.	01 No.		
5.2	Services Cost for Condensate Stabilizer Reboiler (E-7101/7201) Tube Bundle (For Complete Replacement Job including Hydro Testing).	01 No.		
Total Cost of item No. 05				
Grand Total from Item No. 01 to Item No. 05				
<p>Note:</p> <ol style="list-style-type: none"> Bid price must be quoted in PKR otherwise the bid will be rejected. 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. <p>Financial Evaluation will be carried out item wise i.e Tube bundle cost + packing & transportation cost + installation / hydro testing services cost of each bundle will be added & compared separately. Contract will be awarded to technically qualified and financially lowest evaluated bidders at each items basis.</p>				

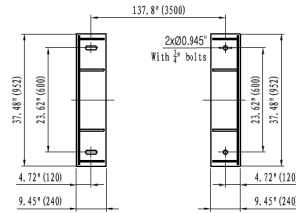
13.0 Attachment:

Following drawings are attached with TOR.

- Drawing No. A44-01-MEF-DWG-14-01 to 07
- Drawing No. A44-01-MEF-DWG-16-01 to 08
- Drawing No. A44-01-MEF-DWG-17-01 to 11
- Drawing No. B45-01-MEF-DWG-10-01 to 06
- Drawing No. B71-01-MEF-DWG-14-01 to 07



SADDLE ARRANGEMENT
NO SCALE



Technical requirements

- The design, fabrication, inspection, test and acceptance shall comply with ASME Sec. VIII-1 (2010ED 1011ADD) Rules for Construction of Pressure Vessels.
- Welding shall comply with ASME Sec. IX Qualification Standard For Welding And Brazing Procedures, Welders, Brazers, And Welding And Brazing Operators.
- Material requirements
 - Material should meet ASME SEC. II-2010.SA-516 GR. 70 base material of clad-steel should be used in normalized condition. Clad-steel should meet the requirement of SA264 with a bond quality of class I or above.
 - The equipment should meet the requirement of datasheet (A44-01PW-DAS-08) and specification (165-I-SPM-057).
 - Category A,3 welding joints shall be 100% RT tested as per ASME-V Sec. Article II and results shall be as per ASME-VIII Sec. IdivisionUW-51.
 - Category C,D welding joints shall be 100% MT/PT tested as per ASME-VIII Sec. Idivision Appendix 6 or 8.
 - Tubes shall be SA-213 TP316L. Purchasing shall be as per SA-1016. Outer diameter shall be within 3/4" ± 0.004" (Ø19.05 ± 0.1mm) and thickness shall be 0.065" ± 0.013" (1.65mm ± 0.33mm).
 - Welds of shell side shell inner surface shall be ground to be flush with base metal. Burr, welding spatter, bends and sharp edges shall be not allowed on surface. Category A, B weld joint internal surface of shell side shall be smooth.
 - Welding joints between tube plates to tubes, header flange to tube plate overlay welding surface, clad plates' joints 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 exchanger tube and tube plate.
 - External shall conduct anti-trust after manufacturing, Swiss Standards Institute 055900 S.A.2.5 is qualified. SS shall conduct pickling, CS shall paint anti-rust primer and finish coating, film thickness 100-150µm.
 - Header shall be heat treated.
 - Welding joints of tube side category A,B,C,D see part drawing.
 - Header lug only shall be for header lifting;

DESIGN DATA

DESIGN STANDARD	ASME CODE SEC. VIII DIV. 1, 2010ED-2011.000.	
CERTIFICATION MARK WITH U IDENTIFIER	YES	
NB REGISTER	NO	
TEMA CLASS	R	
DESIGN PARAMETER	SHELL	TUBE
SERVICE	WATER	
DENSITY (IN/OUT)	1b/ft ³	62.5/61.9
3.9/4.2		
MEDIUM PROPERTY	NO LETHAL	
EXPLOSIVE (NO LETHAL)		
MAIN BODY MATERIAL	SA516 Gr. 70	SA313 TP316L/SA196 Gr. 10-SS316L
PIPE MATERIAL	SA105/SA106 GrB	SS316L-SA-105N
DESIGN TEMPERATURE	°F (°C)	150 (65.5)
200 (93.3)		
OPERATING TEMPERATURE (IN/OUT)	°F (°C)	93 (33.8) / 115 (46)
:40 (60) / 110 (43.3)		
MMWT AT PRESSURE	°F (°C)	32 (0)
32 (0)		
HYDROSTATIC TEST TEMPERATURE	°F (°C)	70 (21)
70 (21)		
OPERATING PRESSURE	psig (MPa)	50 (0.345)
1045 (7.2)		
DESIGN PRESSURE	psig (MPa)	150 (1.03)
1200 (8.27)		
MAX ALLOWANCE WORKING PRESSURE	psig (MPa)	150 (1.03)
1200 (8.27)		
SAFETY VALVE SETTING PRESSURE	psig (MPa)	/
/		
SAFETY VALVE MODEL	/	
/		
HYDROSTATIC TEST PRESSURE	psig (MPa)	195 (1.34)
1560 (10.75)		
JOINT EFFICIENCY	1.0	
1.0		
CORROSION ALLOWANCE	in (mm)	0.118 (3)
0		
DISTANCE NUMBER	1	
2		
POST WELD HEAT TREATMENT	/	
YES		
RT.	RT FULL/UW-51	RT FULL/UW-51
MT OR PT.	FULL (C, D, E) / APPENDIX 6&8	
HEAT EXCHANGE AREA	ft ² (m ²)	4228.34 (392.62)
TUBE SPEC	in (mm)	3/4"x0.065"x196.85" (#19.6x1.65x15000) 635U
JOINT STYLE OF TUBE AND TUBESHEET	INTENSITY WELD AND EXPANSION	
IMPACT TESTING	/	
PER UW-10(F) AND UCS-66		
TOTAL VOLUME	ft ³ (m ³)	114 (3.23)
49.4 (1.4)		
SEISMIC ZONE	2A (0.15)	
VESSEL WEIGHT	lb (kg)	26120 (11847)
DESIGN SERVICE LIFE	YEAR	
25		
INSULATION THICKNESS	in (mm)	/

LIST OF NOZZLE

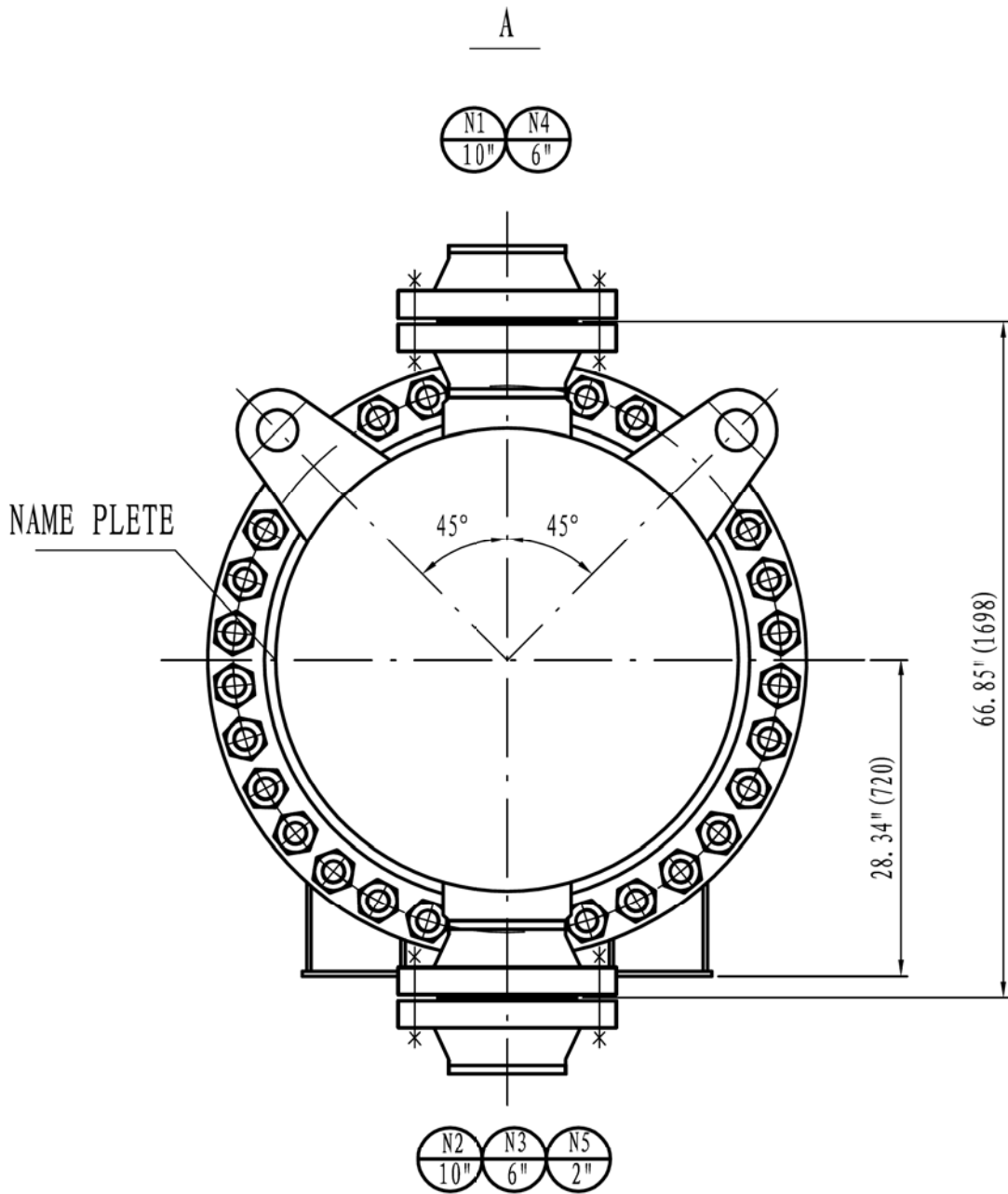
MARK	SIZE	FLANGE PER ASME B16.5-2000E RATING (CLASS)	TYPE	SEALING TYPE	ASME B31.10E-2000E	DESCRIPTION	REMARK
N1	10"	600#	WN	RF	/	GAS INLET	
N2	10"	600#	WN	RF	/	GAS OUTLET	
N3	6"	150#	WN	RF	Sch80	WATER INLET	
N4	6"	150#	WN	RF	Sch80	WATER OUTLET	
N5	2"	150#	WN	RF	Sch160	DRAIN OUTLET	

ITEM	QTY.	PARTS NAME	MATERIAL	SINGLE WEIGHT (lb)	TOTAL WEIGHT (lb)	REMARKS
24	1	GASKET	316L/F.C.			
23	34	STD BOLTS 1/2"-UNC-2H L=21.25"	SA 193 Gr. B7	10.2	306	L ₁ = 4.5"
22	1	GASKET	316L/F.C.			
21	1	SADDLE SUPPORT S	SUBASSEMBLY		139	
20	2	EARTH PLATE	SA240 304	0.44	0.88	
19	1	SADDLE SUPPORT F	SUBASSEMBLY		139	
17	8	HEX NUTS 5/8"-UNC-2H	SA 194 Gr. 2H	0.1	0.8	
16	4	STD BOLTS 1/2"-UNC-2H L=3.5"	SA 193 Gr. B7	0.3	1.2	
15	1	GASKET 1"-150-316L-F.C.	SS316L/F.C.			
14	1	PIPE 2"xSch160 L=5.91"	SA106 Gr. B		3.7	
13	2	FLANGE 10"x150 RF Sch160	SA-105	6	12	COMPANION
12	1	ELLIPTICAL HEAD	SA-516 Gr. 70		240	

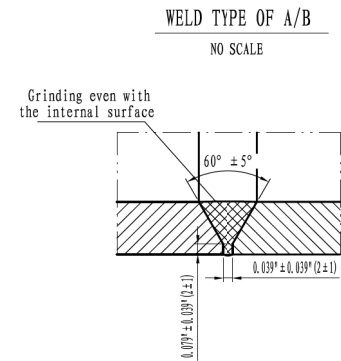
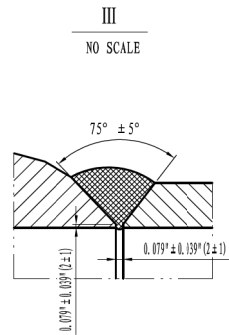
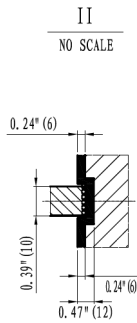
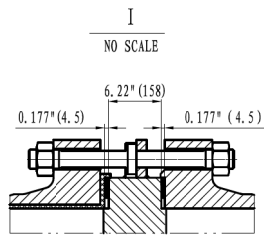
ITEM	QTY.	PARTS NAME	MATERIAL	SINGLE WEIGHT (lb)	TOTAL WEIGHT (lb)	REMARKS
11	32	HEX NUTS 3/4"-UNC-2H	SA 194 Gr. 2H	0.15	4.8	
10	16	STD BOLTS 3/4"-UNC-2H L=4.5"	SA 193 Gr. B7	0.6	9.6	
9	2	GASKET 6"-150-316L-F.C.	SS316L/F.C.			
8	2	PIPE 6" Sch80 L=5.11"	SA-106 Gr. B	11.3	24.6	
7	4	FLANGE 10"x150 RF Sch80	SA-105	26	104	COMPANION
6	1	BUNDLE	SUBASSEMBLY		15128	
5	1	SHELL 1040"x8.472"x103"	SA-516 Gr. 70		3300	
4	1	FLANGE 1	SA266 Gr. 2N		1580	
3	72	HEX NUTS 1-1/8"-UNC-2H	SA 194 Gr. 2H	3.4	244.8	
2	2	SHOULDER STD	SA 193 Gr. B7	19.1	38.2	
1	1	CHANNEL	SUBASSEMBLY		4876	

GENERAL DRAWING FOR
INLET GAS TRIM COOLER

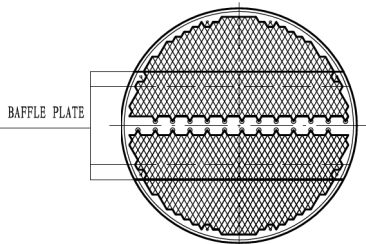
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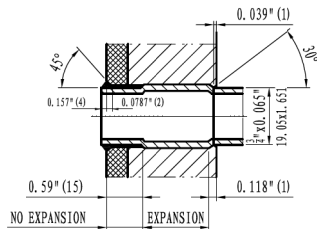
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GENERAL DRAWING FOR INLET GAS TRIM COOLER													
<table border="1" style="margin: auto;"> <tr> <td>REV</td> <td>C</td> <td>SCALE</td> <td>1: 10</td> </tr> </table>		REV	C	SCALE	1: 10	<table border="1" style="margin: auto;"> <tr> <td>EQUIP TAG.</td> <td>E-4401&E-5401</td> </tr> <tr> <td>PHASE</td> <td>DETAILED DESIGN</td> </tr> <tr> <td>DWG. NO</td> <td>A44-01-MEF-DWG-14-01.02</td> </tr> </table>	EQUIP TAG.	E-4401&E-5401	PHASE	DETAILED DESIGN	DWG. NO	A44-01-MEF-DWG-14-01.02	
REV	C	SCALE	1: 10										
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PHASE	DETAILED DESIGN												
DWG. NO	A44-01-MEF-DWG-14-01.02												
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TOTAL	1 PAGES	1 PAGE											



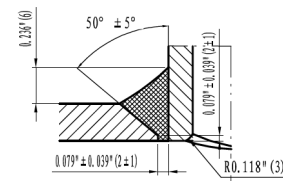
TUBE, DRAW BAR, BAFFLE PLATE
ARRANGEMENT DIAGRAM
NO SCALE



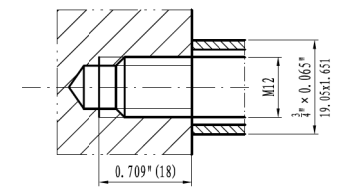
WELD TYPE OF TUBE AND TUBESHEET
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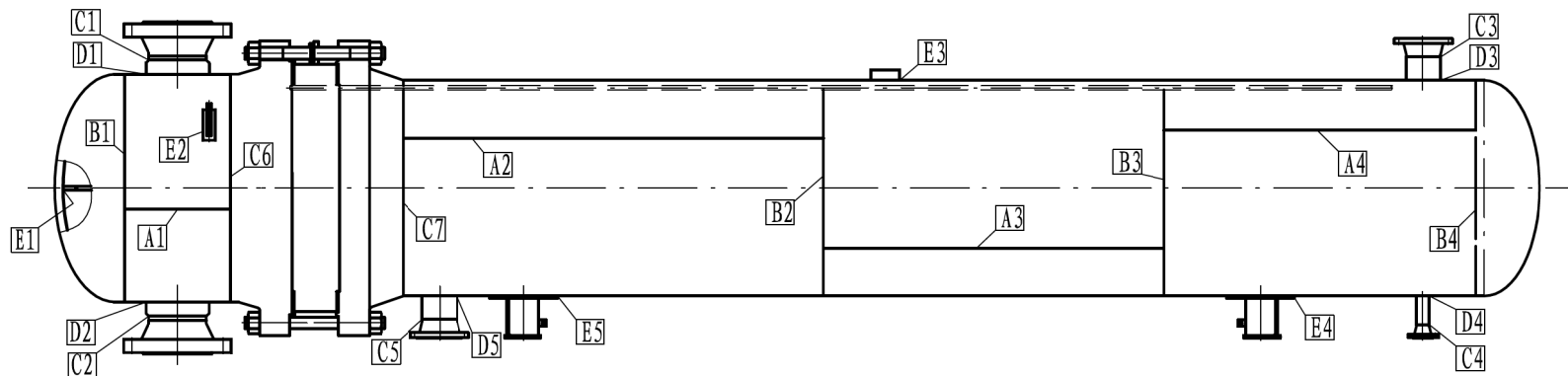
WELD OF N3, N4, N5
NOZZLE AND SHELL
NO SCALE



DRAW BAR, TUBE, TUBESHEET
CONNECTION DIAGRAM
NO SCALE



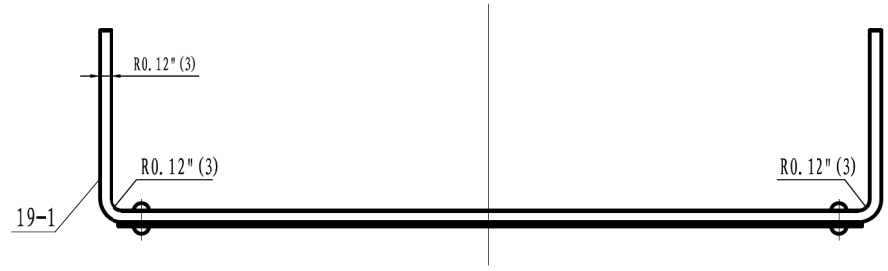
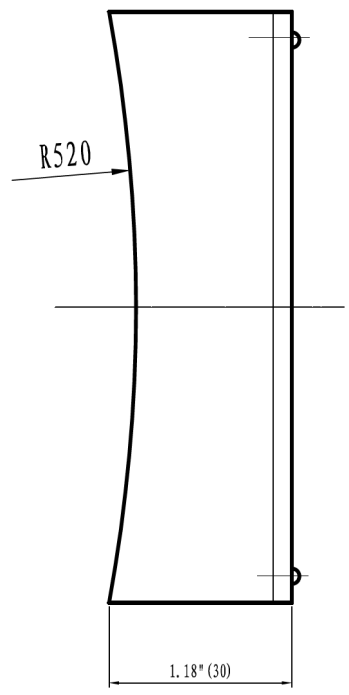
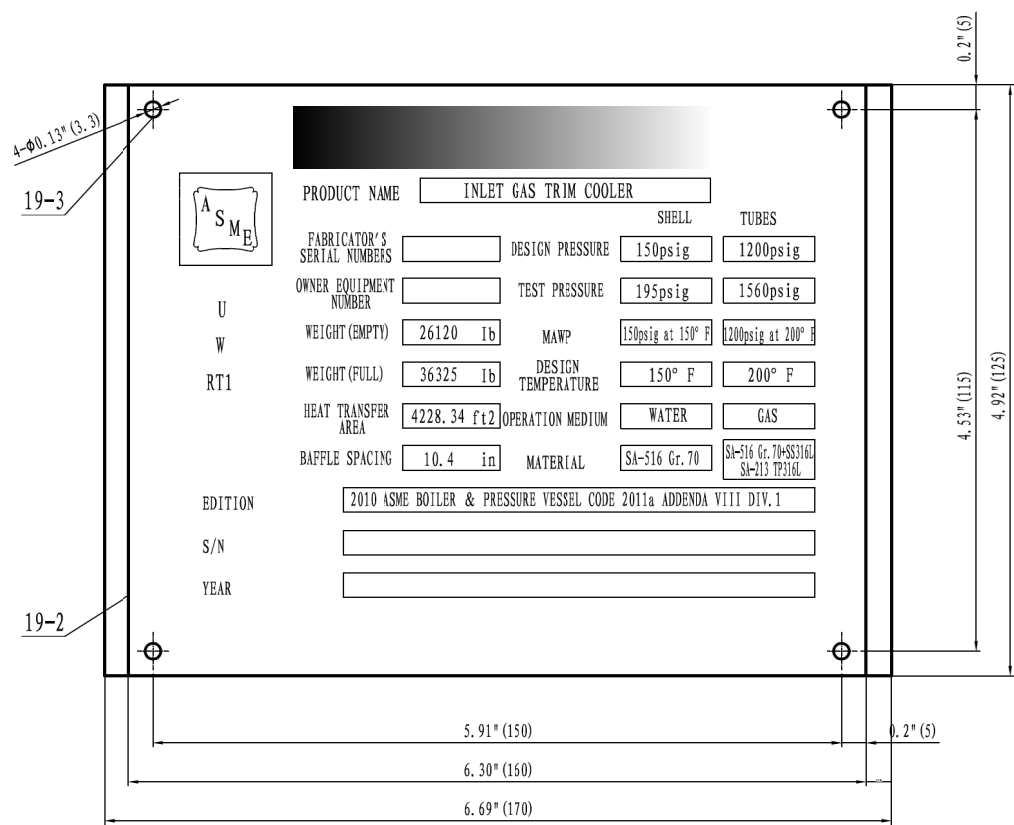
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				PHASE		DETAILED DESIGN	
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GENERAL DRAWING FOR
INLET GAS TRIM COOLER

Others: 12.5

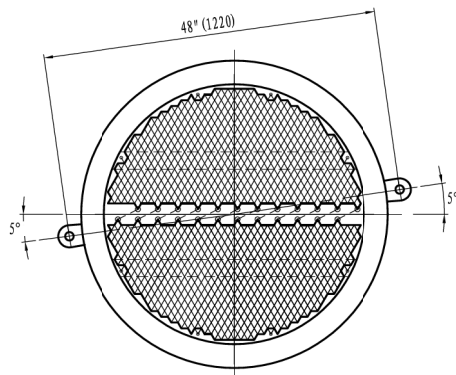
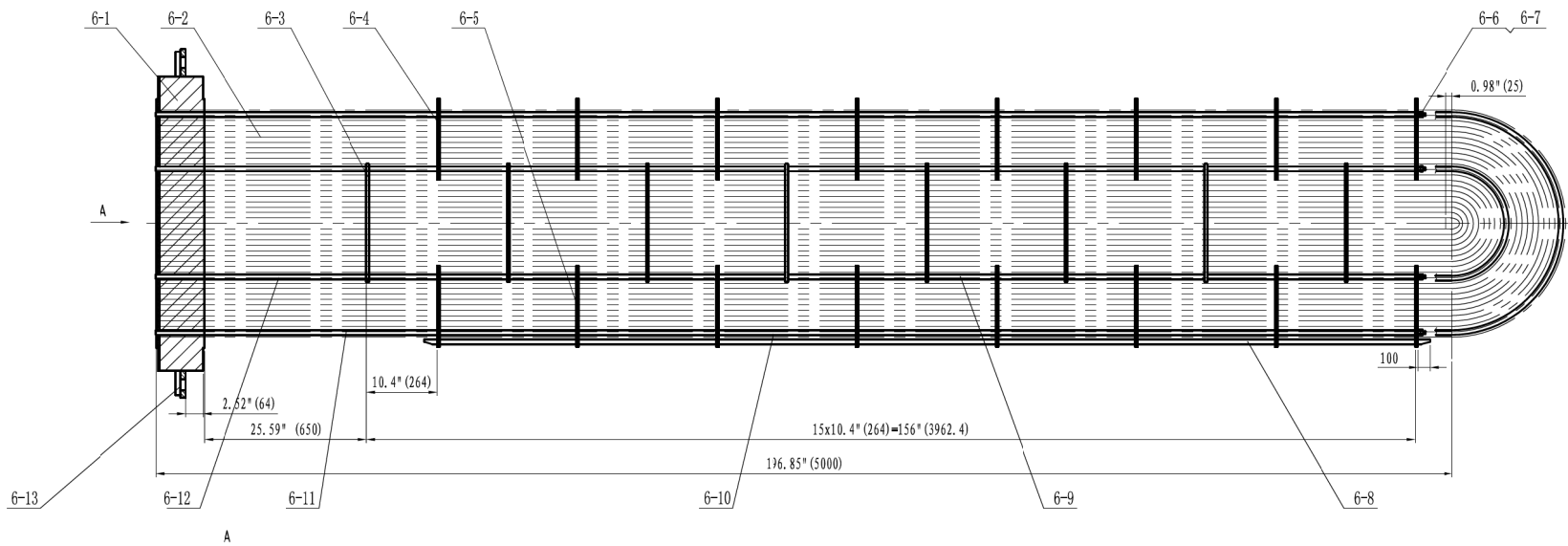


19-3		RIVET φ 0.12" × 0.59" (φ 3x15)	4	LY1			
19-2		NAME PLATE δ=0.078" (2)	1	SA-240 316		0.154	
19-1		NAME PLATE SUPPORT δ=0.12" (3)	1	SA-240 304		1.1	
ITEM	DWG. NO. OR STD. NO.	PARTS. NAME	QTY.	MATERIAL	WEIGHT (lb)		REMARKS
					SINGLE	TOTAL	

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.

NAME PLATE DRAWING FOR INLET GAS TRIM COOLER				ENGINEERING NAME		
				EQUIP TAG.	E-4401&E-5401	
				PHASE	DETAILED DESIGN	
				DWG. NO	A44-01-MEF-DWG-14-02	
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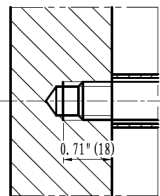
Technical requirements

1. Tube shall be SA-213 TP316L seamless tube and purchasing shall be as per SA-1016. Outer diameter shall be within $\frac{3}{4}'' \pm 0.004''$ ($\phi 19.05 \pm 0.1\text{mm}$) and thickness shall be $0.065'' \pm 0.013''$ ($1.65\text{mm} \pm 0.33\text{mm}$).
2. Joints between tubes and plates shall be strength welding with expansion;
3. All spacer length tolerance shall be $-0.04''$ (1mm);
4. Other requirements see general drawing.

ITEM	DWG. NO. OR. STD. NO.	PARTS. NAME	QTY	MATERIAL	SINGLE WEIGHT (1b)	TOTAL WEIGHT (1b)	REMARKS
6-13	AA-01-MEF-DWG-14-06	LOCKING THE EAR	2	SA516 Gr. 70	3.9	7.8	
6-12		TUBE3/4"x0.083"	4	SA179	1.25	5	L=25.59"
6-1		TUBE3/4"x0.083"	4	SA179	1.76	7	L=35.99"
6-10		TUBE3/4"x0.083"	28	SA179	0.8	22.4	L=20.4"
6-9		TUBE3/4"x0.083"	60	SA179	0.53	31.8	L=10"
6-8	AA-01-MEF-DWG-14-07	SLIDE	2	SA283 Gr. C	15	30	
6-7	ASMEB18.2.4.1W-2002	NUTS M12	16	SA194 Gr. 2H			
6-6	AA-01-MEF-DWG-14-06	DRAW BAR	8	SA36	9.5	76	
6-5	AA-01-MEF-DWG-14-06	BAFFLE PLATE III	8	SA283 Gr. C	46.3	370	
6-4	AA-01-MEF-DWG-14-06	BAFFLE PLATE II	8	SA283 Gr. C	46.3	370	
6-3	AA-01-MEF-DWG-14-06	BAFFLE PLATE I	8	SA283 Gr. C	93	741	
6-2	AA-01-MEF-DWG-14-06	TUBE	1	SUBASSEMBLY		10747	
6-1	AA-01-MEF-DWG-14-06	TUBESHEET	1	SA266 Gr. 2N+SS316L		2730	
6	BUNDLE	SUBASSEMBLY	15138				AA-01-MEF-DWG-14-04
ITEM	PARTS. NAME	WAT' L	MASS	SCALE	DWG. NO.	ASSY. DWG. NO.	

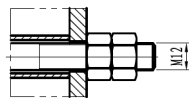
DRAW BAR, TUBE, TUBESHEET CONNECTION DIAGRAM

NO SCALE



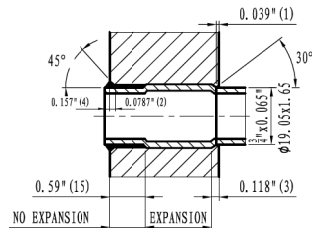
DRAW BAR, TUBE, BAFFLE PLATE CONNECTION DIAGRAM

NO SCALE



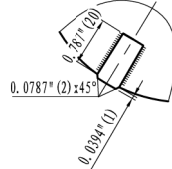
TUBE, TUBESHEET CONNECTION DIAGRAM

NO SCALE



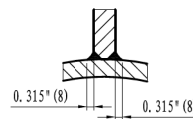
LOCKING THE EAR BAFFLE PLATE CONNECTION DIAGRAM

NO SCALE



WELD TYPE OF LOCKING THE EAR AND TUBESHEET

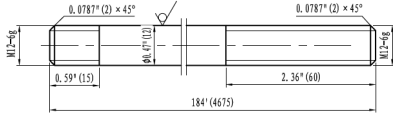
NO SCALE



PARTS DRAWING FOR INLET GAS TRIM COOLER

REV	C	SCALE	TOTAL	6 PAGES	3 PAGE

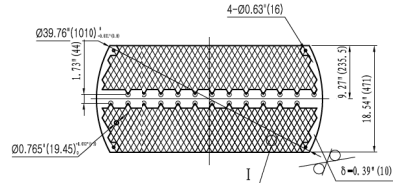
ENGINEERING NAME	
EQUIP TAG.	E-4401&E-5401
PHASE	DETAILED DESIGN
DWG. NO.	AA-01-MEF-DWG-14-04



Technical requirements

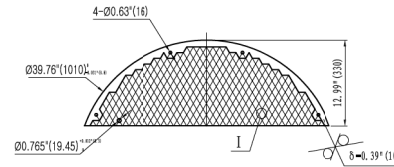
1. Screw dimension shall be as per ASME B1.13M-2005;
2. Remove burr and iron scrap when screw machine finished.

6-6	DRAW BAR	SA36	9.5				
ITEM	PARTS.NAME	MAT'L	MASS	SCALE	DWG NO.	ASSY. DWG NO.	



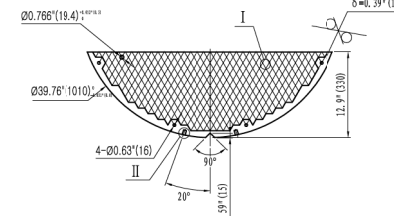
Technical requirements
Support plate shall be flat, flatness tolerance shall be no more than 0.118\"/>

6-3	BAFFLE PLATE I	SA283 GrD	93				
ITEM	PARTS.NAME	MAT'L	MASS	SCALE	DWG NO.	ASSY. DWG NO.	



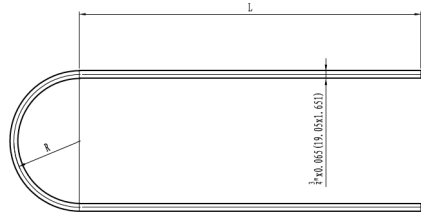
Technical requirements
Support plate shall be flat, flatness tolerance shall be no more than 0.118\"/>

6-4	BAFFLE PLATE II	SA283 GrD	46.3				
ITEM	PARTS.NAME	MAT'L	MASS	SCALE	DWG NO.	ASSY. DWG NO.	



Technical requirements
Support plate shall be flat, flatness tolerance shall be no more than 0.118\"/>

6-5	BAFFLE PLATE III	SA283 GrD	46.3				
ITEM	PARTS.NAME	MAT'L	MASS	SCALE	DWG NO.	ASSY. DWG NO.	

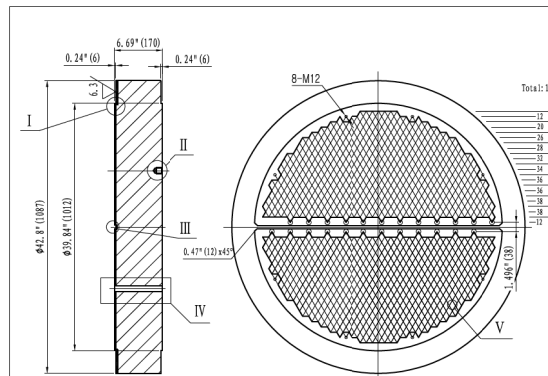


序号	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Total
L	195.87	196.85	196.85	196.85	196.85	196.85	196.85	196.85	196.85	196.85	196.85	196.85	196.85	196.85	196.85	196.85	196.85	196.85	196.85	196.85	196.85	196.85	196.85
R	1.85	1.84	2.45	3.31	4.18	5.01	5.84	6.71	7.59	8.49	9.39	10.29	11.19	12.09	12.99	13.89	14.79	15.69	16.59	17.49	18.39	19.29	20.19
总长	396.89	398.73	401.41	404.08	406.76	409.44	412.12	414.79	417.47	420.15	422.83	425.51	428.18	430.86	433.54	436.22	438.89	441.57	444.25	446.93	449.61	452.29	454.97
数量	12	39	38	39	38	37	36	37	36	33	34	33	32	31	28	27	26	23	20	17	12	7	635
重量	15.74	15.0	15.91	16	16.13	16.25	16.35	16.44	16.56	16.66	16.75	16.88	16.97	17.08	17.2	17.3	17.4	17.52	17.61	17.73	17.83	17.94	
总重	188.88	616.2	404.58	624	613	601.3	588.6	618.3	596.2	549.8	579.5	562	553	529.5	481.6	477.1	452.4	402.96	362.2	301.41	213.96	125.58	10747

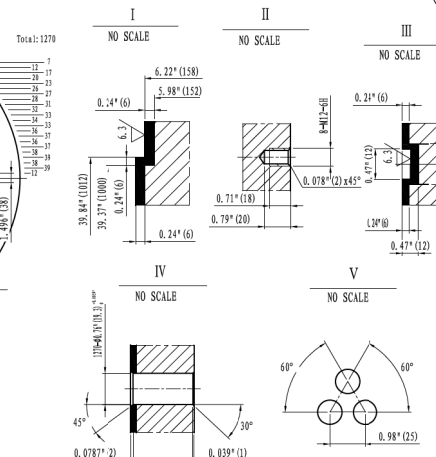
Technical requirements

1. Tubes shall be SA-213 TP316L seamless tubes and purchasing shall be as per SA-106. Outer diameter shall be within ± 0.004 ($\Phi 19.05 \pm 0.1$)mm and thickness shall be 0.063 ± 0.01 (0.0025)mm.
2. U tubes shall be cold bend and roundness deviation of bended section shall be no more than 15% outer diameter of tube.
3. U tube are allowed to joined;
4. Other requirements see general drawing.

6-2	TUBE	SA-213 TP316L	10747				
ITEM	PARTS.NAME	MAT'L	MASS	SCALE	DWG NO.	ASSY. DWG NO.	

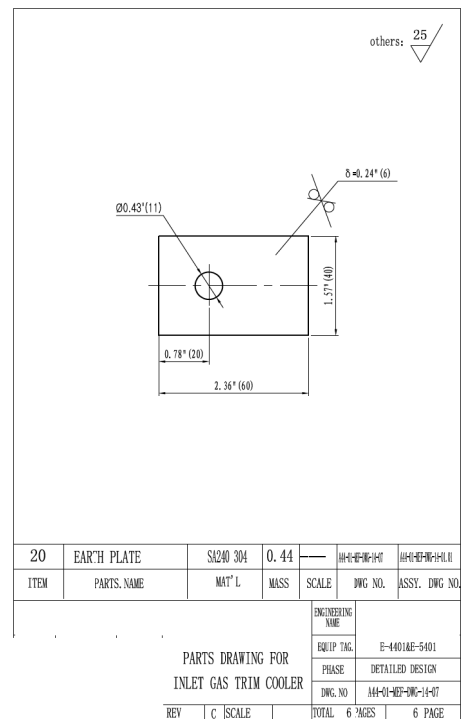
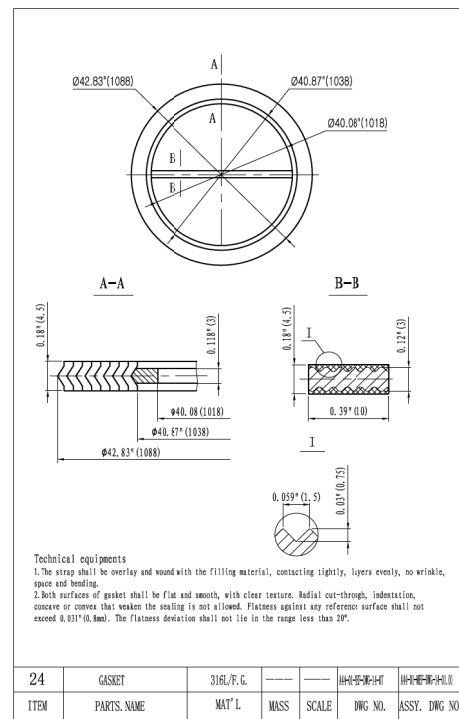
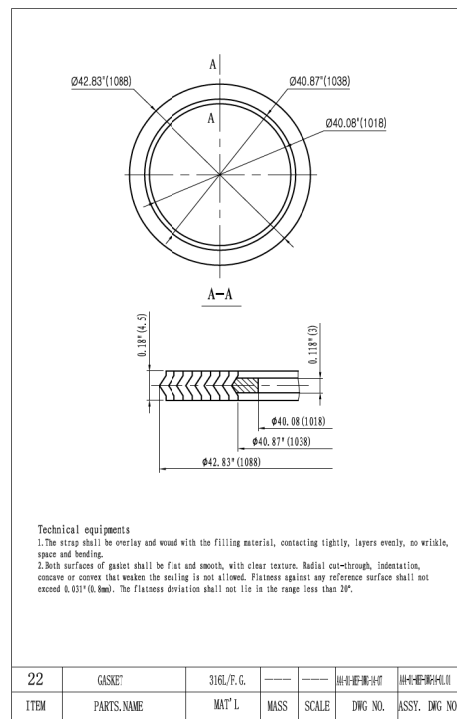
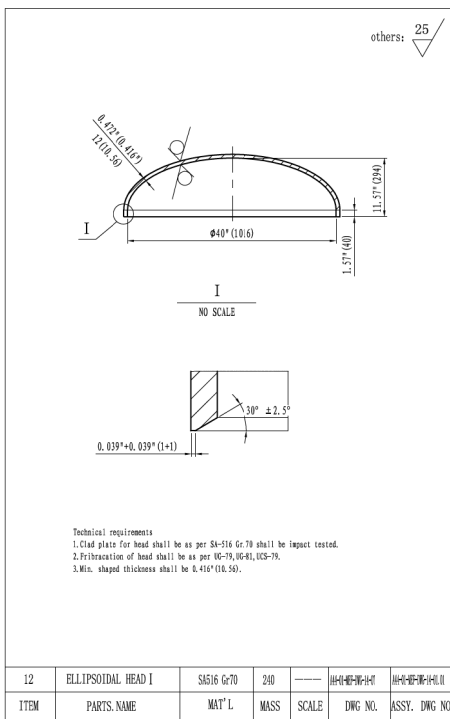
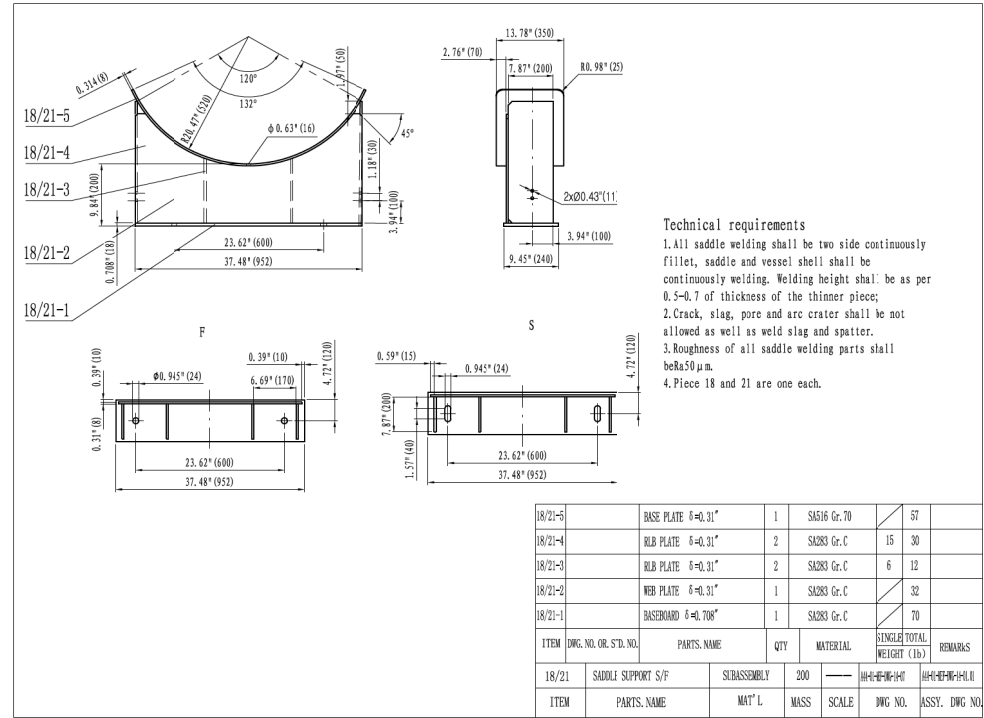
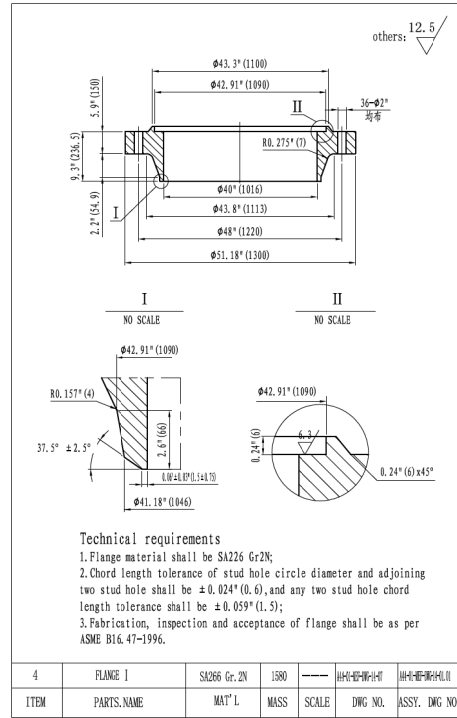
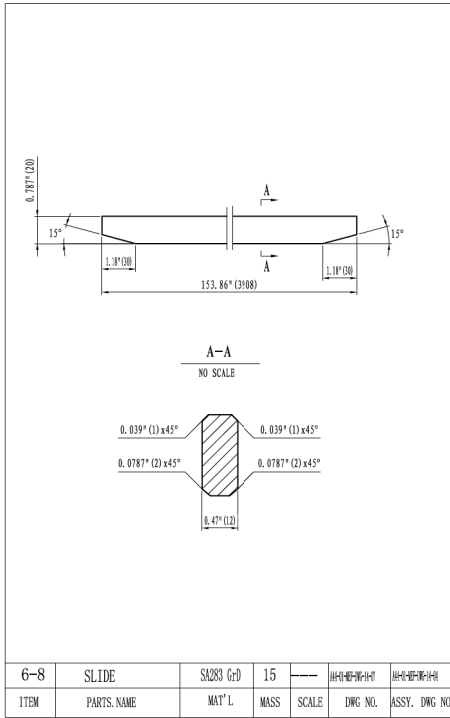


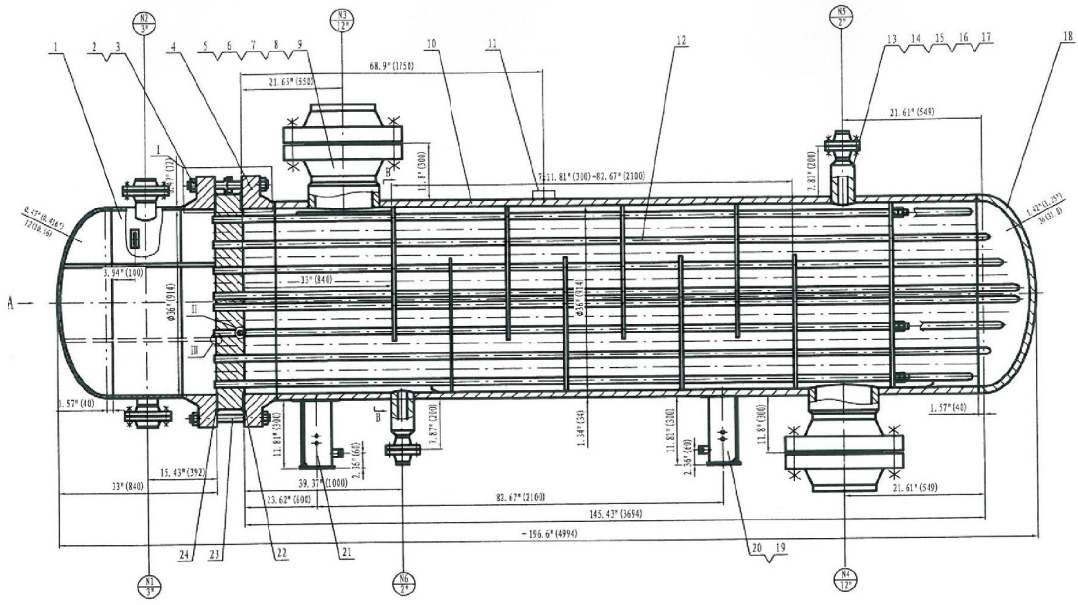
- Technical requirements**
1. Material shall be as per SA266 Gr. 2W-SS316L;
 2. Plate sealing surface and axes shall be vertical and perpendicularity tolerance shall be 0.016\"/>



6-1	TUBESHEET	SA266 Gr. 2W-SS316L	2730				
ITEM	PARTS.NAME	MAT'L	MASS	SCALE	DWG NO.	ASSY. DWG NO.	

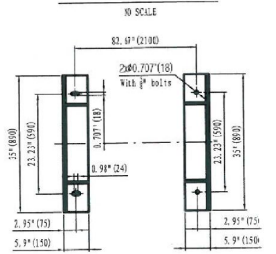
PARTS DRAWING FOR INLET GAS TRIM COOLER		ENGINEERING NAME	E-4401AE-5101
REV	C	SCALE	PHASE
TOTAL 6 PAGES		DETAILED DESIGN	
4 PAGE		MA-01-02-0W-1-05	





- 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. I 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 datasheet (A41-01PRQ-04S-10) and specification (165-4-SFM-057). Tube shall be SA-191 and purchasing shall be as per SA-450 and outer diameter shall be within ± 0.004 (± 0.10 mm) and thickness shall be 0.083 ± 0.0157 (2.10 ± 0.4 mm). One piece of butt welds shall be allowed for heat exchange tube which shall be ball passing tested and water pressure tested under 300 psig (2.068 MPa) 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 indicated. 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 arbor 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% RT or PT tested as per ASME-VIII division I Appendix 6 or 8.
 - Welding joints between plates and tubes shall be RT tested.
 - Test pressure ring or tool 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 SHEET).
 - Tube side category A, B, C, D see PARTS DRAWING.
 - Header lag 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
RE REGISTER	NO
TEMA CLASS	R
DESIGN PARAMETER	SHELL TUBE
SERVICE	GAS WATER
DENSITY (IN/OUT)	13.798 14.417/14.1
NEUTRON PROPERTY	EXHAUSTIVE LISTED
MAIN BODY MATERIAL	SA105 SA191/SA196 Gr.7C
PIPE MATERIAL	SA105 SA105/SA106 Gr.B
DESIGN TEMPERATURE	°F (°C) 150 (65.5) 150 (65.5)
OPERATING TEMPERATURE (IN/OUT)	°F (°C) 20.5 (49.2) / 115 (46) 93 (33.8) / 115 (46)
MDCT AT PRESSURE	°F (°C) 32 (0) 32 (0)
HYDROSTATIC TEST TEMPERATURE	°F (°C) 70 (21) 70 (21)
OPERATING PRESSURE	psig (MPa) 1035 (7.13) 50 (0.345)
DESIGN PRESSURE	psig (MPa) 1200 (8.27) 150 (1.034)
RE ALLOWED WORKING PRESSURE	psig (MPa) 1200 (8.27) 150 (1.034)
SAFETY VALVE SETTING PRESSURE	psig (MPa) / /
SAFETY VALVE MODEL	/ /
HYDROSTATIC TEST PRESSURE	psig (MPa) 1560 (10.75) 195 (1.34)
JOINT EFFICIENCY	1.0 1.0
CORROSION ALLOWANCE	in (mm) 0.118 (3) 0.118 (3)
DISTANCE NUMBER	1 6
POST WELD HEAT TREATMENT	YES YES
RT	R7 FULL/0W-51 RT FULL/0W-51
WT OR PT	FULL (C, D, E) / APPENDIX 6/8/9
HEAT EXCHANGE AREA	ft² (m²) 1466.5 (136.2)
CORROSION OF TUBE AND TUBESHEET	IN (MM) 3/4" (0.083) / 41.732" (019.052) / 13800 320
INTENSITY WELD AND EXPANSION	
IMPACT TESTING	YES NO
TOTAL VOLUME	ft³ (m³) 61.48 (1.74) 28.5 (0.8)
SEISMIC ZONE	2A (0.15)
VESSEL WEIGHT	17 (kg) 19860 (9006)
DESIGN SERVICE LIFE	YEAR 25
INSULATION THICKNESS	IN (MM) /

LIST OF NOZZLE

MARK	SIZE	PLACE PER ASME	TYPE	SEALING TYPE	SIZE	OR	OR	OR	DESCRIPTION	REMARK
N1	3"	150#	WN	RF	SA105				WATER INLET	
N2	3"	150#	WN	RF	SA105				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	

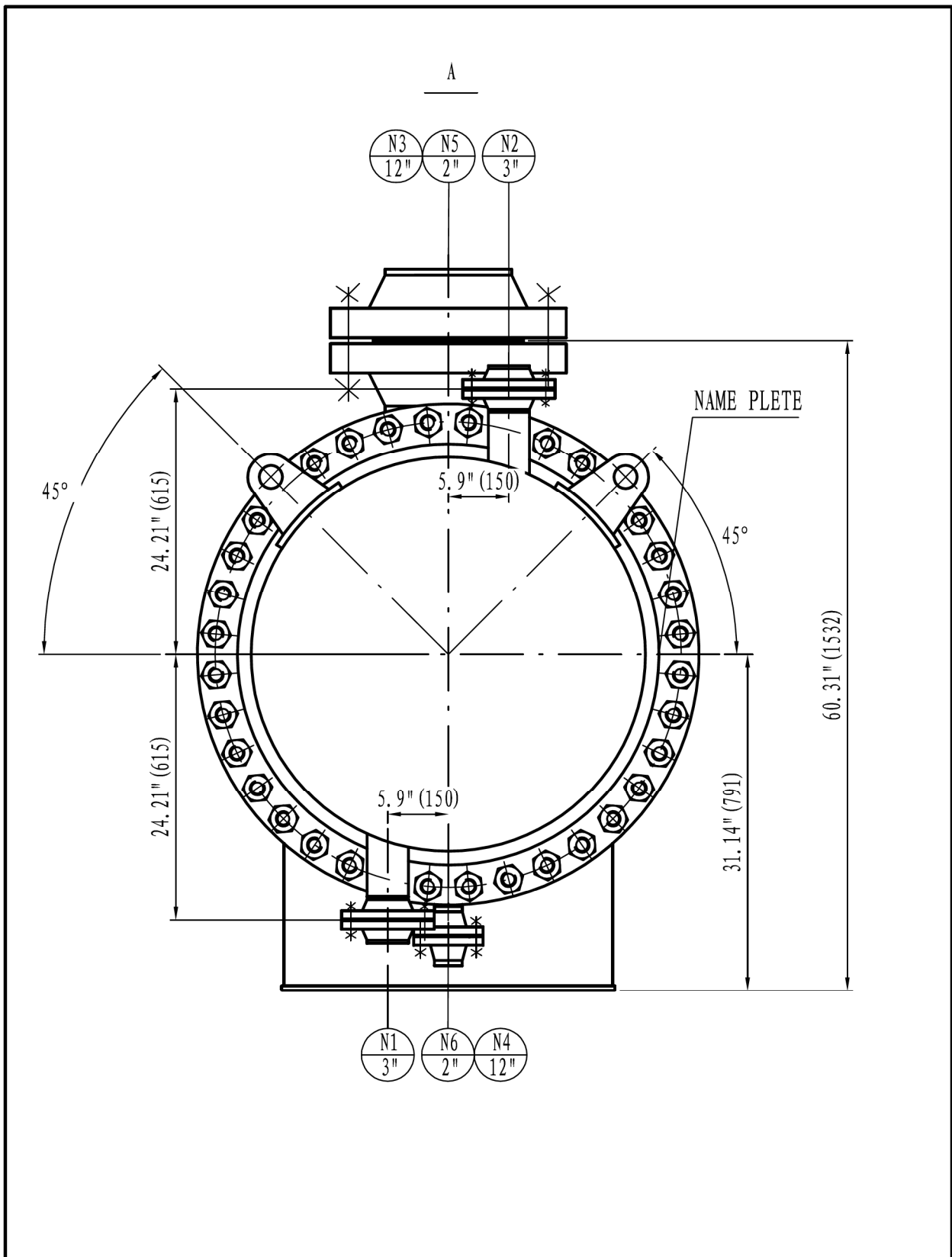
14	HH-01-02-00-01-01	PIPE	2	SA105	2.53	6.06				
13	ASME B16.2-1-2010	FLANGE WN" 600 RF B-1.68"	4	SA105	9.9	29.9			COMPANION	
12	HH-01-02-00-01-01	BUNDLE	1	SUBASSEMBLY					8492	
11	HH-01-02-00-01-01	NAME PLATE	1	SUBASSEMBLY						
10	ASME B16.2-1-2010	SHELL DRUM ALUM"	1	SA616 Gr.7C	6010	115			6010	115
9	ASME B16.2-1-2010	HEAD BUTTS 1 1/4" WN 2B	80	SA 194 Gr. 2H	1.2	96				
8	ASME B16.2-1-2010	END BUTTS 1 1/4" WN 2B	40	SA 193 Gr. B7	2.42	96.8				
7	ASME B16.2-1-2010	GASKET 12" 400 316 L G.	2	SS316L / F. G.						
6	HH-01-02-00-01-01	PIPE	2	SA105	230	460				
5	ASME B16.2-1-2010	FLANGE WN" 400 RF B-1.61"	4	SA105	226	2904.8			COMPANION	
4	HH-01-02-00-01-01	FLANGE I	1	SA205 Gr. 2H		1668				
3	ASME B16.2-1-2010	NUTS 1 3/4" 316-2B	64	SA 194 Gr. 2H	2.46	256.2				
2	HH-01-02-00-01-01	SKULLER STD	2	SA 193 Gr. B7	19.2	38.4				
1	HH-01-02-00-01-01	CHANNEL	1	SUBASSEMBLY		2207				
ITEM	QTY	NO. OR STD. NO.	PARTS NAME	QTY	MATERIAL	SINGLE TOTAL WEIGHT (LB)	REMARKS			

24	HH-01-02-00-01-01	GASKET	1	316L / F. G.						
23	ASME B16.2-1-2010	STD BOLTS 1/4" 316-2B X 1.5"	30	SA 193 Gr. B7	10.2	306				
22	HH-01-02-00-01-01	GASKET	1	316L / F. G.						
21	HH-01-02-00-01-01	SCALE SUPPORT S	1	SUBASSEMBLY		105.6				
20	HH-01-02-00-01-01	GASKET PLATE	2	SA240 304	0.44	0.88				
19	HH-01-02-00-01-01	SCALE SUPPORT F	1	SUBASSEMBLY		105.6				
18	HH-01-02-00-01-01	ELLIPSOIDAL HEAD I	1	SA616 Gr.7C		612				
17	ASME B16.2-1-2010	HE NUTS 3/4" 316-2B	32	SA 194 Gr. 2H	0.1	3.2				
16	ASME B16.2-1-2010	STD BOLTS 5/8" 316-2B L 1.45"	16	SA 193 Gr. B7	0.3	4.8				
15	ASME B16.20-2007	GASKET 2" 316-2B F. G.	2	SS316 / F. G.						

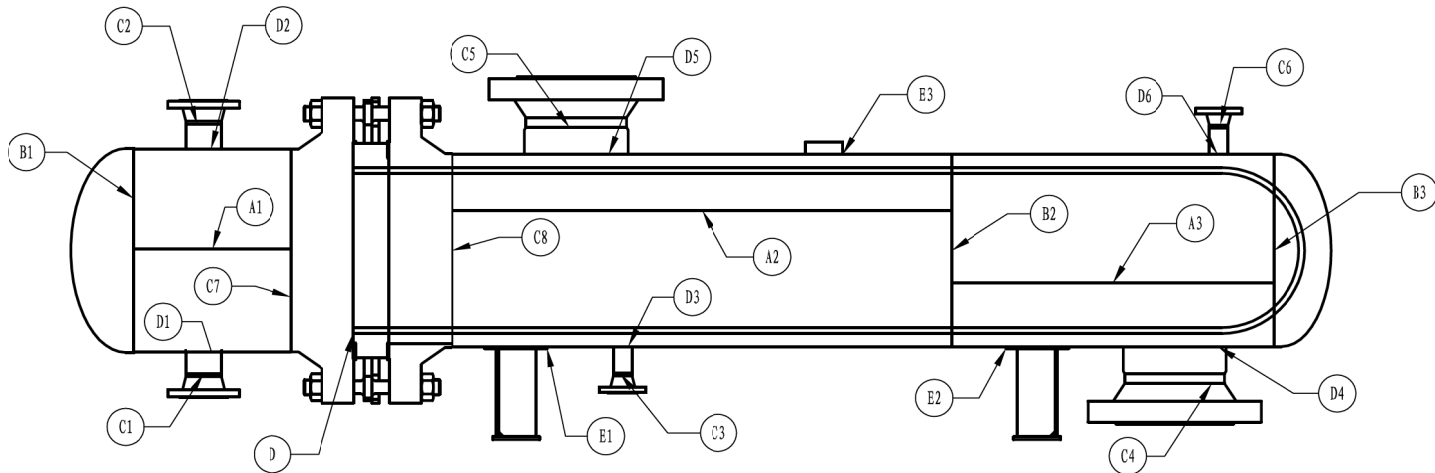
GENERAL DRAWING FOR TREATED GAS TRIM COOLER

REV C SCALE 1:10 TOTAL 7 PAGES 1 PAGE





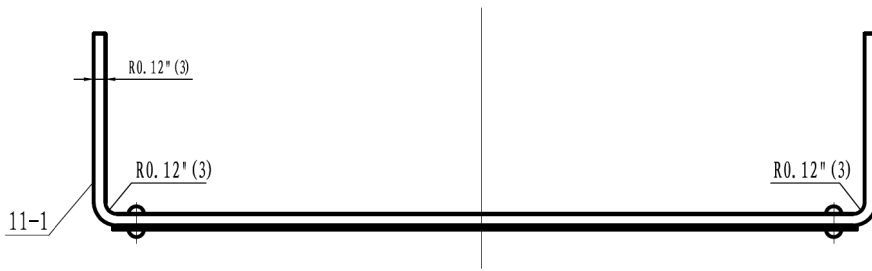
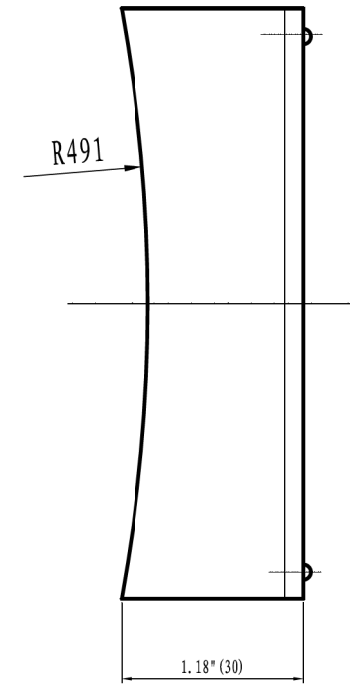
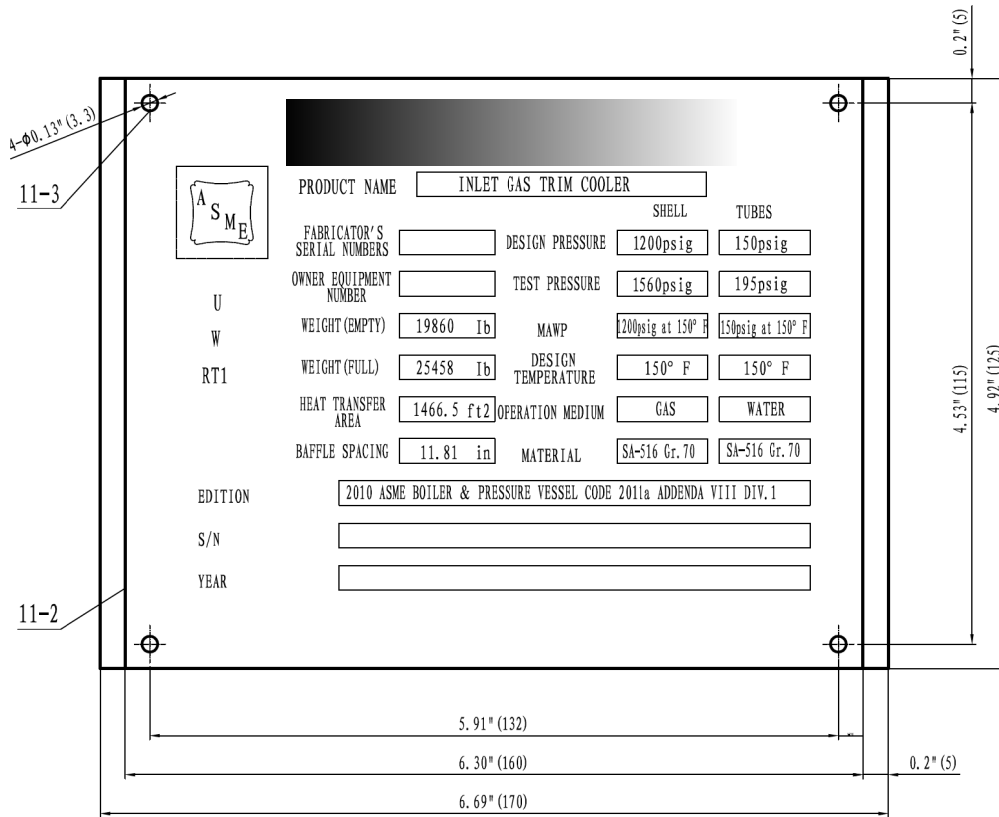
				ENGINEERING NAME
GENERAL DRAWING FOR TREATED GAS TRIM COOLER				EQUIP TAG. E-4403&E-5403
				PHASE DETAILED DESIGN
				DWG. NO A44-01-MEF-DWG-16-01.02
REV	C	SCALE	1: 10	TOTAL 1 PAGES 1 PAGE



				ENGINEERING NAME	
				EQUIP TAG.	E-4403&E-5403
				PHASE	DETAILED DESIGN
				DWG. NO	A44-01-MEF-DWG-16-01.04
REV	C	SCALE	1: 10	TOTAL	1 PAGES
					1 PAGE

GENERAL DRAWING FOR
TREATED GAS TRIM COOLER

others: $\frac{12.5}{\nabla}$

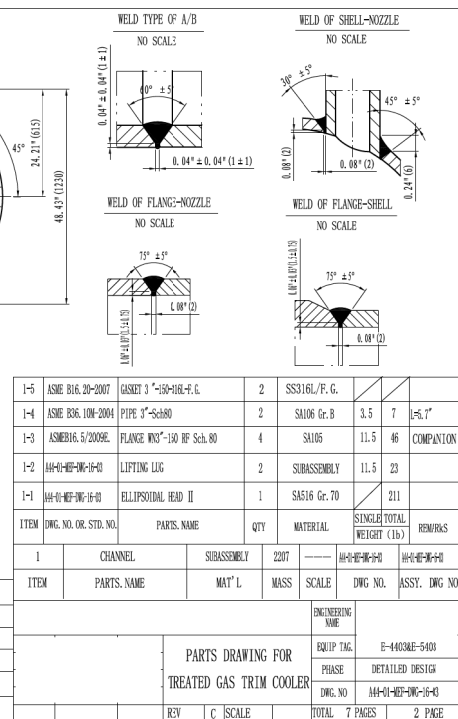
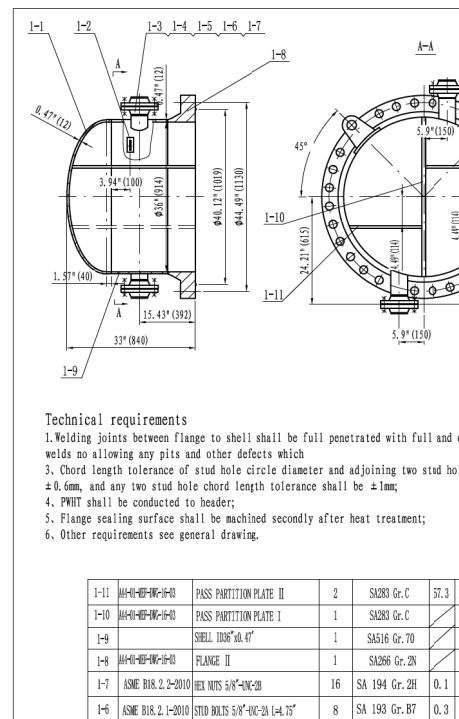
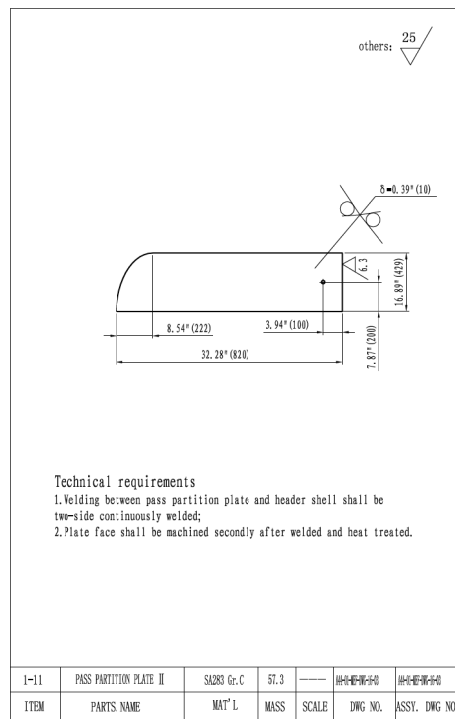
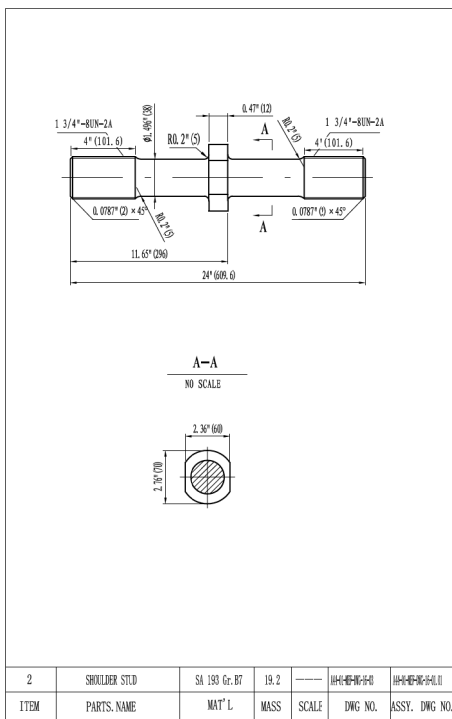
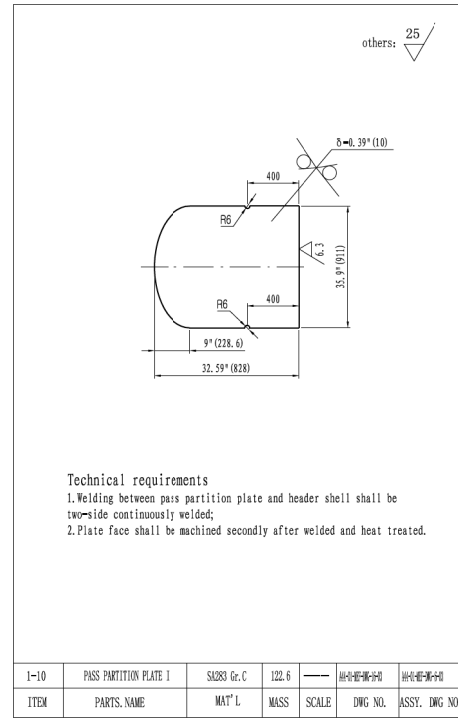
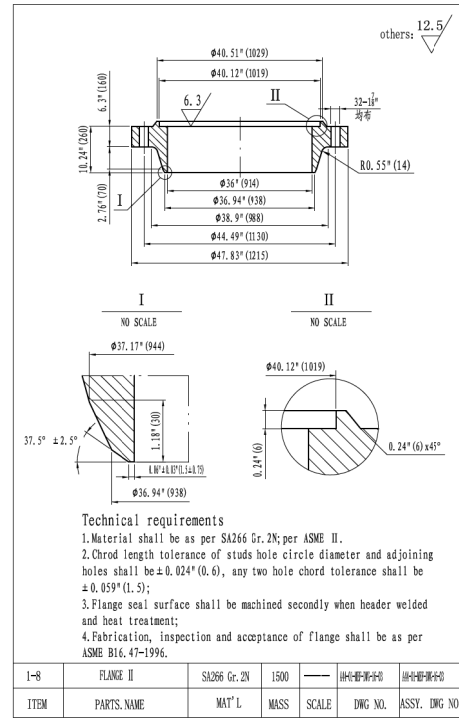
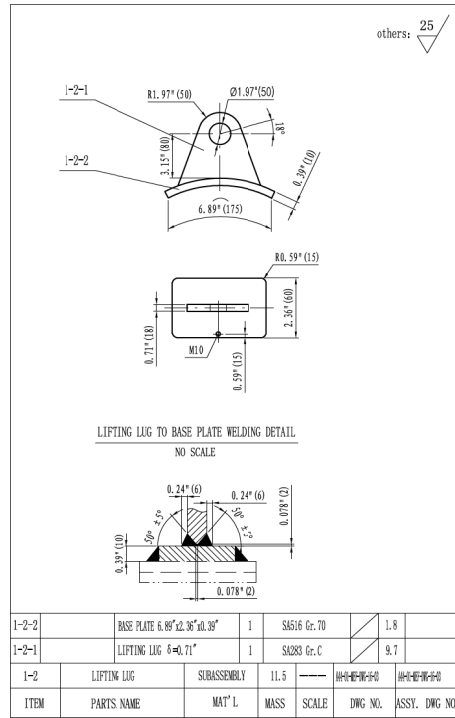
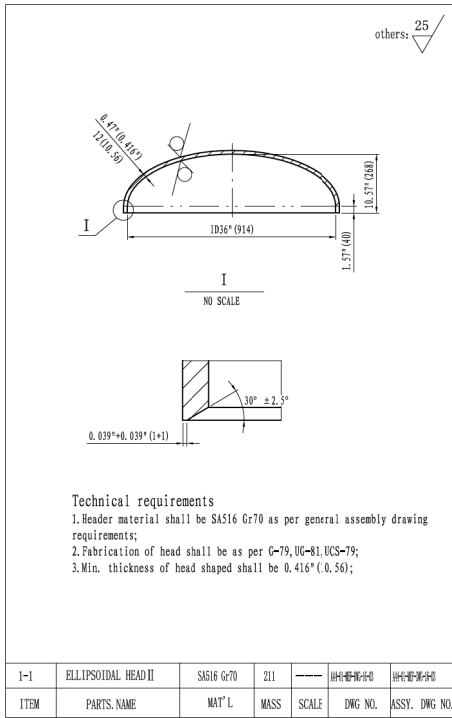


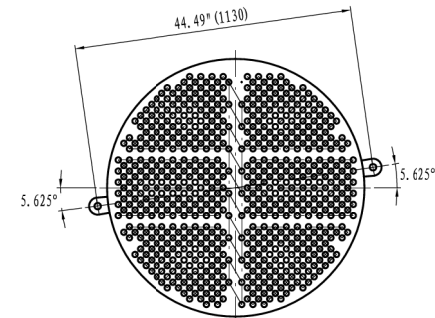
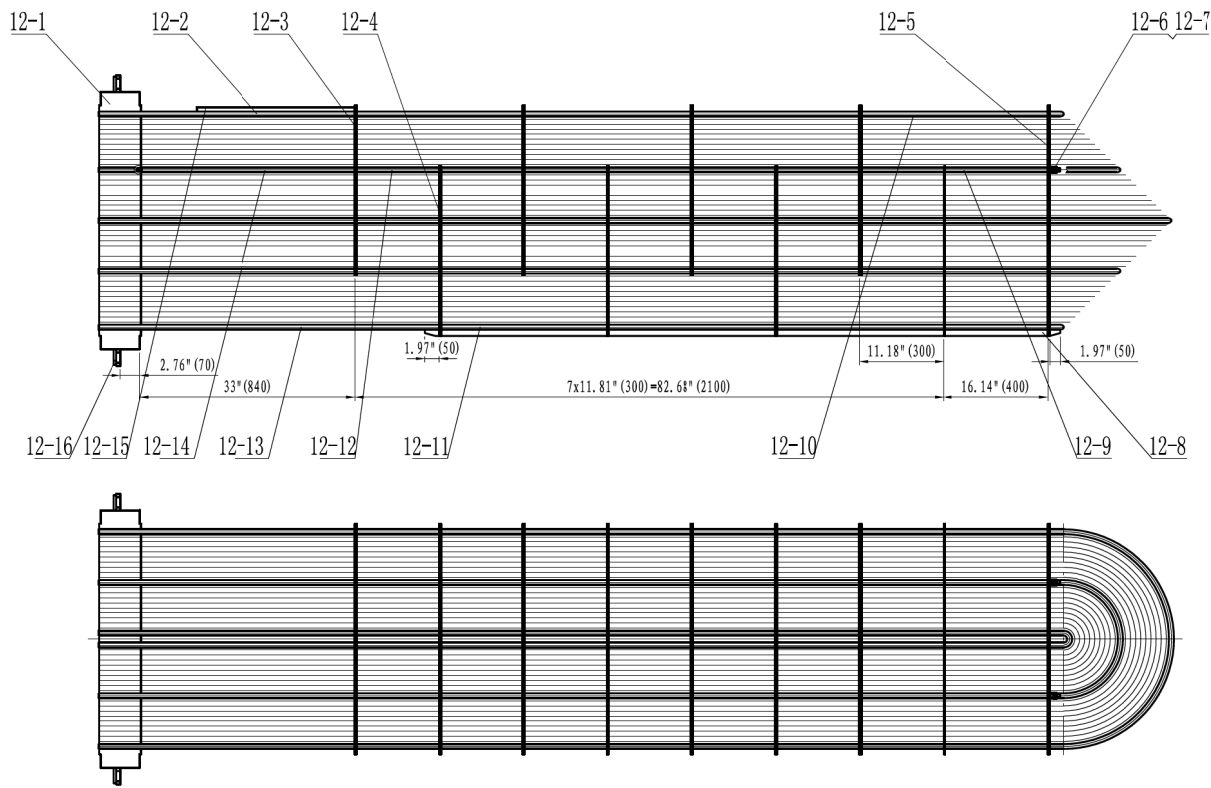
Technical requirement

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.

11-3		RIVET $\phi 0.12" \times 0.59"$ ($\phi 3 \times 15$)	4	LY1			
11-2		NAME PLATE $\delta = 0.078"$ (2)	1	SA-240 316		0.154	
11-1		NAME PLATE SUPPORT $\delta = 0.12"$ (3)	1	SA-240 304		1.1	
ITEM	DWG. NO. OR. STD. NO.	PARTS. NAME	QTY	MATERIAL	SINGLE WEIGHT	TOTAL WEIGHT (1b)	REMARKS
				ENGINEERING NAME			
				EQUIP TAG.	E-4403&E-5403		
				PHASE	DETAILED DESIGN		
				DWG. NO	A44-01-MEF-DWG-16-02		
REV	C	SCALE	1:2	TOTAL	1 PAGES	1 PAGE	

NAME PLARE DRAWING FOR
TREATED GAS TRIM COOLER



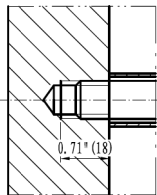


Technical requirements

1. Tubes shall be SA-179 seamless tube and purchasing shall be as per A-450. Outer diameter shall be within $\frac{1}{32}'' \pm 0.004''$ ($\phi 19.05 \pm 0.1mm$) and thickness shall be $0.083'' \pm 0.0157''$ ($2.1mm \pm 0.4mm$);
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.

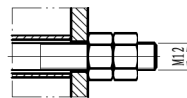
DRAW BAR, TUBE, TUBESHEET CONNECTION DIAGRAM

NO SCALE



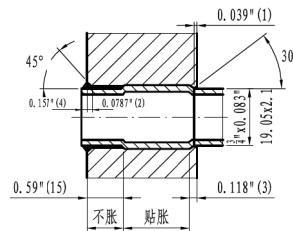
DRAW BAR, TUBE, BAFFLE PLATE CONNECTION DIAGRAM

NO SCALE



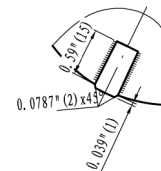
TUBE, TUBESHEET CONNECTION DIAGRAM

NO SCALE



LOCKING THE EAR BAFFLE PLATE CONNECTION DIAGRAM

NO SCALE

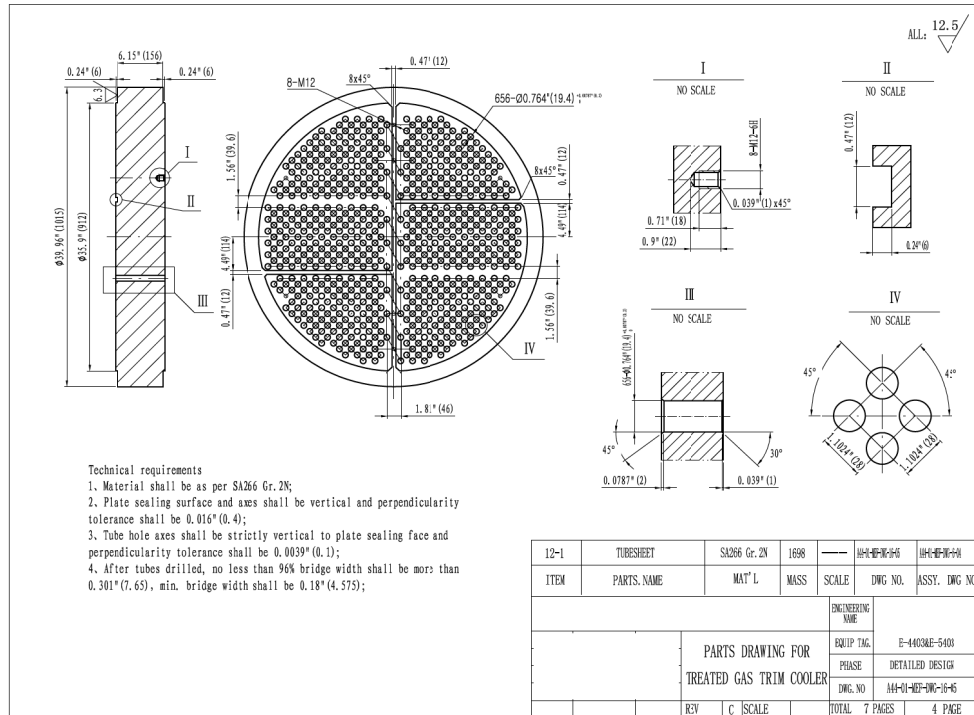
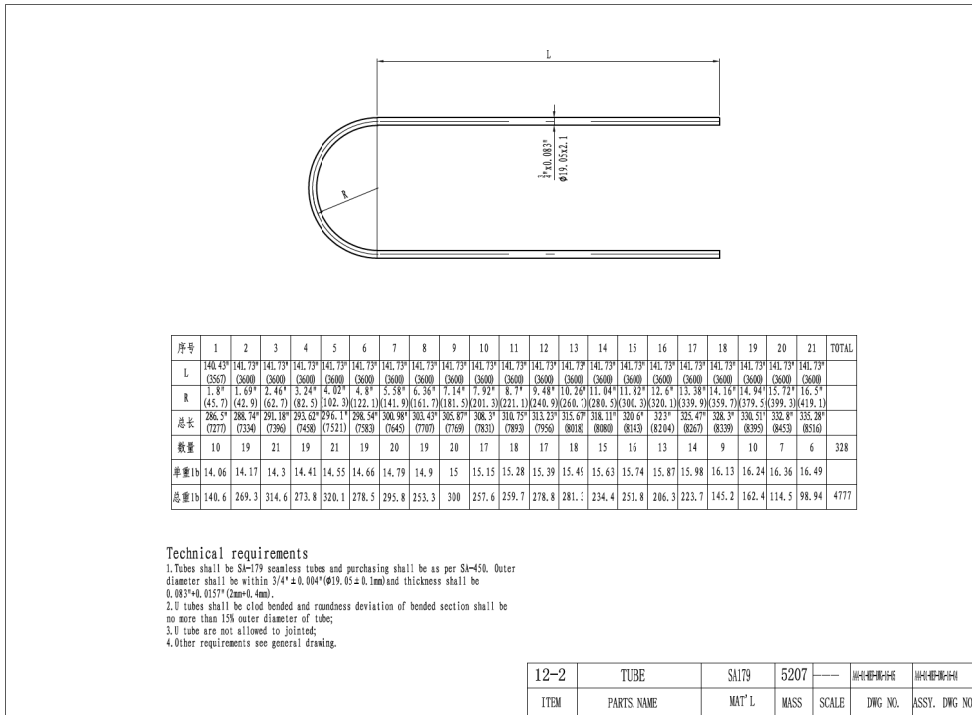
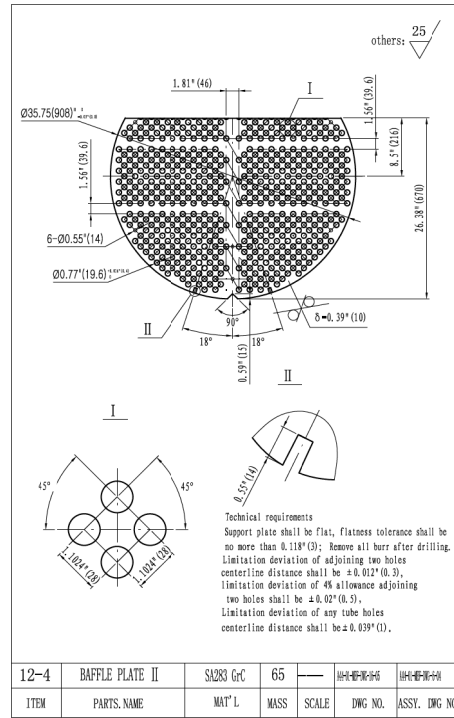
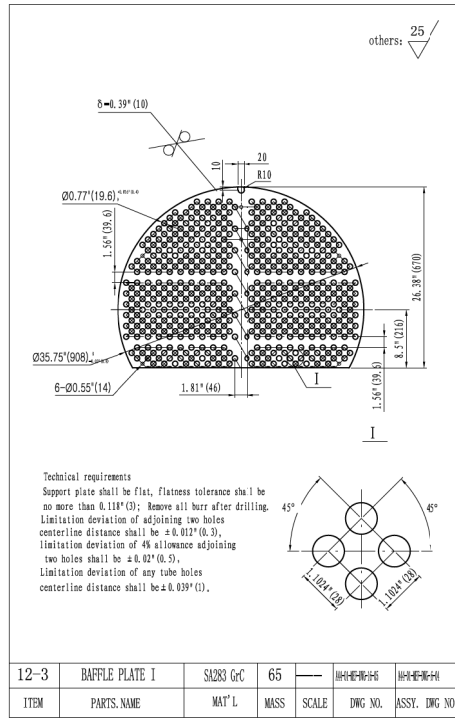
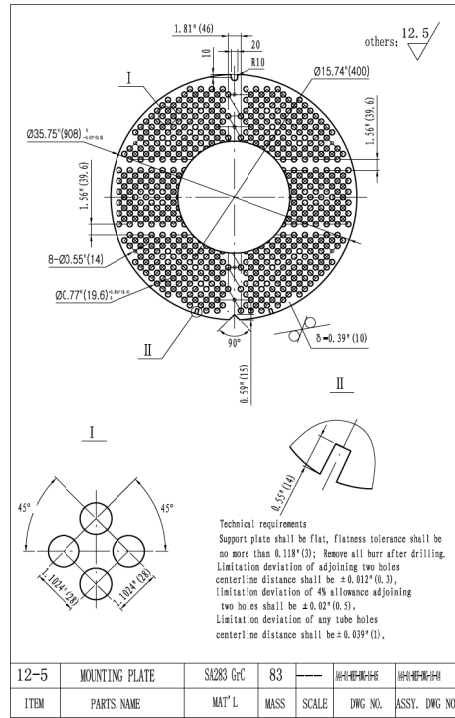
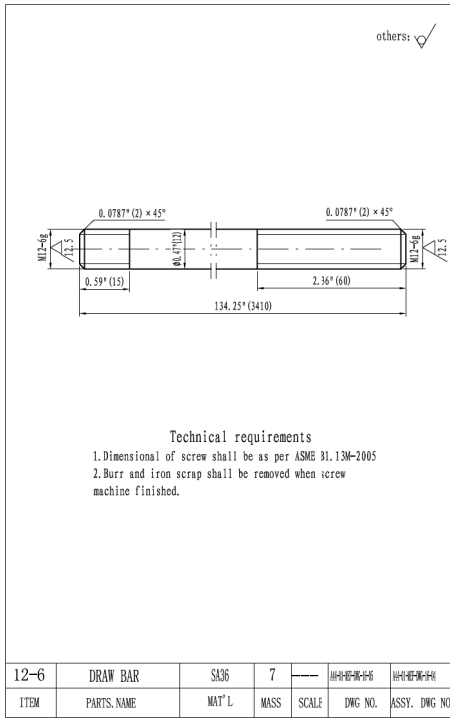


12-12	TUBE3/4"x0.083"	28	SA179	0.62	17.3	L=11.42"	
12-11	TUBE3/4"x0.083"	12	SA179	1.3	15	L=23.23"	
12-10	TUBE3/4"x0.083"	2	SA179	1.4	2.8	L=27.17"	
12-9	TUBE3/4"x0.083"	6	SA179	0.77	0.46	L=15.35"	
12-8	HH-01-MEF-DWG-H-06	SLIDE	2	SA283 Gr. C	7.7	15.4	
12-7	ASMEB18.2.4. M-2002	NUTS M12	16	SA194 Gr. 2H			
12-6	HH-01-MEF-DWG-H-06	DRAW BAR	8	SA36	7	56	
12-5	HH-01-MEF-DWG-H-06	MOUNTING PLATE	1	SA283 Gr. C		83	
12-4	HH-01-MEF-DWG-H-06	BAFFLE PLATE II	4	SA283 Gr. C	65	260	
12-3	HH-01-MEF-DWG-H-06	BAFFLE PLATE I	4	SA283 Gr. C	65	260	
12-2	HH-01-MEF-DWG-H-06	TUBE	1	SUBASSEMBLY		5207	
12-1	HH-01-MEF-DWG-H-06	TUBESHEET	1	SA266 Gr. 2N		1698	
ITEM	DWG. NO. OR. STD. NO.	PARTS. NAME	QTY	MATERIAL	SINGLE WEIGHT (1b)	TOTAL WEIGHT (1b)	REMARKS

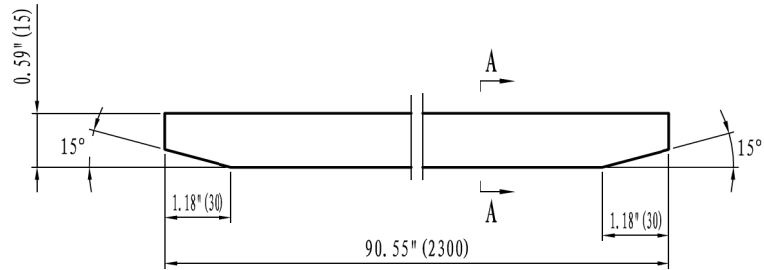
12	BUNDLE	SUBASSEMBLY	7637		HH-01-MEF-DWG-H-06	HH-01-MEF-DWG-H-06
ITEM	PARTS. NAME	MAT'L	MASS	SCALE	DWG NO.	ASSY. DWG NO.

12-16	HH-01-MEF-DWG-16-06	LOCKING THE EAR	2	SA516 Gr. 70	3.97	7.93
12-15		STRIKING PLATE 12.8"x22"x0.24" (323x560x6)	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"

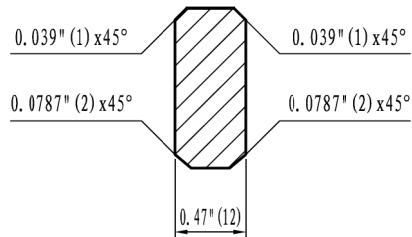
				ENGINEERING NAME		
				EQUIP TAG.	E-4403&E-5403	
				PHASE	DETAILED DESIGN	
				DWG. NO.	HH-01-MEF-DWG-16-04	
REV	C	SCALE		TOTAL	7 PAGES	3 PAGE



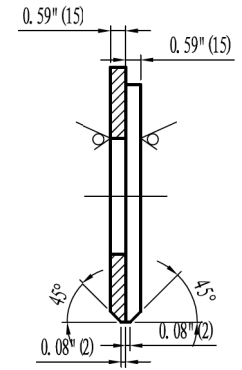
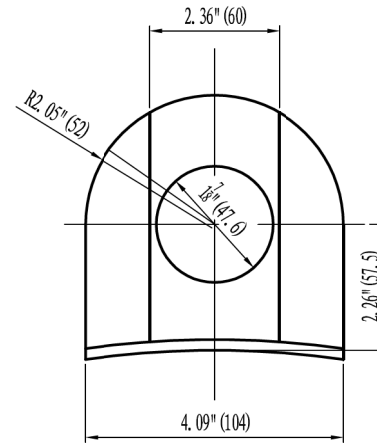
PARTS DRAWING FOR		ENGINEERING NAME	
TREATED GAS TRIM COOLER		EQUIP TAG	E-40030E-5100
		PHASE	DETAILED DESIGN
		DWG. NO.	MA-01-REF-DWG-16-6
REV	C	SCALE	TOTAL 7 PAGES 4 PAGE



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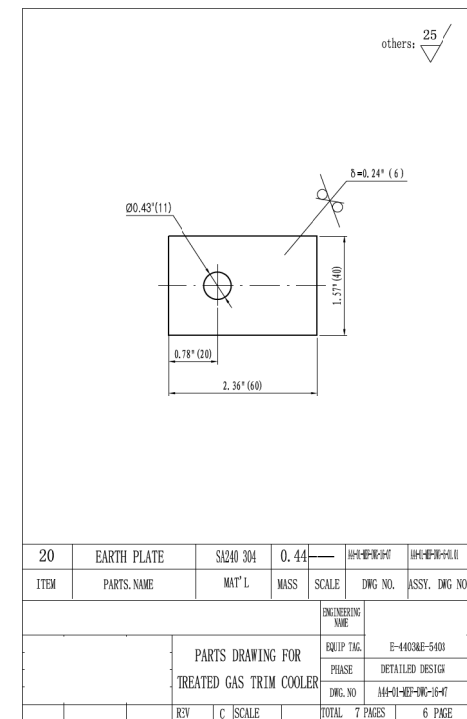
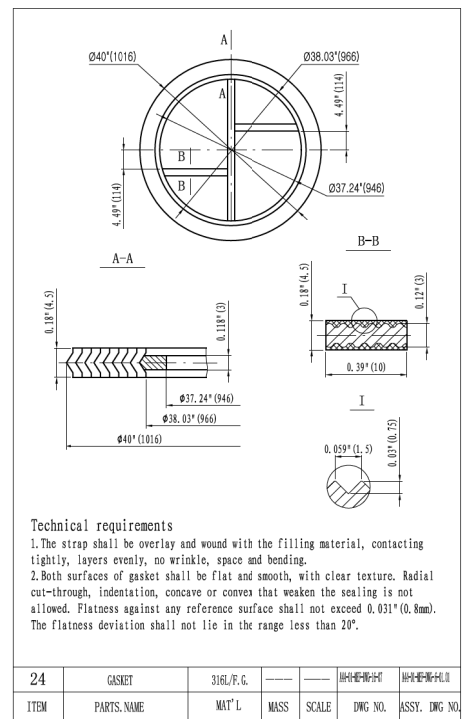
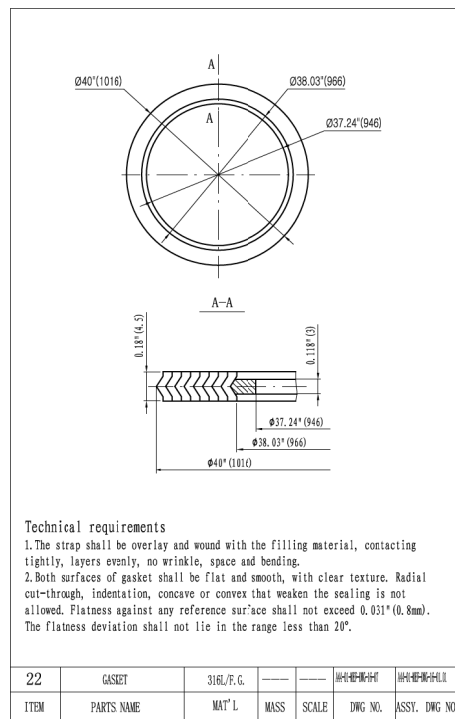
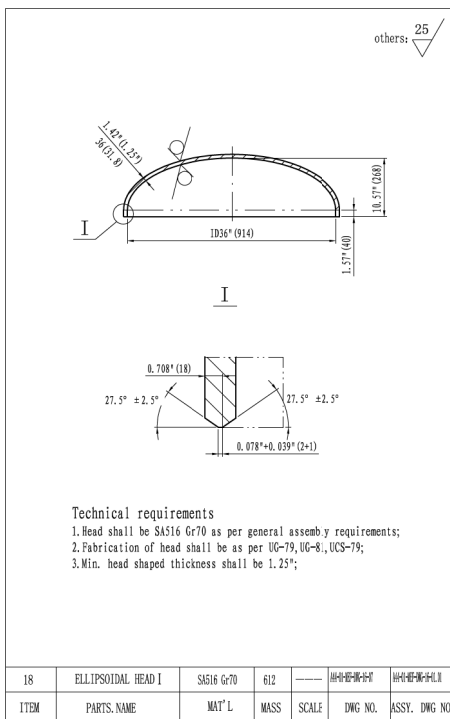
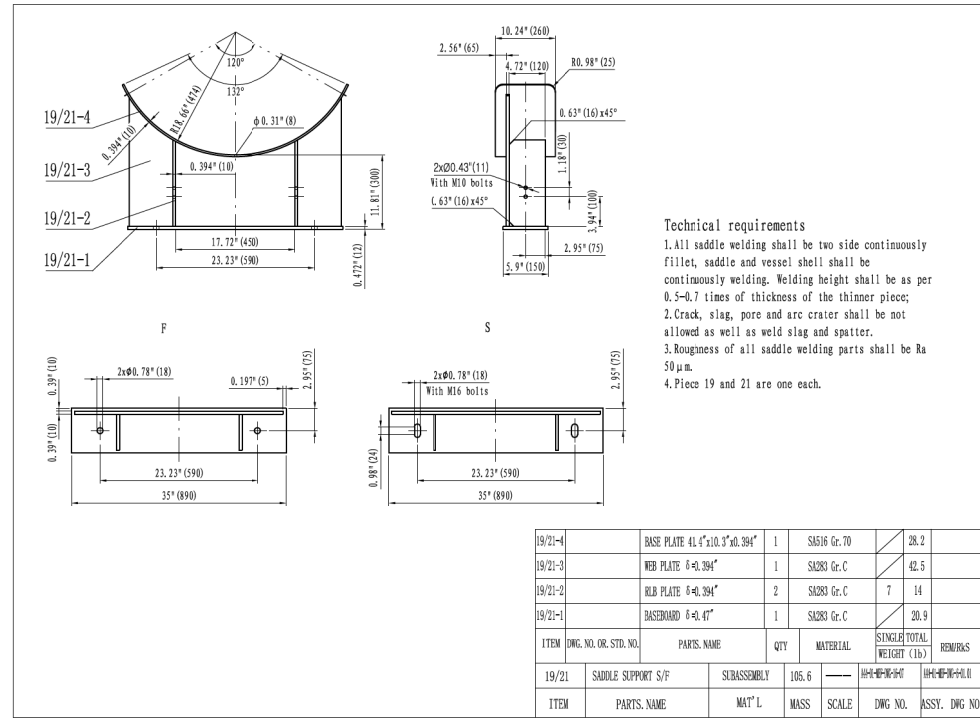
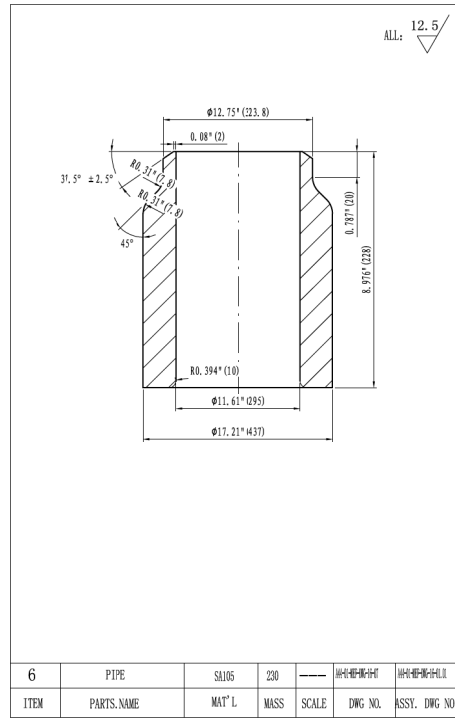
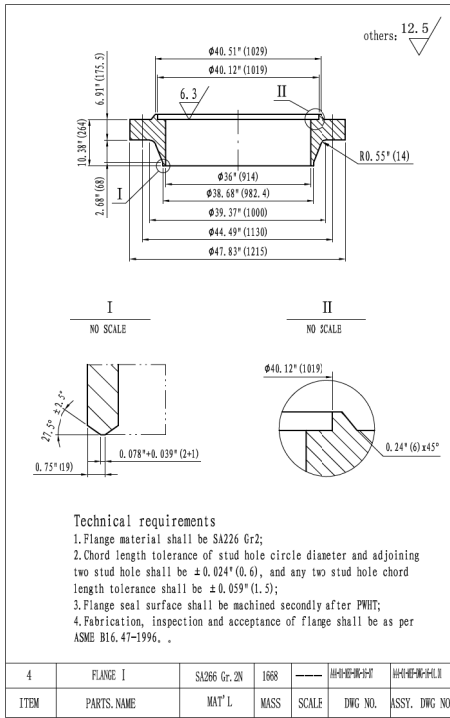



12-7	SLIDE	SA283 GrD	7.7	---	AA-01-MEF-DWG-16-06	AA-01-MEF-DWG-16-04
ITEM	PARTS. NAME	MAT'L	MASS	SCALE	DWG NO.	ASSY. DWG NO.

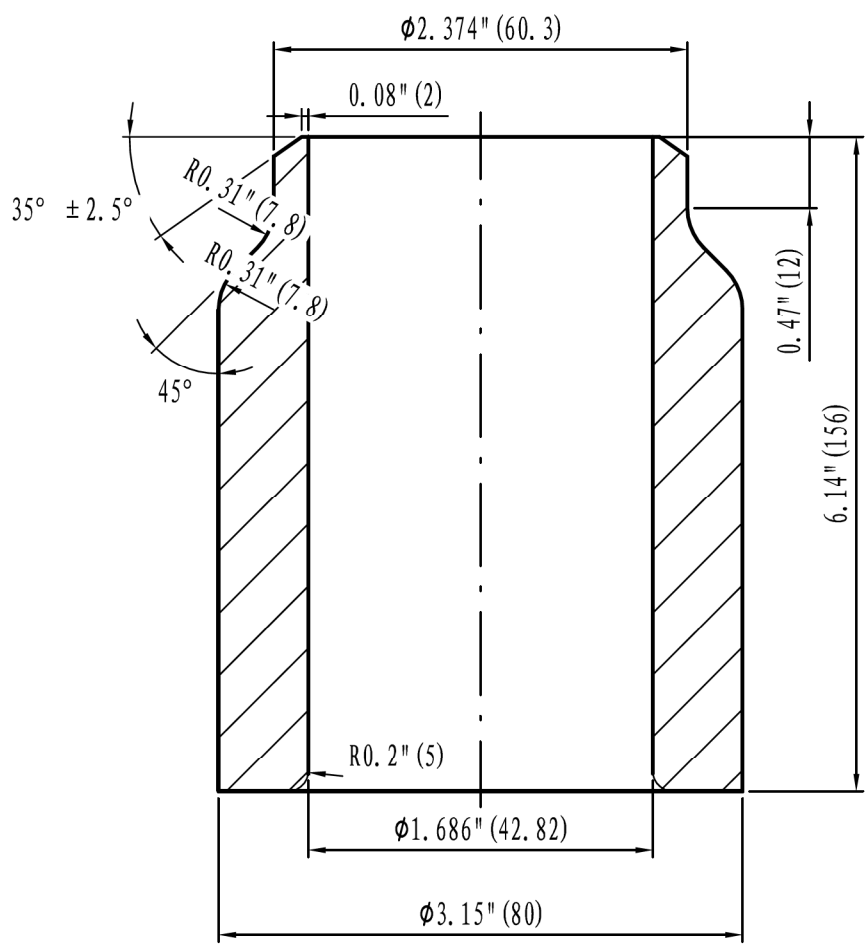


12-16	LOCKING THE EAR	SA516 Gr. 70	3.97	---	AA-01-MEF-DWG-16-06	AA-01-MEF-DWG-16-04
ITEM	PARTS. NAME	MAT'L	MASS	SCALE	DWG NO.	ASSY. DWG NO.
				ENGINEERING NAME		
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				PHASE	DETAILED DESIGN	
				DWG. NO	AA4-01-MEF-DWG-16-06	
REV	C	SCALE		TOTAL	7 PAGES	5 PAGE

PARTS DRAWING FOR
TREATED GAS TRIM COOLER



ALL: 12.5 / 

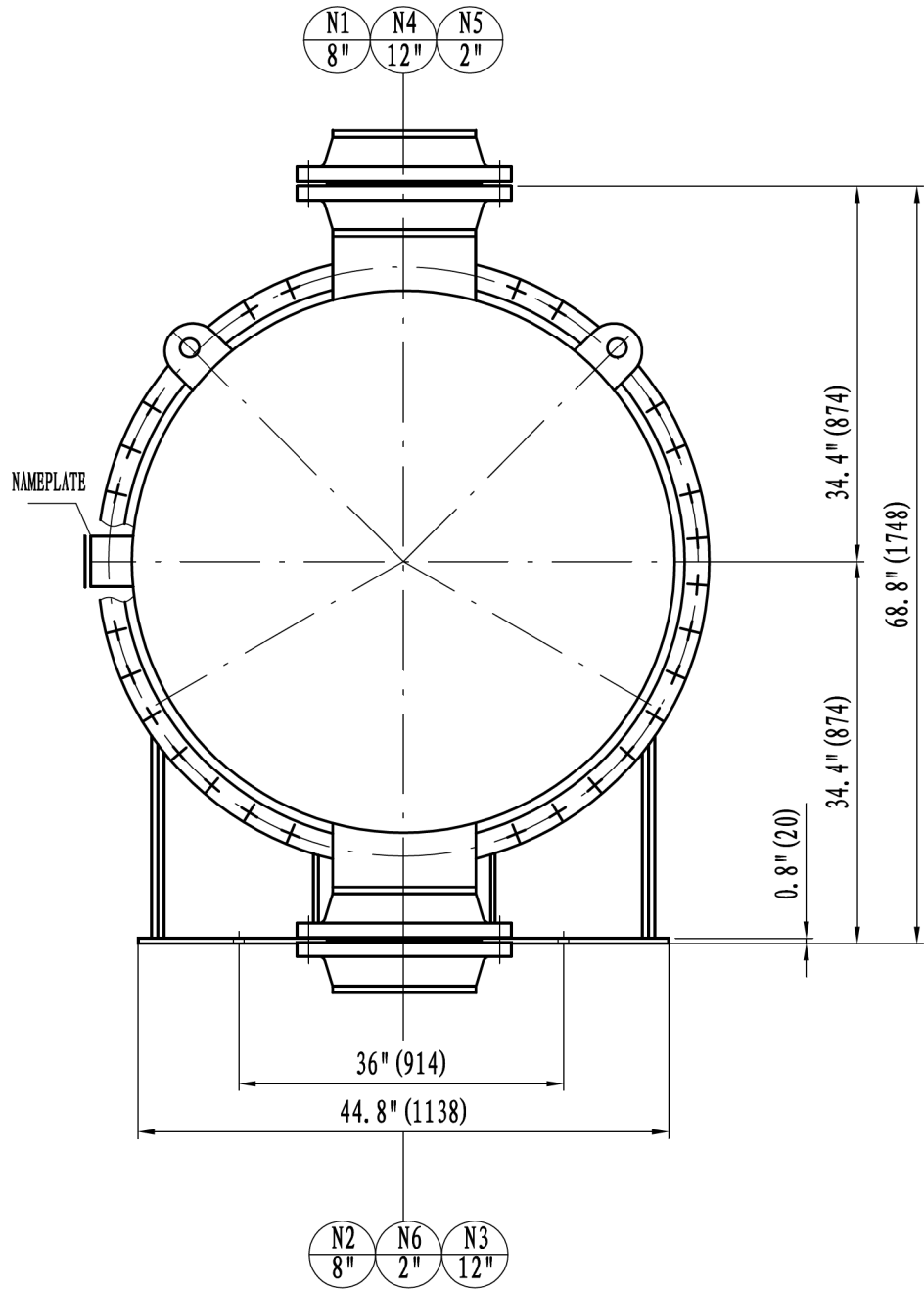


14	PIPE	SA105	2.53	---	A44-01-MEF-DWG-16-08	A44-01-MEF-DWG-16-01.01
ITEM	PARTS. NAME	MAT' L	MASS	SCALE	DWG NO.	ASSY. DWG NO.

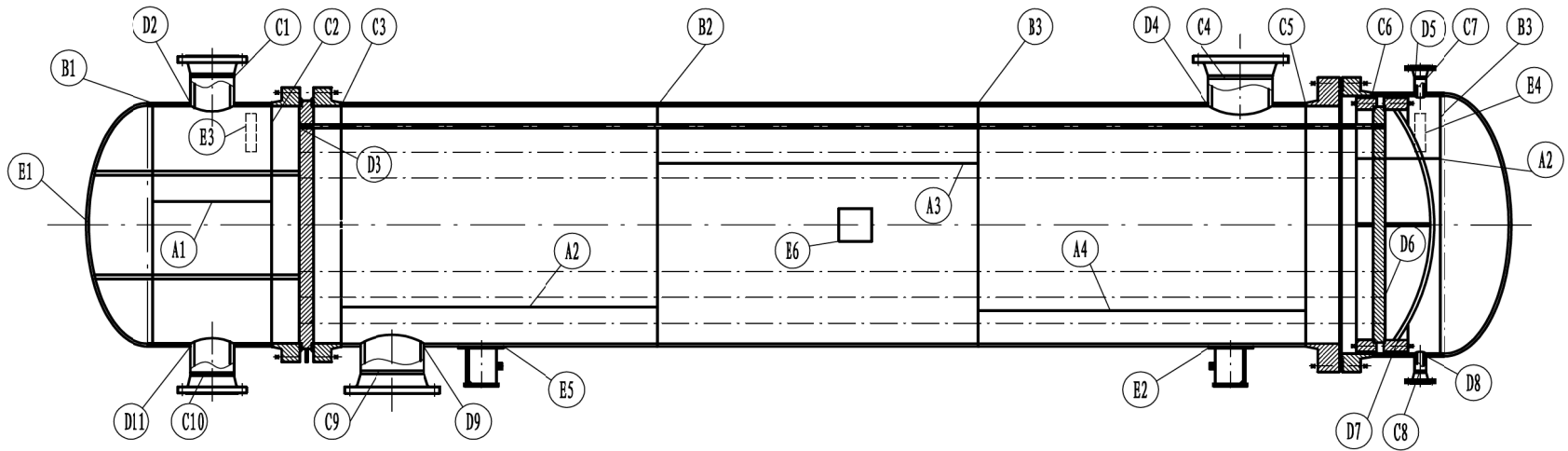
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REV	C	SCALE		TOTAL 7 PAGES	7 PAGE

PARTS DRAWING FOR
TREATED GAS TRIM COOLER

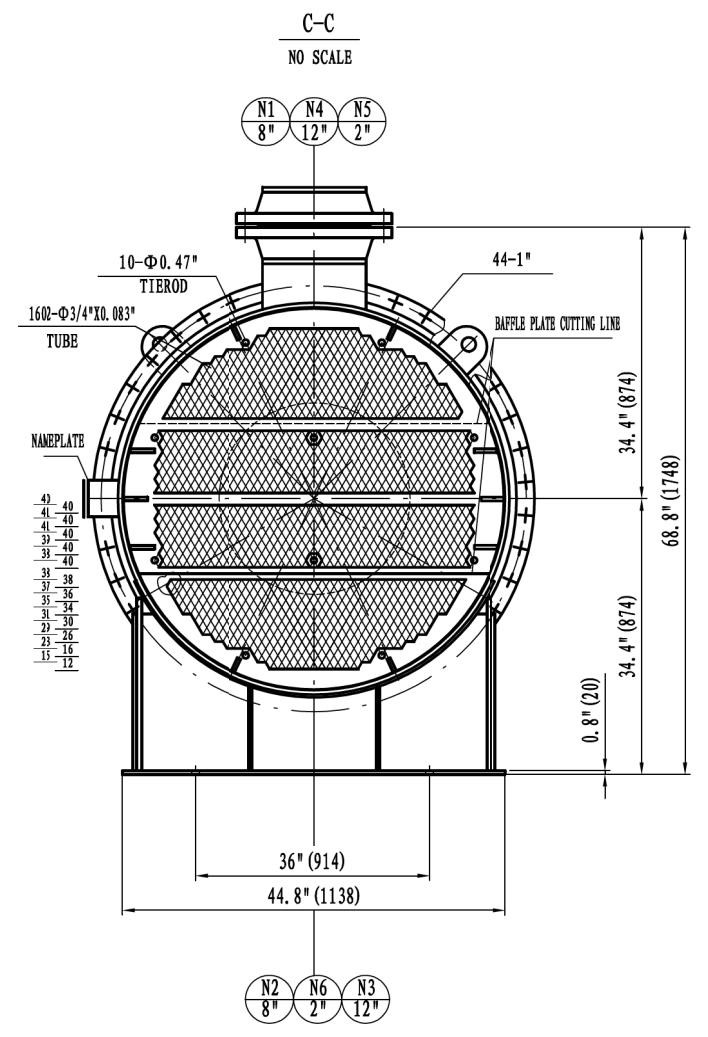
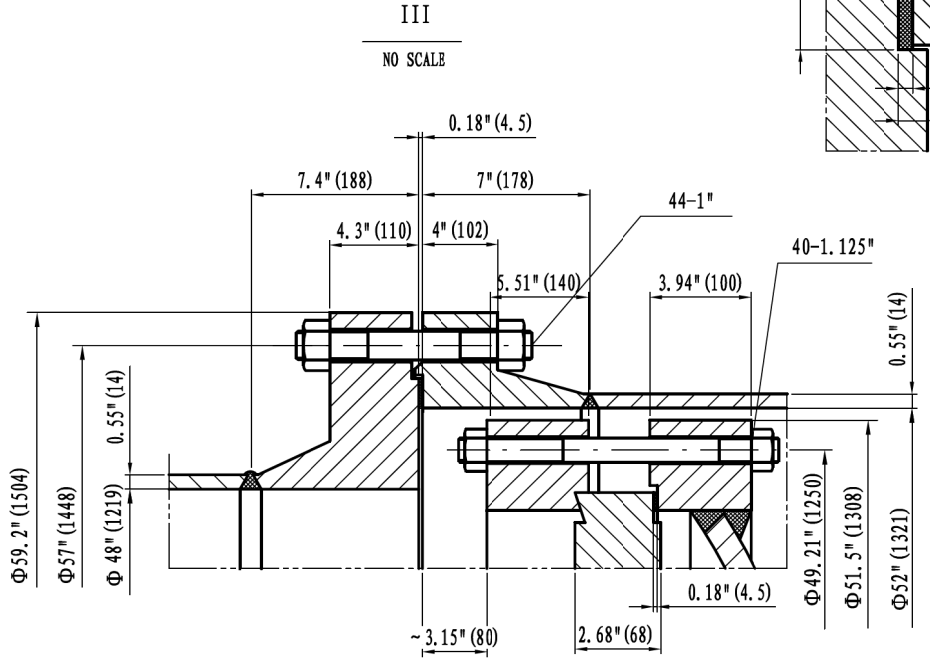
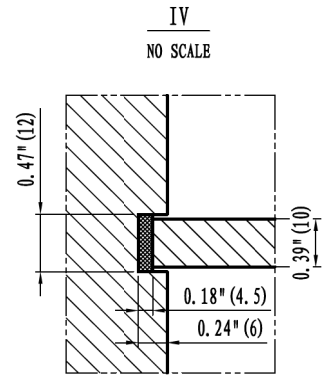
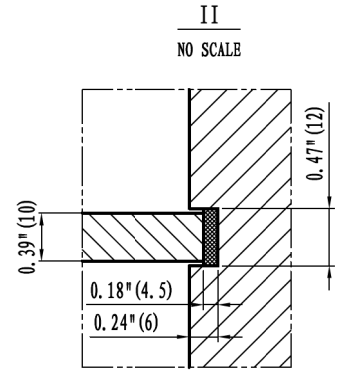
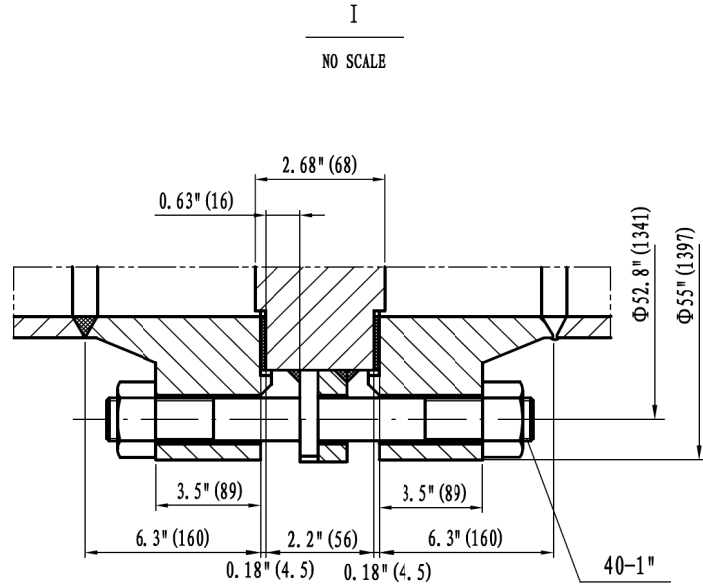
A
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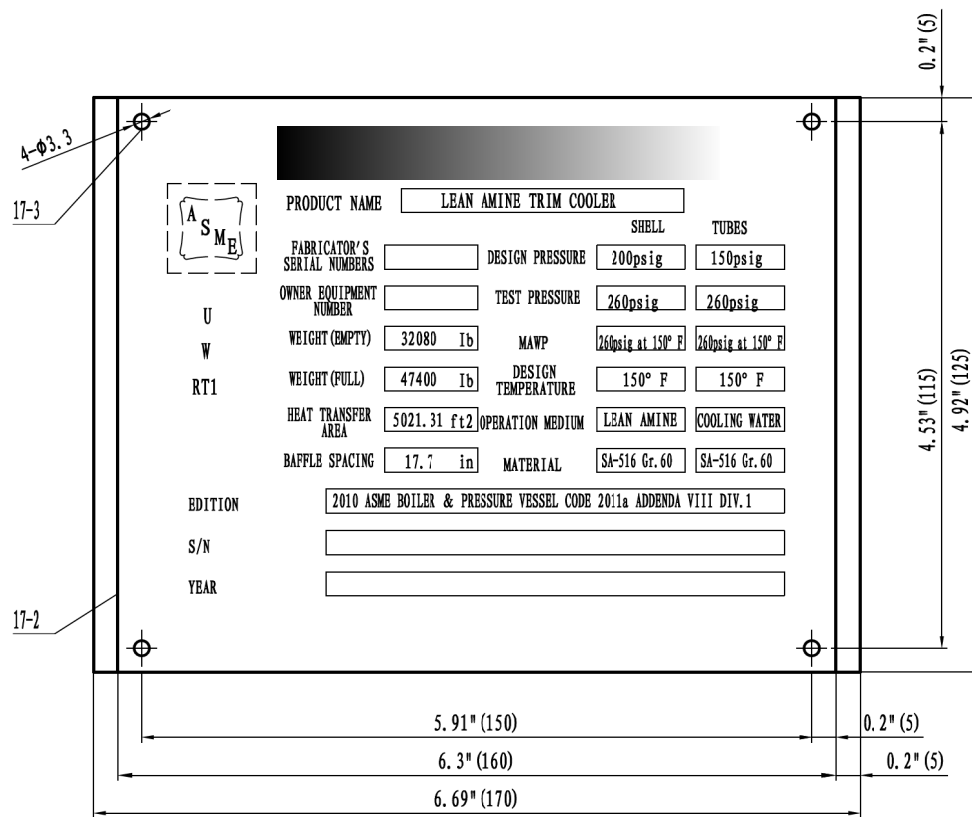
				ENGINEERING NAME	
GENERAL DRAWING FOR LEAN AMINE TRIM COOLER				EQUIP TAG.	E4405/E5405
				PHASE	DETAILED DESIGN
				DWG. NO	A44-01-MEF-DWG-17-01.02
REV	C	SCALE		TOTAL 14 PAGES	PAGE 2



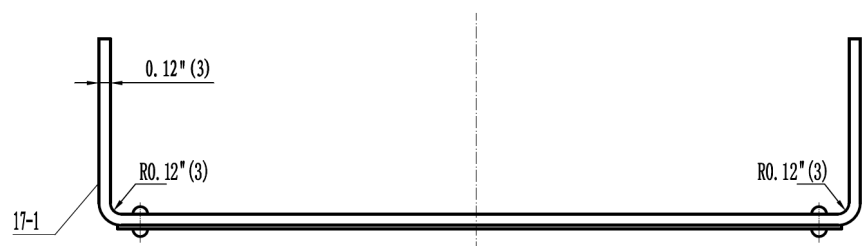
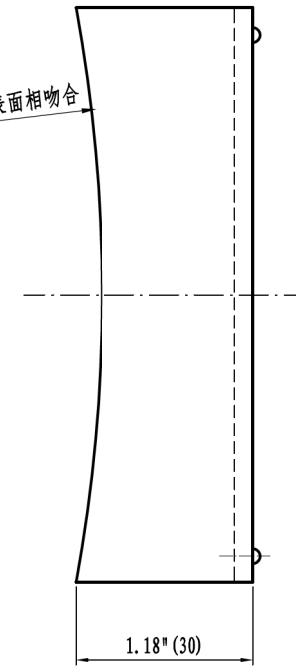
				ENGINEERING NAME	
				EQUIP TAG.	B4405/B5405
				PHASE	DETAILED DESIGN
				DWG. NO	A44-01-MEF-DWG-17-01.03
REV	C	SCALE		TOTAL 14 PAGES	PAGE 3



GENERAL DRAWING FOR LEAN AMINE TRIM COOLER			ENGINEERING NAME	
			EQUIP TAG.	B4405/B5405
			PHASE	DETAILED DESIGN
			DWG. NO	A44-01-MEF-DWG-17-01.04
REV	C	SCALE	TOTAL 14 PAGES	PAGE 4



与筒体外表面相吻合

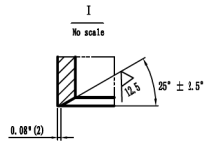
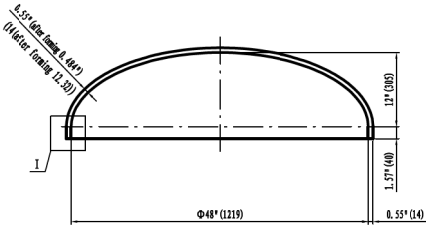


17-3		STUD	Φ0.12"X0.59"	4	LY1			
17-2		RATING PLATE	δ=0.08"	1	SA240 316		0.9	
17-1		PLATE	δ=0.12"	1	SA240 304		1.3	
ITEM	DWG NO. OR STD NO.	PARTS NAME		Q'TY	MATERIAL	SINGLE / TOTAL WEIGHT (lb)		REMARK
17		NAMEPLATE		2.2		44-01-MEF-DWG-04-03		44-01-MEF-DWG-17-01.01
ITEM	PARTS NAME		MATERIAL	WEIGHT(lb)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.	
						ENGINEERING NAME		
NAME PLATE DRAWING FOR LEAN AMINE TRIM COOLER						EQUIP TAG.	B4405/B5405	
						PHASE	DETAILED DESIGN	
						DWG. NO	A44-01-MEF-DWG-17-02	
REV				C	SCALE	TOTAL 14 PAGES		PAGE 5

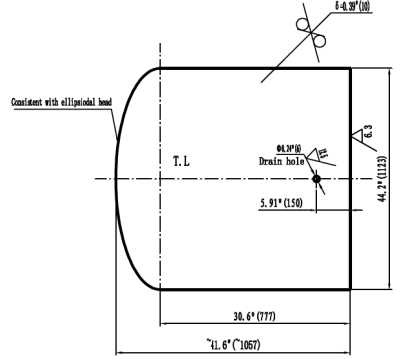
Technical Requirements

others: ∇ 25

1. Plate shall be as per ASME II.
2. Head shall be .
3. Fabrication, inspection and acceptance shall be as per UG79, UG81, UCS79.
4. Min. shaped thickness shall be 0.484".



1-1	ELLIPSOIDAL HEAD	SA516 Gr. 60	420	44-HI-MEP-DWG-11-43	44-HI-MEP-DWG-11-43
ITEM	PARTS NAME	MATERIAL	WEIGHT(LBS)	SCALE	LOCAL DWG NO. ASS'Y DWG NO.



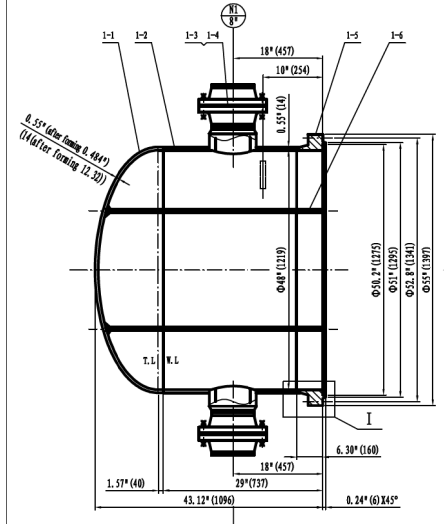
Note: After the floating cover welding and heat treated, machine the sealing surface to ∇ 6.5

1-5	PASS PARTITION I	SA56	196	44-HI-MEP-DWG-11-43	44-HI-MEP-DWG-11-43
ITEM	PARTS NAME	MATERIAL	WEIGHT(LBS)	SCALE	LOCAL DWG NO. ASS'Y DWG NO.

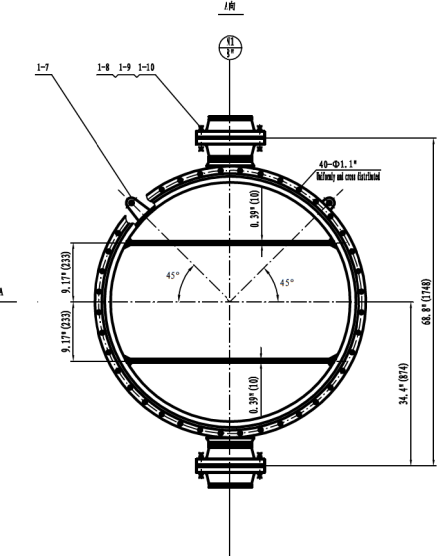
Technical Requirements

others: ∇

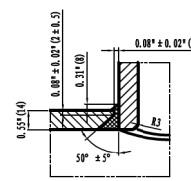
1. Plates, forging and tubes shall be as per ASME II.
2. Welding requirements see assembly drawing.
3. Stress-relief heat treatment shall be conducted when header welding qualified. Flange (piece 1-5) and pass partition seal surface shall be fine machined after heat treatment.
4. All connecting piece shall be welded to equipment and heat treatment shall be not allowed after heat treatment.
5. Other Technical Requirements see assembly drawing Technical Requirements.



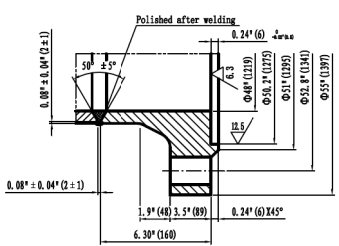
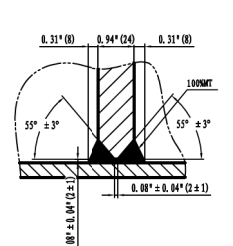
Tube and shell welding node
No scale



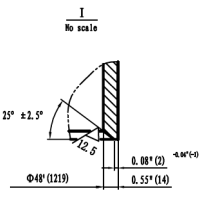
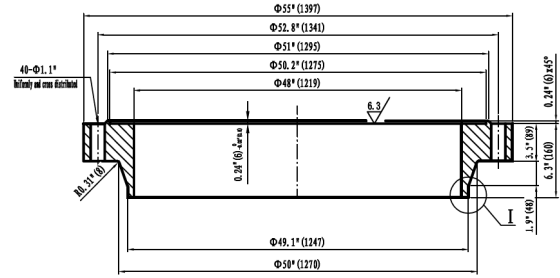
Lug welding joint
No scale



Shell section welding joints
No scale



Polished after welding
No scale



others: ∇ 12.5

Technical Requirements

1. Material for equipment shall be as per ASME II.
2. Crack and defects which reduce flange strength and connecting reliability shall not be allowed on flange seal face and surface.
3. Tolerance of stud hole circle diameter and chord length of two adjoining stud hole shall be ± 0.024" (0.6).
4. Tolerance of any two of stud hole chord length shall be ± 0.079" (2.0).
5. Limit deviation of mechanical machining surface linear dimension tolerance shall be as per ISO 2768-1:1989 (M) Level M.
6. Flange sealing surface (piece 1-5) shall be fine machined after welded with header and heat treatment.

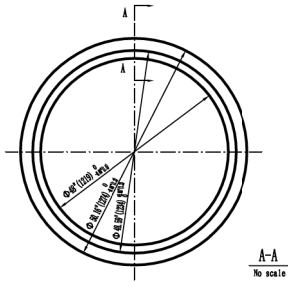
7-1	SHRLL FLANGE	SA266 Gr. 2N	618	44-HI-MEP-DWG-11-43	44-HI-MEP-DWG-11-43
1-5	SIXTONAL HEAD FLANGE	SA266 Gr. 2N	618	44-HI-MEP-DWG-11-43	44-HI-MEP-DWG-11-43
ITEM	PARTS NAME	MATERIAL	WEIGHT(LBS)	SCALE	LOCAL DWG NO. ASS'Y DWG NO.

1-10	ASME B18.2.2	HEX NUTS 3/4"-UNC-2B	32	SA-194 2H	0.2	6.1	Carbon Plated
1-9	ASME B18.2.1	STD 3/4"-UNC-2A-4.75"	16	SA-193 B7	0.63	11	Carbon Plated
1-8	ASME B16.20	GASKET 8"-154-F.C	2	SS316L/F.C			
1-7	44-HI-MEP-DWG-11-43	LIFTING	2	SA516 Gr. 60	9.4	18.8	
1-6	44-HI-MEP-DWG-11-43	PASS PARTITION I	2	SA56	196	391	
1-5	44-HI-MEP-DWG-11-43	CHANNEL FLANGE	1	SA266 Gr. 2N		611	
1-4	44-HI-MEP-DWG-11-43	NOZZLE	2	SA266 Gr. 2N	97	194	
1-3	ASME16.5/2009B	FLANGE 8"-151 RF W/ Sch80	4	SA105	42.1	168.4	

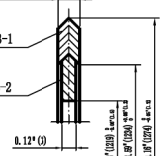
1-2	SHRLL DN48" 0-0.155"-22.7"	1	SA516 Gr. 60	541		
1-1	44-HI-MEP-DWG-11-43	ELLIPSOIDAL HEAD	1	SA516 Gr. 60	420	
ITEM	DWG NO. OR STD NO.	PARTS NAME	Q'TY	MATERIAL	STK/LBL TOTAL WT/LBS (LBS)	REMARK
1	CHANNEL		2369		44-HI-MEP-DWG-11-43	44-HI-MEP-DWG-11-43
ITEM	PARTS NAME	MATERIAL	WEIGHT(LBS)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.
ENCIPHERING NAME						
EQUIP TAG: B4405/B5405						
PLANS: DETAILED DESIGN						
DWG NO: 44-01-MEP-DWG-17-03						
TOTAL 14 PAGES PAGE 6						

Technical Requirements

1. Fabrication and acceptance of gasket shall be as per ASME B 16.20-2007.



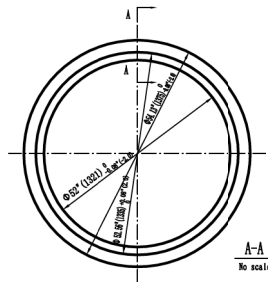
0.18" ± 0.008" (4.5 ± 0.2)



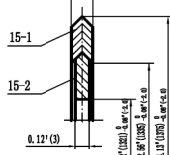
2-2		FLAT STEEL	1	SS316L				
2-1		GASKET	1	SS316L/P. G.				
ITEM	DWG NO. OR STD. NO.	PARTS NAME	Q'TY	MATERIAL	SINGLE WEIGHT (LBS)	TOTAL WEIGHT (LBS)	REMARK	
3		SHELL GASKET			44-#1-MSP-WG-17-#1	44-#1-MSP-WG-17-#1		
ITEM	PARTS NAME	MATERIAL	WEIGHT(LBS)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.		

Technical Requirements

1. Fabrication and acceptance of gasket shall be as per ASME B 16.20-2007.



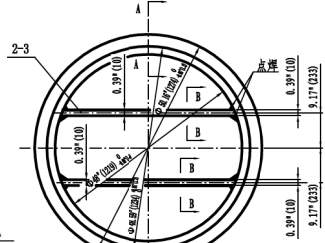
0.18" ± 0.008" (4.5 ± 0.2)



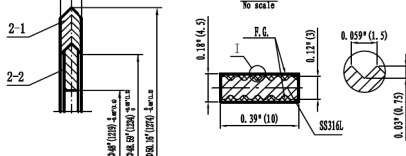
15-2		FLAT STEEL	1	SS316L				
15-1		GASKET	1	SS316L/P. G.				
ITEM	DWG NO. OR STD. NO.	PARTS NAME	Q'TY	MATERIAL	SINGLE WEIGHT (LBS)	TOTAL WEIGHT (LBS)	REMARK	
15		GASKET			44-#1-MSP-WG-17-#1	44-#1-MSP-WG-17-#1		
ITEM	PARTS NAME	MATERIAL	WEIGHT(LBS)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.		

Technical Requirements

1. Fabrication and acceptance of gasket shall be as per ASME B 16.20-2007.
2. Touch pad parts and wood gasket shall be inner ring point welding, SS316L plate shall be as per ASME II.



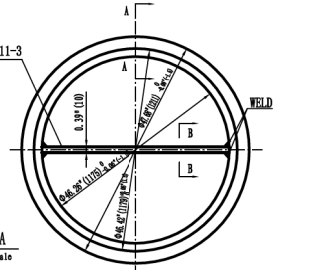
0.18" ± 0.008" (4.5 ± 0.2)



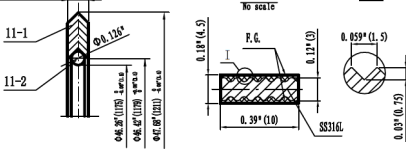
2-3		GASKET	2	SS316L/P. G.				
2-2		FLAT STEEL	1	SS316L				
2-1		GASKET	1	SS316L/P. G.				
ITEM	DWG NO. OR STD. NO.	PARTS NAME	Q'TY	MATERIAL	SINGLE WEIGHT (LBS)	TOTAL WEIGHT (LBS)	REMARK	
2		GASKET			44-#1-MSP-WG-17-#1	44-#1-MSP-WG-17-#1		
ITEM	PARTS NAME	MATERIAL	WEIGHT(LBS)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.		

Technical Requirements

1. Fabrication and acceptance of gasket shall be as per ASME B 16.20-2007.
2. Touch pad parts and wood gasket shall be inner ring point welding, SS316L plate shall be as per ASME II.



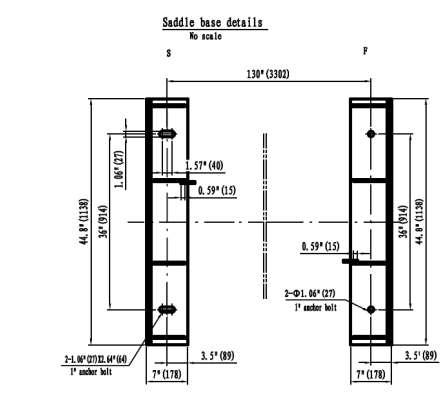
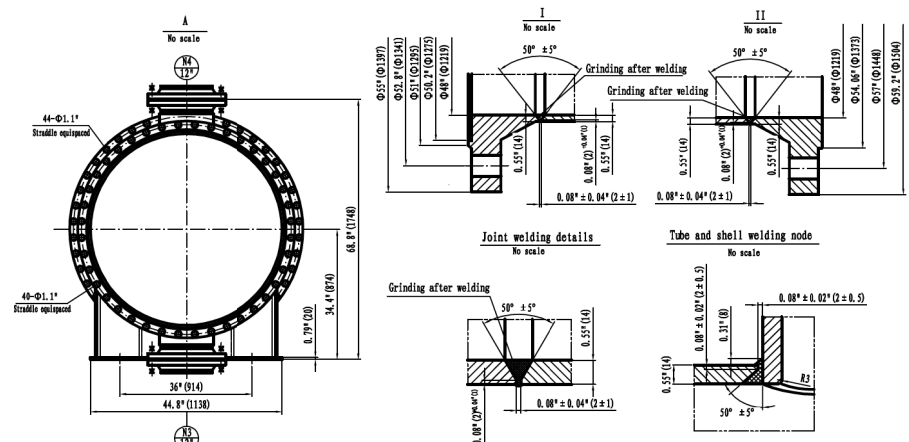
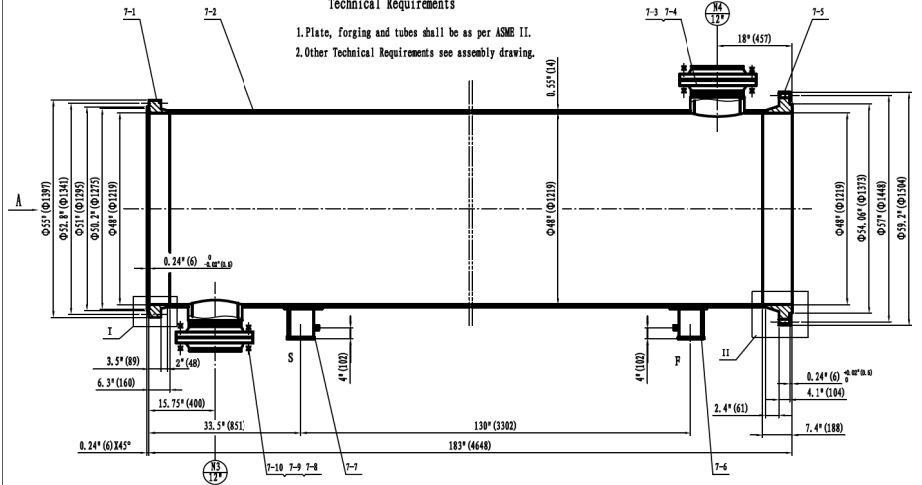
0.18" ± 0.008"



11-3		GASKET	1	SS316L/P. G.				
11-2		FLAT STEEL	1	SS316L				
11-1		GASKET	1	SS316L/P. G.				
ITEM	DWG NO. OR STD. NO.	PARTS NAME	Q'TY	MATERIAL	SINGLE WEIGHT (LBS)	TOTAL WEIGHT (LBS)	REMARK	
11		FLAUITR HEAD COVER GASKET			44-#1-MSP-WG-17-#1	44-#1-MSP-WG-17-#1		
ITEM	PARTS NAME	MATERIAL	WEIGHT(LBS)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.		

Technical Requirements

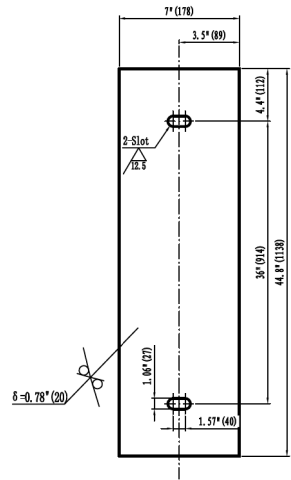
1. Plate, forging and tubes shall be as per ASME II.
2. Other Technical Requirements see assembly drawing.



7-10	ASME B18.2.2	HEX NUTS 7/8"-UNC-2B	48	SA-194 2H	3.1	14.88	Carbon Plated
7-9	ASME B18.2.1	STD 7/8"-UNC-2A-5.15"	24	SA-193 B7	0.88	21.35	Carbon Plated
7-8	ASME B16.20	GASKET 12"-150-1.6	2	SS316L/P. G.			
7-7	44-#1-MSP-WG-17-#5	SLIDING SUPPORT SADDLE	1	SAN/SA16 Gr. 60		242	
7-6	44-#1-MSP-WG-17-#5	FIXED SUPPORT SADDLE	1	SAN/SA16 Gr. 60		241	
7-5	44-#1-MSP-WG-17-#5	SHELL FLANGE	1	SA266 Gr. 2N		1232	
7-4	44-#1-MSP-WG-17-#11	NOZZLE	2			94	188
7-3	ASME16.5/2409B	FLANGE 12"-150 RF W/ 3-1/2"	4	SA105		88.1	352.4
7-2		SHELL 104" x 4.15" x 168.3"	1	SA516 Gr. 60			4037
7-1	44-#1-MSP-WG-17-#5	SHELL FLANGE	1	SA266 Gr. 2N			619
ITEM	DWG NO. OR STD. NO.	PARTS NAME	Q'TY	MATERIAL	SINGLE WEIGHT (LBS)	TOTAL WEIGHT (LBS)	REMARK
7		SHELL		6040	1:15	44-#1-MSP-WG-17-#1	44-#1-MSP-WG-17-#1
ITEM	PARTS NAME	MATERIAL	WEIGHT(LBS)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.	

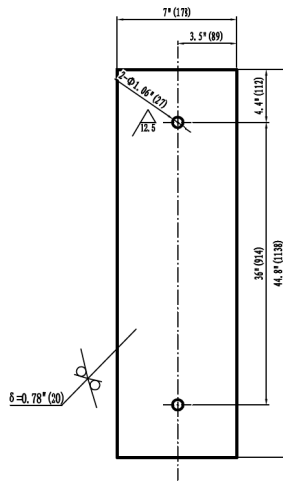
ENGINEERING NAME			
PARK'S DRAWING FOR EQUIP TAG. B4405/B5405			
LEAN ANINE TRIM COOLER PLANS DETAILED DESIGN			
DWG. NO.	A44-01-MSP-WG-17-04	TOTAL 14 PAGES	PAGE 7

others:



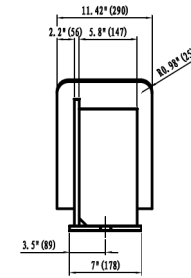
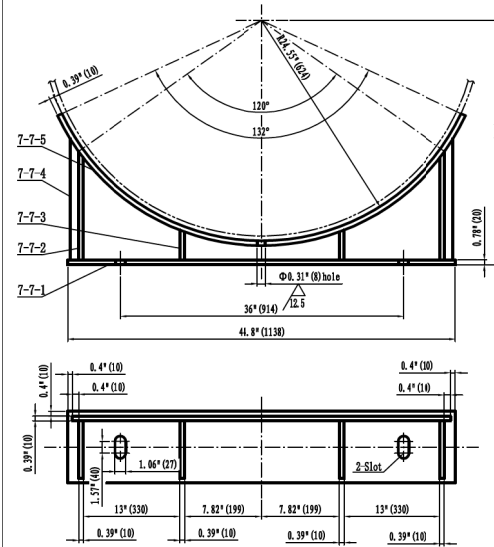
ITEM	PARTS NAME	MATERIAL	WEIGHT(LBS)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.
7-7-1	PLATE	SA336	67.8		AA-HI-MEP-DWG-17-05	AA-HI-MEP-DWG-17-05

others:



ITEM	PARTS NAME	MATERIAL	WEIGHT(LBS)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.
7-6-1	PLATE	SA336	69		AA-HI-MEP-DWG-17-05	AA-HI-MEP-DWG-17-05

others:

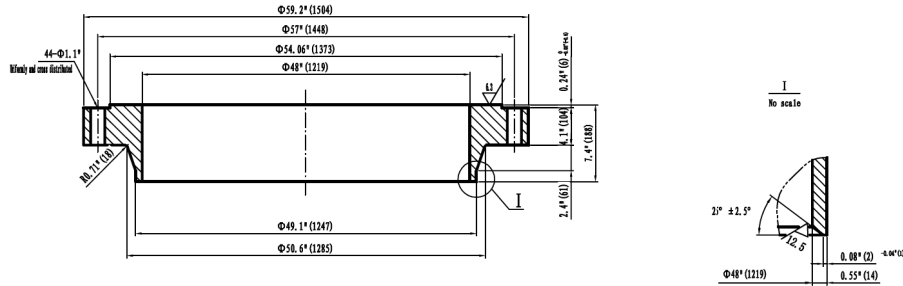


ITEM	DWG NO. OR STD NO.	PARTS NAME	Q'TY	MATERIAL	WEIGHT(LBS)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.	REMARK
7-7-5		PLATE	1	SA516 Gr. 60	72				
7-7-4		PLATE	2	SA336	61.3				
7-7-3		PLATE	2	SA336	6.5				
7-7-2		PLATE	2	SA336	13.2				
7-7-1	AA-HI-MEP-DWG-17-05	PLATE	1	SA336	67.8				
7-7		SLIDING SUPPORT SADDLE	241	1:15	AA-HI-MEP-DWG-17-05				AA-HI-MEP-DWG-17-05

others:

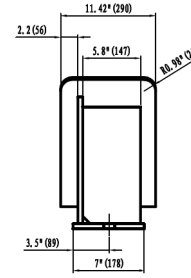
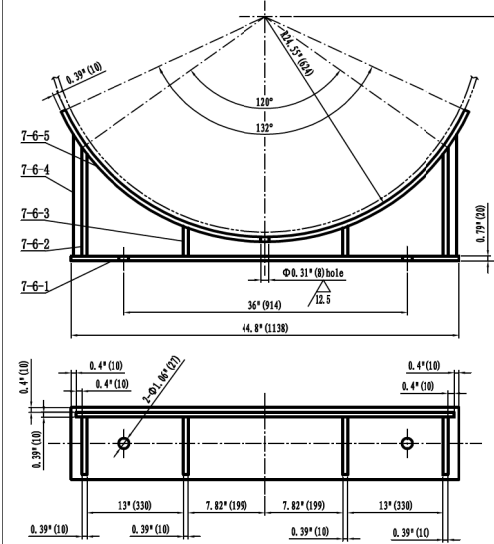
Technical Requirements

- Equipment material shall be as per ASME II.
- Crack and defects which reduce flange strength and connecting reliability shall not be allowed on flange seal face and surface.
- Tolerance of stud hole circle diameter and chord length of two adjoining stud hole shall be ± 0.024 (0.6).
- Tolerance of any two of stud hole chord length shall be ± 0.079 (2.0).
- Limit deviation of mechanical machining surface liner dimension shall be as per ISO 2768-1:1989 (G) Level M.



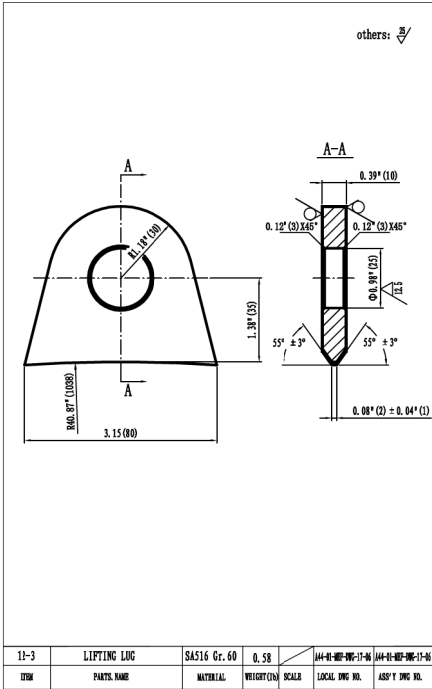
ITEM	PARTS NAME	MATERIAL	WEIGHT(LBS)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.
7-5	SHELL FLANGE	SA266 Gr. 2N	1232		AA-HI-MEP-DWG-17-05	AA-HI-MEP-DWG-17-05

others:

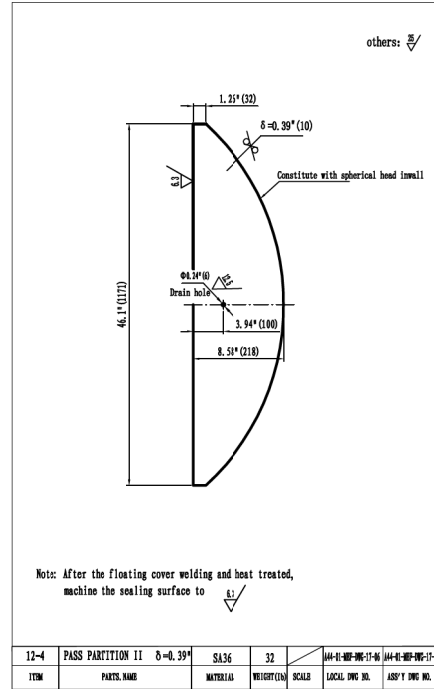


ITEM	DWG NO. OR STD NO.	PARTS NAME	Q'TY	MATERIAL	WEIGHT(LBS)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.	REMARK
7-6-5		PLATE	1	SA516 Gr. 60	72				
7-6-4		PLATE	2	SA336	61.3				
7-6-3		PLATE	2	SA336	6.5				
7-6-2		PLATE	2	SA336	13.2				
7-6-1	AA-HI-MEP-DWG-17-05	PLATE	1	SA336	69				
7-6		FIXED SUPPORT SADDLE	242	1:15	AA-HI-MEP-DWG-17-05				AA-HI-MEP-DWG-17-05

PARTS DRAWING FOR		REVISION	
LEAN AMINE TRIM COOLER		DATE	04/05/25405
		PHASE	DETAILED DESIGN
		DWG. NO.	AA-HI-MEP-DWG-17-05
REV	SCALE	TOTAL PAGE	PAGE 6

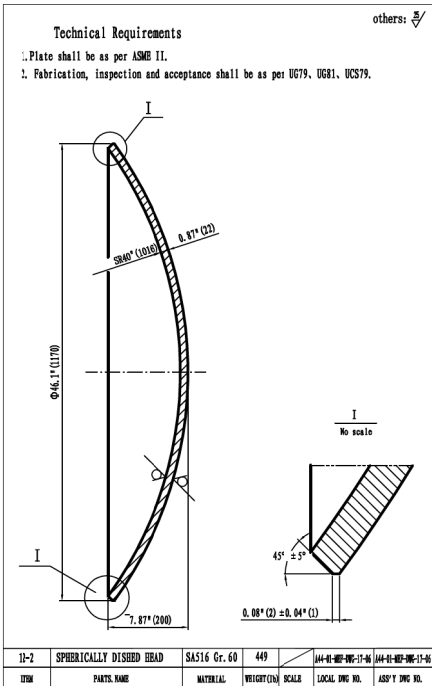


11-3	LIFTING LUG	SA516 Gr. 60	0.58				
ITEM	PARTS NAME	MATERIAL	WEIGHT(LBS)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.	

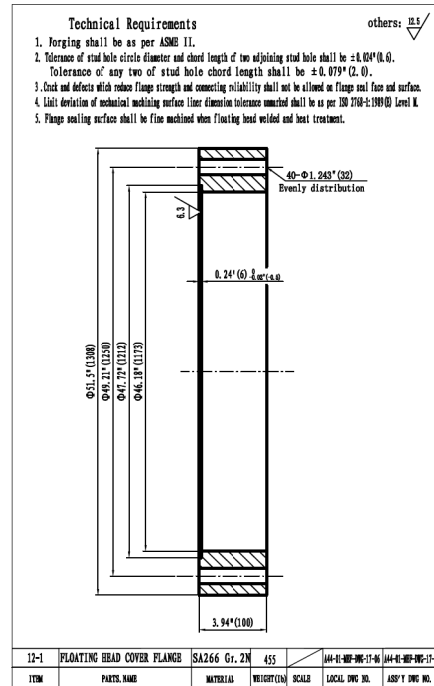


Note: After the floating cover welding and heat treated, machine the sealing surface to

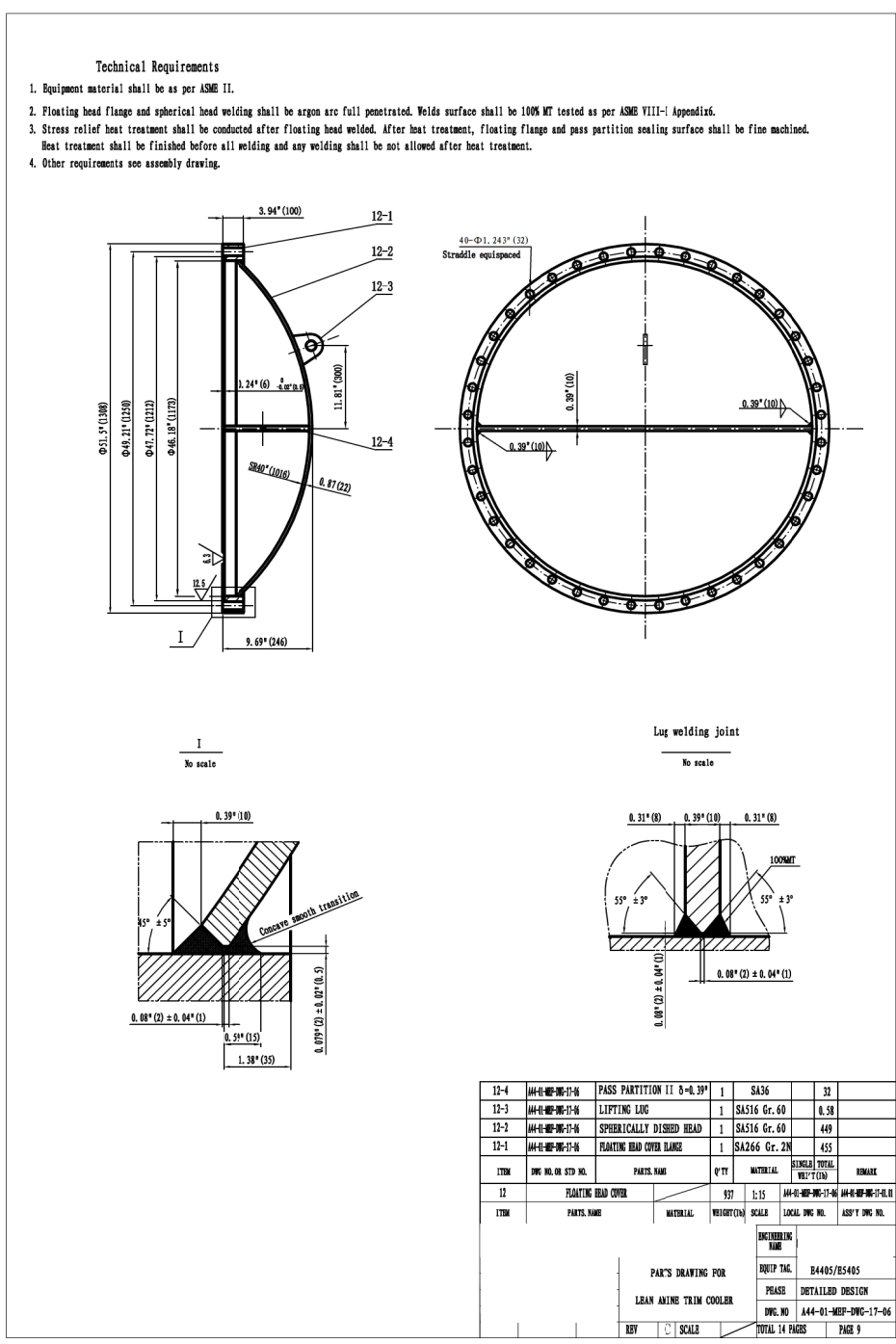
12-4	PASS PARTITION II $\delta=0.39"$	SA516	32				
ITEM	PARTS NAME	MATERIAL	WEIGHT(LBS)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.	



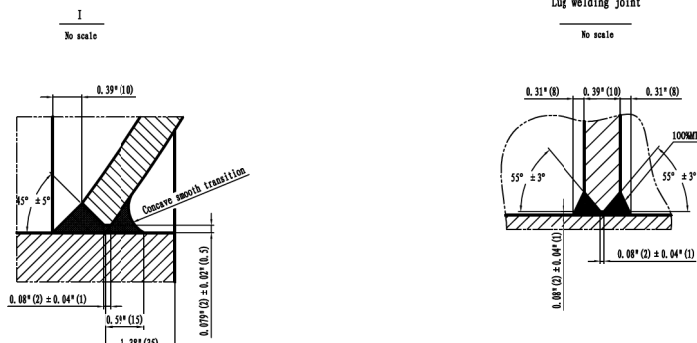
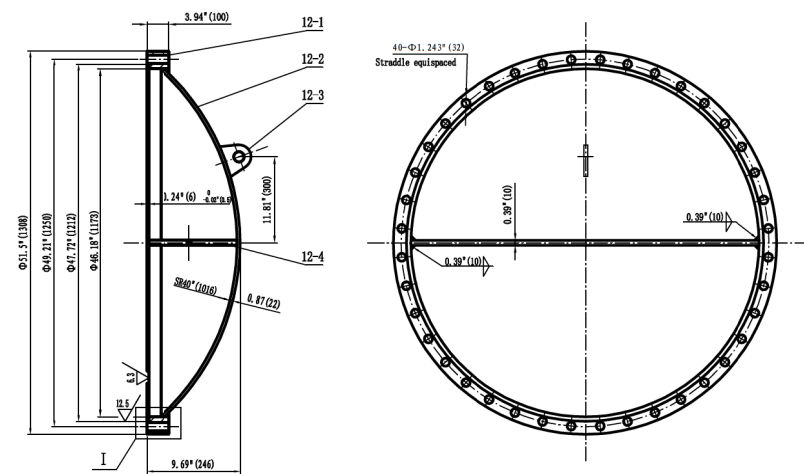
11-2	SPHERICALLY DISHED HEAD	SA516 Gr. 60	449				
ITEM	PARTS NAME	MATERIAL	WEIGHT(LBS)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.	



11-1	FLOATING HEAD COVER FLANGE	SA266 Gr. 2N	455				
ITEM	PARTS NAME	MATERIAL	WEIGHT(LBS)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.	

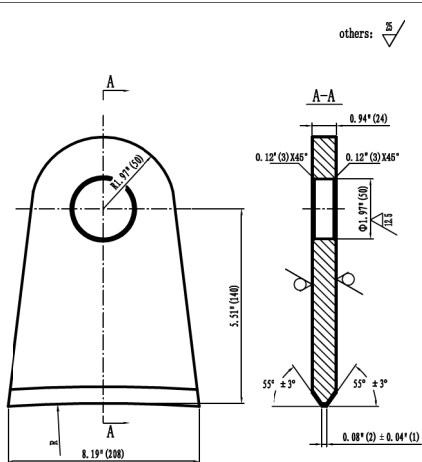


- Technical Requirements**
- Equipment material shall be as per ASME II.
 - Floating head flange and spherical head welding shall be argon arc full penetrated. Welds surface shall be 100% MT tested as per ASME VIII-1 Appendix.
 - Stress relief heat treatment shall be conducted after floating head welded. After heat treatment, floating flange and pass partition sealing surface shall be fine machined. Heat treatment shall be finished before all welding and any welding shall be not allowed after heat treatment.
 - Other requirements see assembly drawing.



12-4	SA516 Gr. 60	SA516 Gr. 60	32				
12-3	LIFTING LUG	SA516 Gr. 60	0.58				
12-2	SPHERICALLY DISHED HEAD	SA516 Gr. 60	449				
12-1	FLOATING HEAD COVER FLANGE	SA266 Gr. 2N	455				
ITEM	DWG NO. OR STD NO.	PARTS NAME	QTY	MATERIAL	SINGLE WEIGHT(LBS)	TOTAL WEIGHT(LBS)	REMARK
12	FLOATING HEAD COVER		1	SA516 Gr. 60	1.15	1.15	
ITEM	PARTS NAME	MATERIAL	WEIGHT(LBS)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.	

ENGINEERING NAME
EQUIP TAG: B4405/B5405
PLANS: DETAILED DESIGN
DWG NO: A44-01-MESP-DWG-17-06
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PART NO.	R	ASS'Y DWG NO.
1-7	24.55* (624)	444-01-MEP-DWG-17-03
13-6	26.55* (674)	444-01-MEP-DWG-17-07

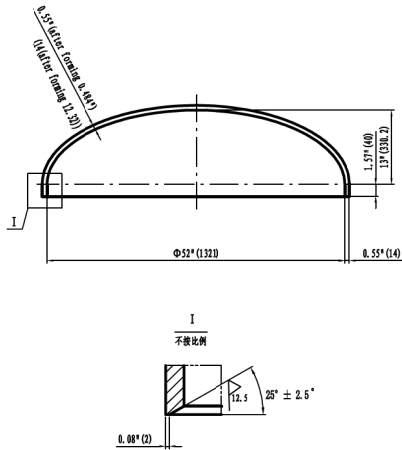
SER. TABLE	LIFTING LUG	SAS16 Gr. 60	9.4	44-H-MEP-DWG-17-01	SER. TABLE
ITEM	PARTS NAME	MATERIAL	WEIGHT (G)	SCALE	LOCAL DWG NO.

others: 25

Technical Requirements

1. Plate shall be as per ASME II.
2. Head shall be shaped by hot-pressing wholly plate.
3. Fabrication, inspection and acceptance shall be as per UG79, UG81, UCS79.
4. Min. shaped thickness shall be 0.481".

others: 25

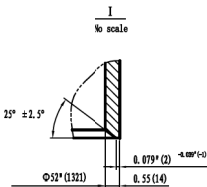
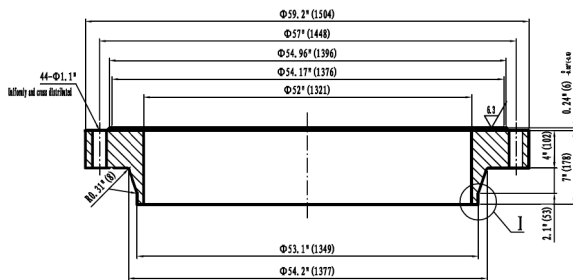


ITEM	PARTS NAME	MATERIAL	WEIGHT (G)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.
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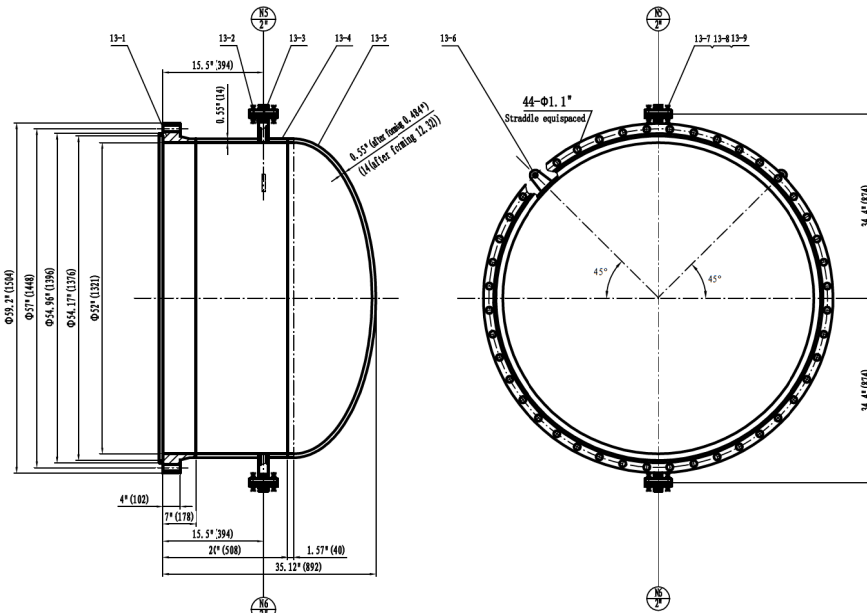
Technical Requirements

1. Equipment material shall be as per ASME II.
2. Crack and defects which reduce flange strength and connecting reliability shall not be allowed on flange seal face and surface.
3. Tolerance of stud hole circle diameter and chord length of two adjoining stud hole shall be ± 0.024 (0.6). Tolerance of any two of stud hole chord length shall be ± 0.099 (2.0).
4. Limit deviation of mechanical machining surface liner dimension tolerance unmarked shall be as per ISO 2768-1:1989 (E) Level M.

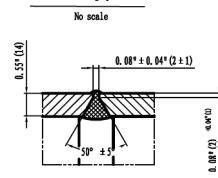
others: 12.5



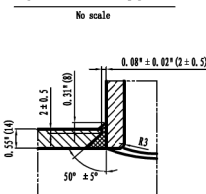
ITEM	PARTS NAME	MATERIAL	WEIGHT (G)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.
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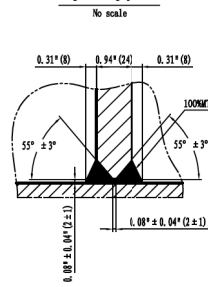
Shell welding joints



Pipe and shell welding point



Lug welding joint



Technical Requirements

1. All equipment material shall be as per ASME II.
2. Welding requirements see assembly drawing.
3. Lug (piece 13-5) only shall be for header lifting.
4. Other Technical Requirements see assembly drawing.

ITEM	DWG NO. OR STD NO.	PARTS NAME	Q'TY	MATERIAL	STANDARD	TOTAL WEIGHT (G)	REMARK
13-9	ASME B18.2.2	HEX NUTS 5/8"-UNC-2B	16	SA-194 2H	0.11	1.76	Cadmium Plated
13-8	ASME B18.2.1	STUD 5/8"-UNC-2A-3.5"	8	SA-193 B7	0.3	2.4	Cadmium Plated
13-7	ASME B16.20	GASKET 2"-150-F.G	2	SS316L/F.G			
13-6	44-H-MEP-DWG-17-01	LIFTING LUG	2	SAS16 Gr. 60	9.4	18.8	
13-5	44-H-MEP-DWG-17-01	ELLIPSOIDAL HEAD	1	SAS16 Gr. 60	511		
13-4	44-H-MEP-DWG-17-01	SHELL INSIDE 0-0.55 (13)	1	SAS16 Gr. 60	331		
13-3	ASME16.5/2009B	FLANGE 2"-150 H W SCH160	4	SA105	6	24	
13-2		NOZZLE 2" SCH10 L=5.90"	2	SA106 Gr. B	1.1	2.2	
13-1	44-H-MEP-DWG-17-01	SHELL COVER PLANGE	1	SA266 Gr. 2N	785		

ITEM	DWG NO. OR STD NO.	PARTS NAME	Q'TY	MATERIAL	WEIGHT (G)	SCALE	LOCAL DWG NO.	ASS'Y DWG NO.
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ENCIPHERING NAME	EQUIP TAG	PLANS	DWG NO	TOTAL PAGE	PAGE 10
	B4405/B5405	DETAILED DESIGN	444-01-MEP-DWG-17-07		

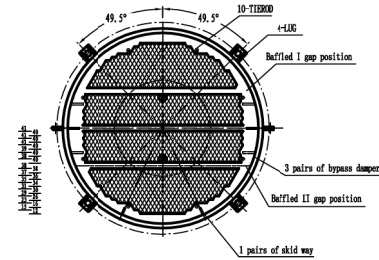
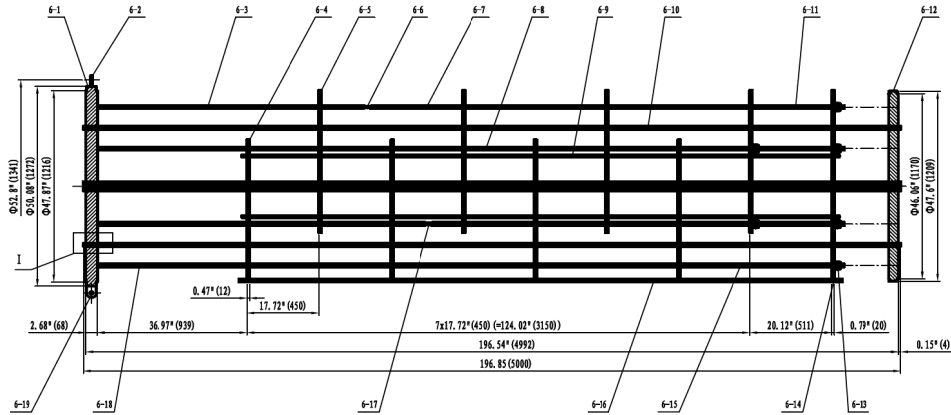
PAK'S DRAWING FOR
LEAN ANINE TRIM COOLER
REV SCALE

Technical Requirements

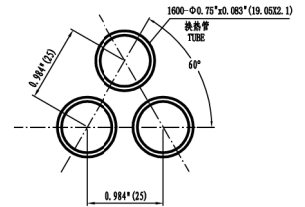
1. Connection between tube plate and tube shall be strength welded followed by light expansion. Strength welded shall be argon arc welding at least twice and arcing point between the first and the second shall be stagger by 120°.
2. Tube shall be SA1179 seamless tube with outer diameter $\Phi 3/4" \pm 0.004"$ ($\Phi 19.05 \pm 0.10mm$) and thickness and its tolerance shall be $0.083" \pm 0.001"$ in.
3. Unless indications, all welds height of fillet welding shall be as per thickness of the thinner piece and shall be continuous welding.
4. Tolerance of spacer length shall be $-1mm$.
5. Other Technical Requirements see assembly Technical Requirements.

Notice :

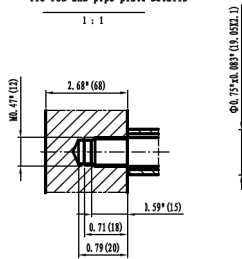
1. Piece (6-19) only shall be for bundle to allow for lifting.



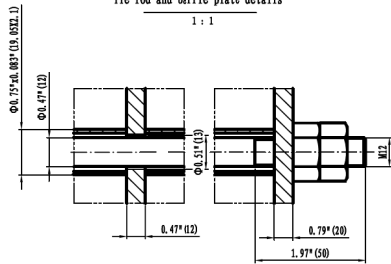
Tube holes details
1:1



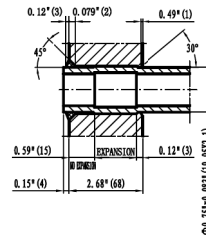
Tie rod and pipe plate details
1:1



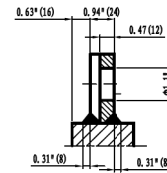
Tie rod and baffle plate details
1:1



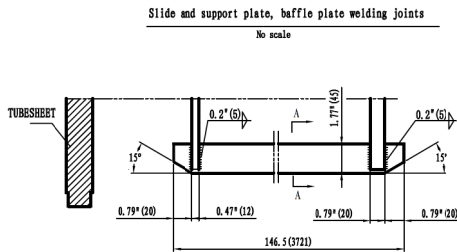
I
No scale



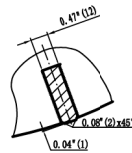
Lug welding joint
No scale



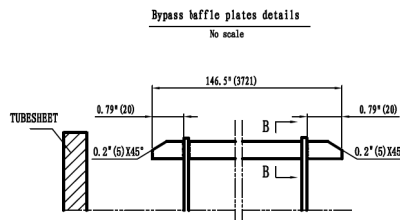
Slide and support plate, baffle plate welding joints
No scale



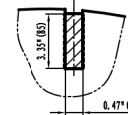
A-A
No scale



Bypass baffle plates details
No scale



B-B
No scale



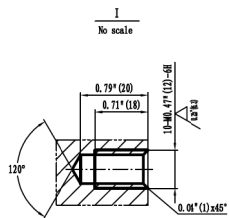
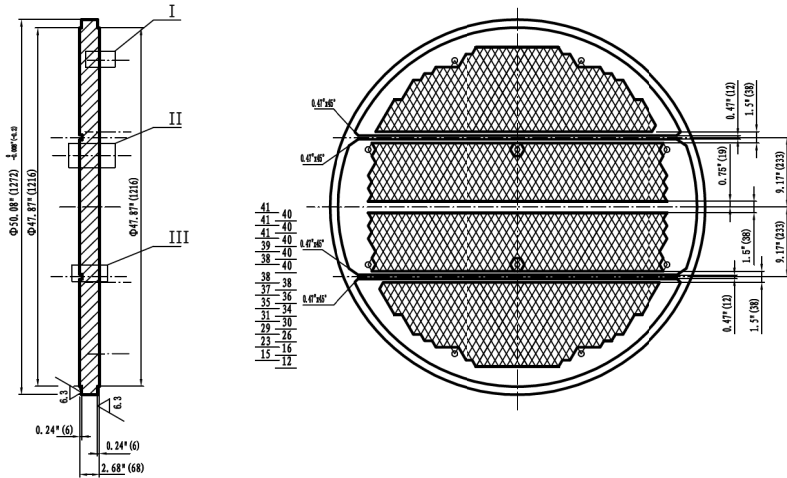
ITEM	DWG NO. OR STD. NO.	PARTS NAME	Q'TY	MATERIAL	WEIGHT (G)	WEIGHT (LBS)	TOTAL WEIGHT (G)	TOTAL WEIGHT (LBS)	REMARK
6-19	444-HI-MEP-DWG-17-10	LIFTING LUG	2	SA336	0.97	1.94			
6-18		SPACER Φ0.75"X1.83" L=36.93"	2	SA1179	1.8	3.6			
6-17	444-HI-MEP-DWG-17-11	TIER ROD	2	SA-6	7.55	15.1			
6-16		SKID WAY 1.77"X1.47"X146.5"	2	SA336	34.6	69.2			
6-15		SPACER 0.75"X1.83" L=31.34"	2	SA1179	1.84	3.68			
6-14	444-HI-MEP-DWG-17-10	SUPPORT PLATE	1	SA336		183			
6-13	ASME B11.1 C. 08-2110	NUT NO. 47"	20	SS304					
6-12	444-HI-MEP-DWG-17-09	FLAATING TUBESHEET	1	SA266 Gr. 2N		815			
6-11		SPACER 0.75"X1.83" L=10.65"	6	SA1179	0.97	5.82			
6-10		TUBE 0.75"X1.83" L=196.85"	1600	SA1179	5.68	15488			
6-9		W-PAS BULK 1.57"X1.47"X146.5"	6	SA336	67.4	404.4			
6-8		SPACER Φ0.75"X1.83" L=17.24"	42	SA1179	0.84	35.3			
6-7		SPACER Φ0.75"X1.83" L=34.97"	12	SA1179	1.72	44			
6-6	444-HI-MEP-DWG-17-11	TIE ROD	8	SA-6	8.49	68			
6-5	444-HI-MEP-DWG-17-10	TRANSVERSE BAFFLE II	4	SA336	103.6	414.4			
6-4	444-HI-MEP-DWG-17-10	TRANSVERSE BAFFLE I	4	SA336	103.6	414.4			
6-3		SPACER Φ0.75"X1.83" L=54.69"	2	SA1179	2.69	5.38			
6-2	444-HI-MEP-DWG-17-10	LOG	4	SA336	1.1	2.2			
6-1	444-HI-MEP-DWG-17-09	STATIONARY TUBESHEET	1	SA266 Gr. 2N		961			

ITEM	DWG NO. OR STD. NO.	PARTS NAME	Q'TY	MATERIAL	WEIGHT (G)	WEIGHT (LBS)	TOTAL WEIGHT (G)	TOTAL WEIGHT (LBS)	REMARK
6		TUBE BUNDLE		1813					444-HI-MEP-DWG-17-08
17M		PARTS NAME		MATERIAL	WEIGHT (G)	SCALE	LOCAL DWG NO.	ASSY'S DWG NO.	

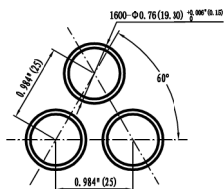
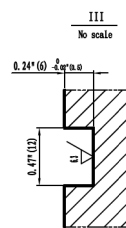
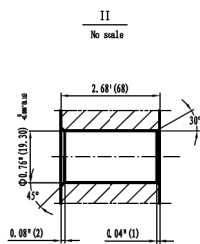
PARTS DRAWING FOR		EQUIP TAG:	B4405/85405
LEAN AMINE TRIM COOLER		PHASE:	DETAILED DESIGN
DWG. NO.		444-01-MEP-DWG-17-08	
TOTAL 14 PAGES		PAGE 11	

Technical Requirements

1. Forging shall be as per ASME II.
2. Plate sealing surface and axes shall be vertical and perpendicularity tolerance shall be 0.4mm.
3. Tube hole shall be strictly vertical with plate sealing surface and perpendicularity tolerance shall be 0.4mm.
4. For no less than 90% plate drill (drill item) .allowance hole width shall be not less than 4.97mm. For no more than 4%, min. allowance hole width shall be 3.08mm.
5. Limit deviation of liner dimension unmark tolerance of mechanical machining surface shall be as per ISO 2768-1:1989 (D)Level m.



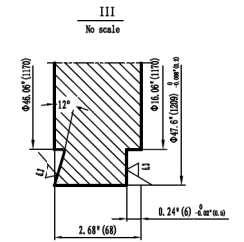
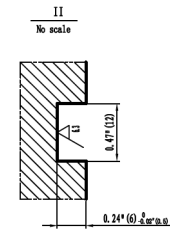
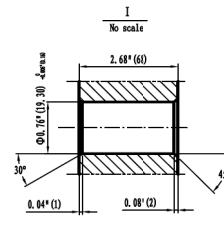
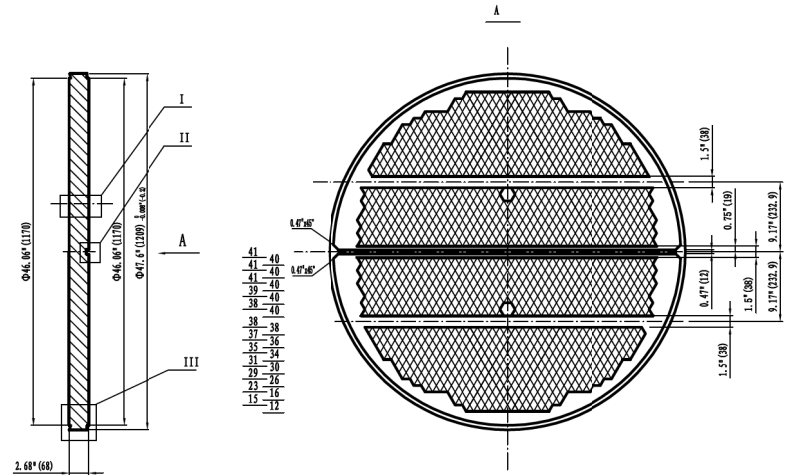
Tube holes details
No scale



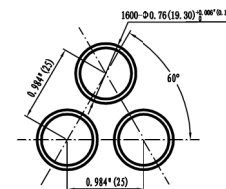
6-1	STATIONARY TUBESHEET	SA266 Gr. 2N	961	1:8	44-01-MEP-DWG-17-01	44-01-MEP-DWG-17-01
ITEM	PARTS NAME	MATERIAL	WEIGHT(Lb)	SCALE	LOCAL DWG NO.	ASSY T DWG NO.

Technical Requirements

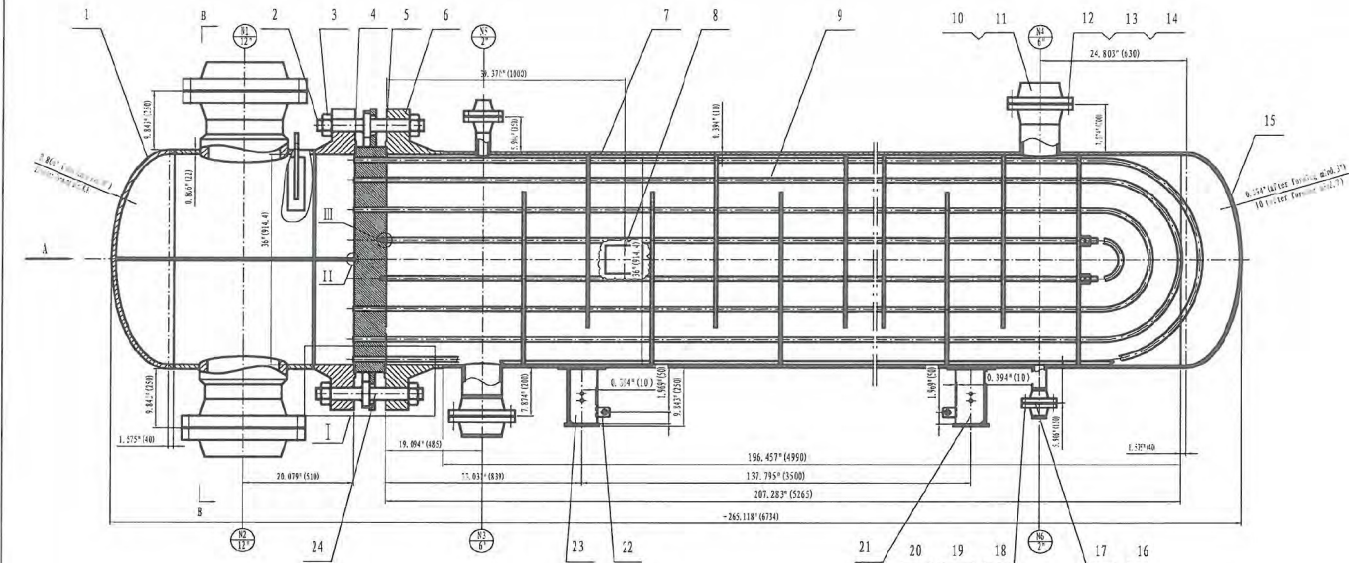
1. Forging shall be as per ASME II.
2. Plate sealing surface and axes shall be vertical and perpendicularity tolerance shall be 0.0157" (0.4).
3. Tube hole shall be strictly vertical with plate sealing surface and perpendicularity tolerance shall be 0.0039" (0.1).
4. For no less than 90% plate drill (drill item) .allowance hole width shall be not less than 0.196" (4.97). For no more than 4%, min. allowance hole width shall be 0.121" (3.08)mm.
5. Limit deviation of liner dimension unmark tolerance of mechanical machining surface shall be as per ISO 2768-1:1989 (D)Level m



Tube holes details
No scale



6-12	FLANTING TUBESHEET	SA266 Gr. 2N	815	1:8	44-01-MEP-DWG-17-01	44-01-MEP-DWG-17-01
ITEM	PARTS NAME	MATERIAL	WEIGHT(Lb)	SCALE	LOCAL DWG NO.	ASSY T DWG NO.
		ENCIPHERING NAME		EQUIP TAG: B4405/B5405		
		PARTS DRAWING FOR		PLANS DETAILED DESIGN		
		DWG. NO		A44-01-MEP-DWG-17-09		
		REV		SCALE		TOTAL 14 PAGES PAGE 13

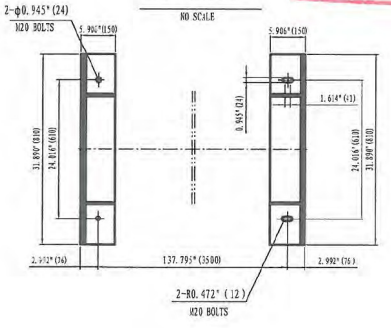


DESIGN DATA	
DESIGN STANDARD	ASME CODE SEC. VIII, DIV. 1, 2010ED+2011ADD.
IDENTIFICATION	YES
NO REGISTER	NO
EXCHANGE TYPE / TEMA CLASS	BEU-HORIZONTAL/R
DESIGN PARAMETER	SHELL THERM / SERVICE
SEVICE	Cooling Water Sales Gas
DENSITY (WAP/LIQU)	lb/ft ³ /
MEDIUM PROPERTY	NOT LETHAL / NOT LETHAL
MAIN BODY MATERIAL	SA516 Gr. 70 / SA179/SA516 Gr. 70
PIPE MATERIAL	SA266 Gr. 2N/SA106 Gr. B / SA266 Gr. 2N
DESIGN TEMPERATURE	° F (° C) 150 (61.1) / 200 (93.3)
OPERATING TEMPERATURE	° F (° C) 83 (31) / 150 (61.1) / 26.7 (8.1) / 71.1 (21.4)
MDMT AT PRESSURE	° F (° C) 32 (0) AT 150 Psig / 32 (0) AT 600 Psig
HYDROSTATIC TEST TEMPERATURE	° F (° C) 70 (21) / 70 (21)
OPERATING PRESSURE	psig (MPa) 500 (34.5) / 500 (34.5)
DESIGN PRESSURE	psig (MPa) 150 (10.3) / 600 (41.4)
MAX ALLOWANCE WORKING PRESSURE	psig (MPa) 150 (10.3) / 600 (41.4)
SAFETY VALVE SETTING PRESSURE	psig (MPa) /
SAFETY VALVE MODEL	/
HYDROSTATIC TEST PRESSURE	psig (MPa) 195 (13.4) / 700 (48.3)
JOINT EFFICIENCY	1 / 1
CORROSION ALLOWANCE	in (mm) 0.118 (3) / 0.118 (3)
DISTANCE NUMBER	1 / 2
POST WELD HEAT TREATMENT	/ / YES
RT.	RT FULL (W-3) / RT FULL (W-5)
MT OR PT.	FULL (C. 3) / APPENDIX 6 or 7
TEXT EXCHANGE AREA	f (2 ha) 2741.46 (254.69)
TUBE SPEC	1.3150 OD x 0.4375 ID x 16.8770 L x 1.500
JOINT STYLE OF TUBE AND TUBESHEET	INTERFERENCE WELD AND EXPANSION
IMPACT TESTING	NO (PER CG-70 (F) AND UCS-66)
TOTAL VOLUME	f (3 m) 126.43 (3.8) / 28.66 (0.8)
SEISMIC ZONE	2A (0.15)
VESSEL WEIGHT	lb (kg) 18307 (8395)
DESIGN SERVICE LIFE	Year 25
INSULATION THICKNESS	in (mm) /

LIST OF NOZZLE							
MARK	SIZE	FLANGE CODE	NO. OF BOLTS	SEALING TYPE	TYPE	DESCRIPTION	REMARK
N1	12"	300F	NV	RF	Sch80	Sales Gas Inlet	
N2	12"	300F	NV	RF	Sch80	Sales Gas Outlet	
N3	6"	150F	NV	RF	Sch80	Cooling Water Inlet	
N4	6"	150F	NV	RF	Sch80	Cooling Water Outlet	
N5	2"	300F	NV	RF	Sch160	VENT	
N6	2"	300F	NV	RF	Sch160	Drain	



SADDLE ARRANGEMENT



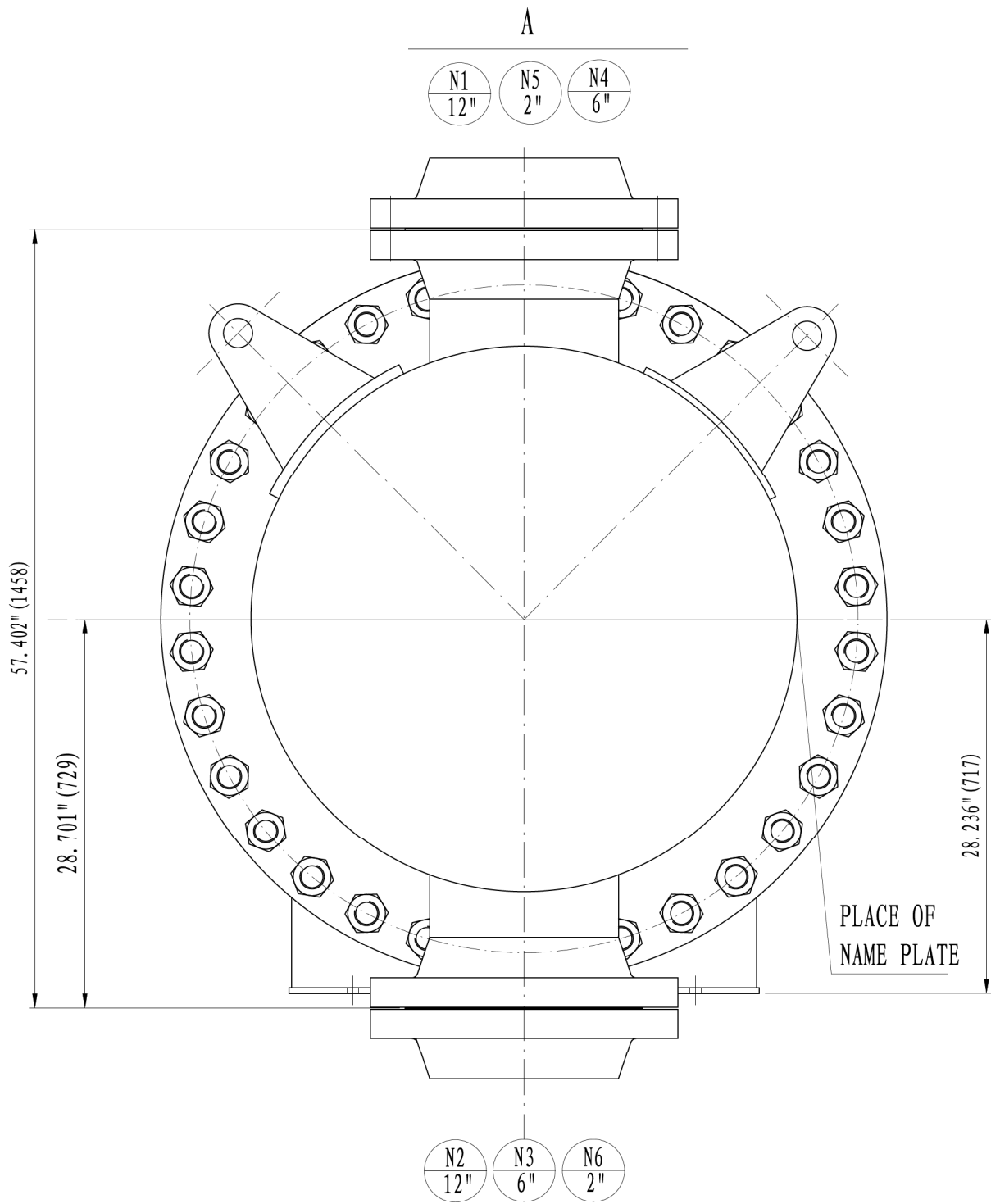
Technical Requirements

- The design, fabrication, inspection, test and acceptance shall comply with ASME Sec. VIII-1 (2010ED 2011ADD) Rules for Construction of Pressure Vessels.
- Welding shall comply with ASME Sec. IX Qualification Standard For Welding And Brazing Procedures, Welders, Brazer, and Welding And Brazing Operators.
- The equipment should meet the requirement of standard (B45-01-MEP-DAS-10-01) and specification (165-4-SPM-057). Tube shall be SA-179 and purchasing shall be as per SA-650 and outer diameter shall be within $2/4 \pm 0.014$ (219.05 \pm 0.1mm) and thickness shall be 0.083 ± 0.0137 (2.1mm \pm 0.4mm). One piece of butt welds shall be allowed for heat exchange tube which shall be full penetrating 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-VI Division I UW-51.
- Category A, B and DN ≥ 10 " C welding joints shall be 100% RT tested as per ASME-VI-1 (W-51). Category C, D welding joints shall be 100% RT or PT tested as per ASME-VI 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 (2.075psi) 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 category A, B, C, D see PARTS DRAWING;
- Header lug shall be only for header lifting.

12	ASME B18. 2. 2-1-2010	STUDS 3/4"-UNC-2A x 4.5"	16	SA-193 Gr. B7	0.6	9.6	(Material Placed)
11	ASME B34. 10M-2004	SHELL PIPE 6" x 0.4375"	2	SA-194 Gr. B	61.37	134.75	(15.144' (0.51))
10	ASME B16. 5/2009E	SHELL FLANGE NPS-150 F SCH80	4	SA-193	44.92	100.0	
9	B45-01-MEP-DWG-10-03	TUBE BRONZE	1	COMPONENT		10.00	
8	B45-01-MEP-DWG-10-02	NAME PLATE	1	COMPONENT		9.09	
7		SHELL BODY (DN 0 x 0.394 ID)	1	SA-516 Gr. 70	2507	2508.87 (638)	
6	B45-01-MEP-DWG-10-03	SHELL COVER (DN 78 CHAMFL. END)	1	SA-266 Gr. 2		1087	
5	B45-01-MEP-DWG-10-03	CASCKET	1	SA2240 304/F.C		7	
4	B45-01-MEP-DWG-10-03	CHAMFL. GASKET	1	SA2240 304/F.C		7	
3	ASME B18. 2. 2-2010	HEAVY HEX NUTS 5/8"-UNC-2B	64	SA-194 Gr. 2H	1.02	147	(Material Placed)
2	ASME B18. 2. 1-2010	STUDS 1 5/8"-UNC-11.5" (415)	30	SA-193 Gr. B7	10.04	301.3	(Material Placed)
1	B45-01-MEP-DWG-10-03	CHAMFL.	1	COMPONENT		3314	

24	B45-01-MEP-DWG-10-03	STUDS 1 5/8"	2	SA-193 Gr. B7	10.04	11.12	
23	B45-01-MEP-DWG-10-06	FILLET SUPPORT SADDLE 3/4" x 1"	1	SA-36/SA-516 Gr. 70	147		
22	B45-01-MEP-DWG-10-05	EARTH PLATE	1	SA-240 304	2.3	4.6	
21	B45-01-MEP-DWG-10-06	SLOPING SUPPORT SADDLE 3/4" x 5"	1	SA-36/SA-516 Gr. 70	147		
20	ASME B16. 20-2007	SHELL CASCKET 2'-300"	1	SA240 304/F.C	/	/	
19	ASME B18. 2. 2-2010	HEAVY HEX NUTS 5/8"-UNC-2B	32	SA-194 Gr. 2H	0.06	2	(Material Placed)
18	ASME B18. 2. 1-2010	STUDS 5/8"-UNC-2A x 4"	16	SA-193 Gr. B7	0.33	5.28	(Material Placed)
17	ASME B36. 10M-2004	SHELL PIPE 2" x 0.344"	1	SA-106 Gr. B	6.25	12.5	(1.3' (0.40') (92))
16	ASME B16. 5/2009E	SHELL FLANGE NPS-200 F SCH80	1	SA-105	17.5		
15	B45-01-MEP-DWG-10-04	SUPPORT RING (DN 0 x 0.394 ID)	1	SA-516 Gr. 70	173		
14	ASME B16. 20-2007	SHELL CASCKET 6'-150"	1	SA240 304/F.C	/	/	
13	ASME B18. 2. 2-2010	HEAVY HEX NUTS 3/4"-UNC-2B	32	SA-194 Gr. 2H	0.22	7.04	(Material Placed)

GENERAL DRAWING FOR SALES GAS COMPRESSOR COOLER			
REV.	B	SCALE	1: 10
ENGINEERING NAME		EAS0445508	
DWG TAG		EAS0445508	
PHASE		DETAILS DESIGN	
DWG. NO.		SA-4-MEP-304-1001.C	
TOTAL PAGES		9	
PAGE		1	

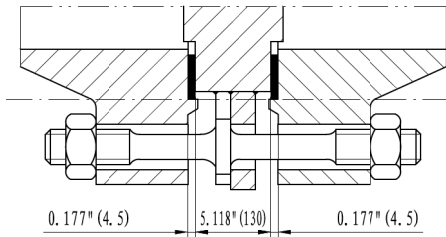


GENERAL DRAWING FOR
SALES GAS COMPRESSOR COOLER

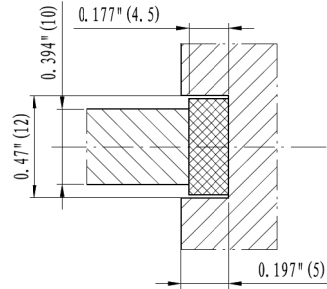
REV.	C	SCALE	1: 10
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ENGINEERING NAME	
EQUIP TAG.	E4504&5504
PHASE	DETAILED DESIGN
DWG. NO	B45-01-MEF-DWG-10-01.02
TOTAL 9 PAGES	PAGE 2

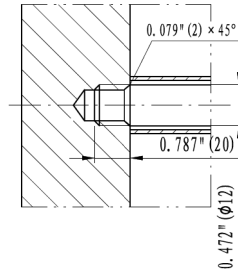
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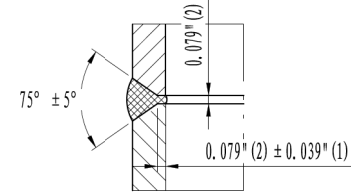
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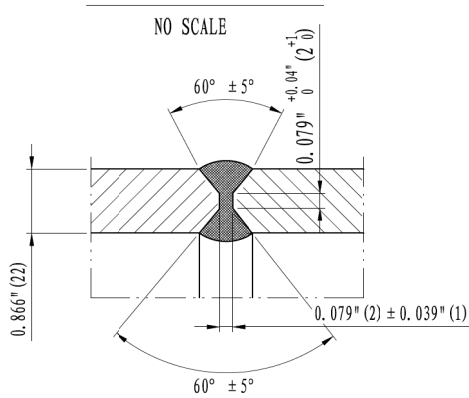
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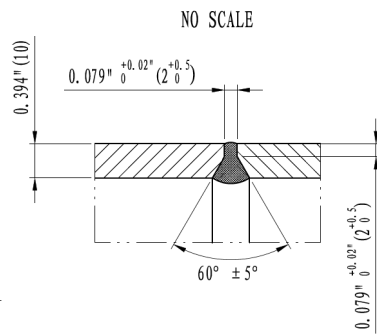
FLANGE AND NOZZLE
WELDED JOINTS
NO SCALE



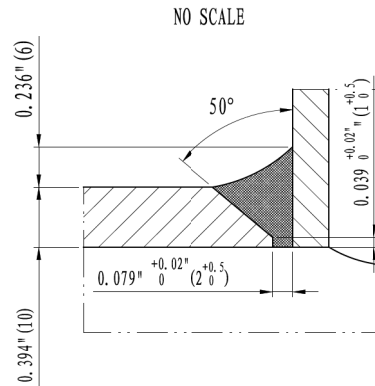
CHANNAL A, B WELDED JOINTS



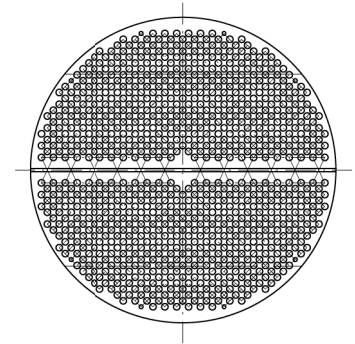
SHELL A, B WELDED JOINTS



N3, N4, N5, N6 NOZZLE
AND SHELL WELDED JOINTS



B-B
NO SCALE

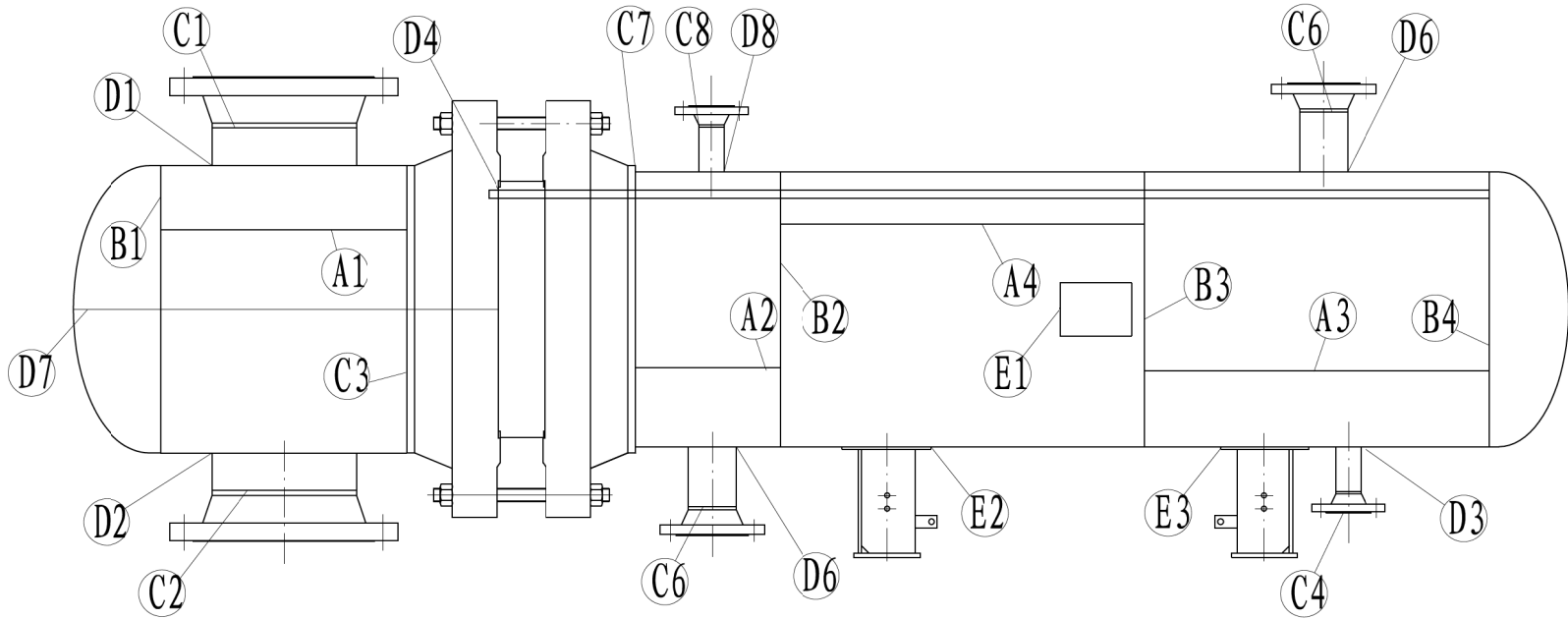


GENERAL DRAWING FOR
SALES GAS COMPRESSOR COOLER

ENGINEERING NAME	
EQUIP TAG.	E4504&5504
PHASE	DETAILED DESIGN
DWG. NO	B45-01-MEP-DWG-10-01.03
TOTAL 9 PAGES	PAGE 3

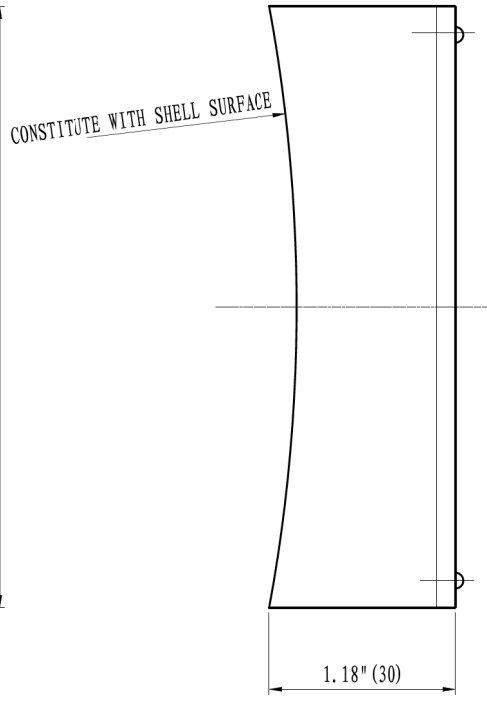
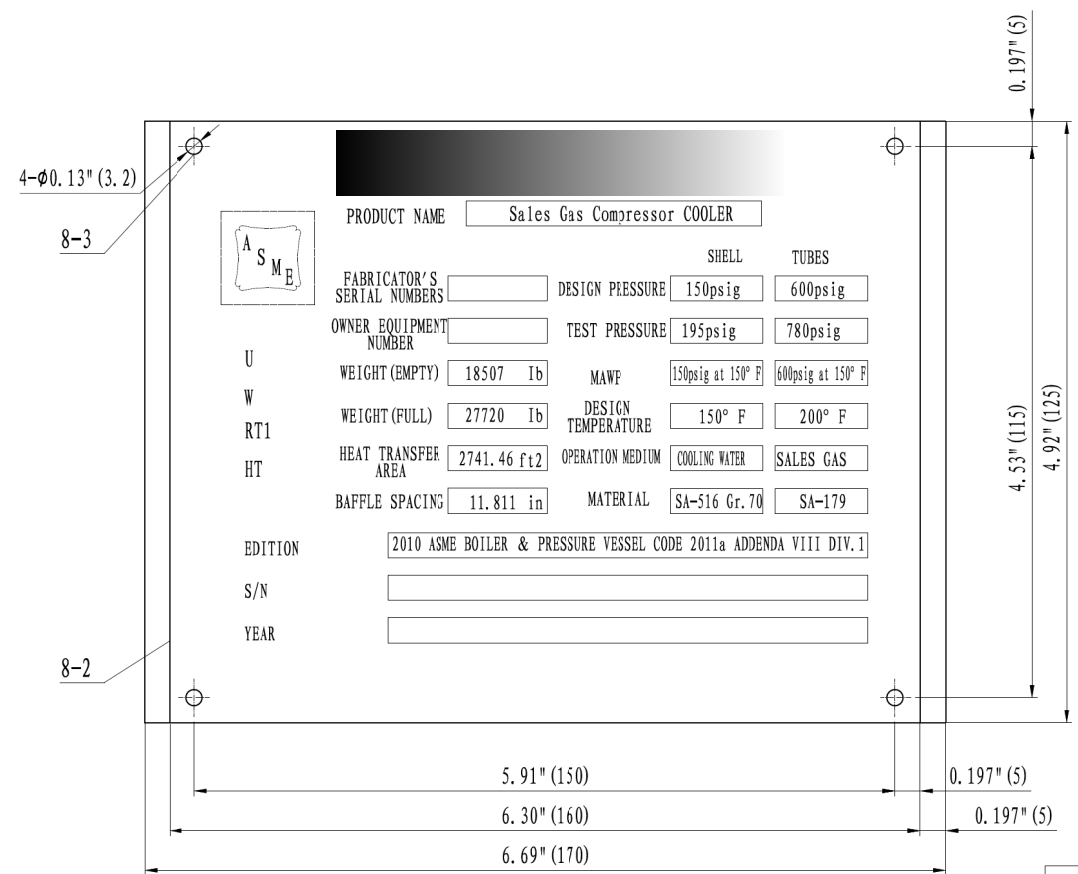
REV. C SCALE 1: 10

WELD MARKING GRAPH

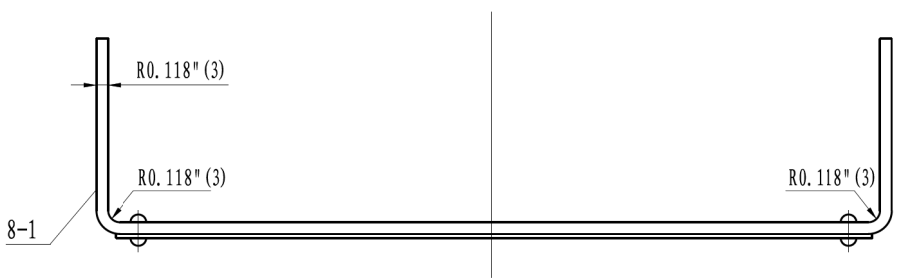


GENERAL DRAWING FOR SALES GAS COMPRESSOR COOLER				ENGINEERING NAME	
				EQUIP TAG.	E4504&5504
				PHASE	DETAILED DESIGN
				DWG. NO	B45-01-MEP-DWG-10-01.04
REV.	A	SCALE	1: 10	TOTAL 9 PAGES	PAGE 4

others: 12.5



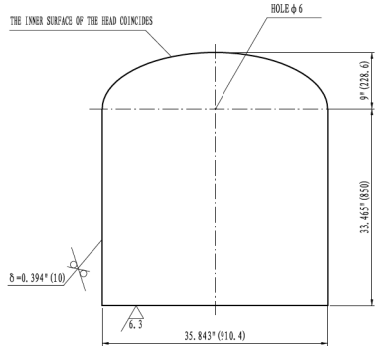
- Technical requirement**
1. All marks in nameplate shall higher than 0.197" (5mm).
 2. Depth of characters in nameplate shall be 0.008" (0.2mm).
 3. The third party stamp shall be stamped with the third inspector.
 4. The owner equipment number filled according to the actual when manufacturing
 5. All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



8-3		RIVET ϕ 0.118" (3) \times 0.315" (8)	4	LY1			
8-2		NAME PLATE δ = 0.079" (2)	1	SA-240 304		0.154	
8-1		RATING PLATE δ = 0.118" (3)	1	SA-283 Gr. C		1.1	
PARTS NO.	DWG NO. OR STD NO.	PARTS NAME	QTY	MAT'L	SINGLE TOTAL		REMARKS
					MASS (lb)		
8		NAME PLATE	2.2	1: 10	B45-01-MEF-DWG-10-02		B45-01-MEF-DWG-10-01.01
PARTS NO.	PARTS NAME	MAT'L	MASS (LB)	SCALE	DWG NO.	ASSY. DWG NO.	

PARTS DRAWING FOR SALES GAS COMPRESSOR COOLER		ENGINEERING NAME					
		EQUIP TAG.	E4504&5504				
		PHASE	DETAILED DESIGN				
REV.	B	SCALE	1: 10	DWG NO.	B45-01-MEF-DWG-10-02	TOTAL 9 PAGES	PAGE 5

OTHERS 12.5/

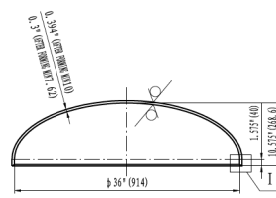


TECHNICAL REQUIREMENTS

1. CHANNEL PLATE SHALL BE SMOOTH, FLATNESS TOLERANCE SHALL BE NO MORE THAN 2MM;
2. BURRS OF CHANNEL PLATE SHALL BE REMOVED;
3. PLATE FACE SHALL BE MACHINED SECONDLY AFTER WELDED AND HEAT TREATED.

1-10	PASS PARTITION	SA-283 Gr. C	125	1:10	IS-4000-10-10	IS-4000-10-10
PARTS NO.	PARTS NAME	MAT'L	MASS (LB)	SCALE	DWG NO.	ASST. DWG NO.

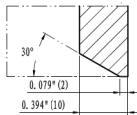
OTHERS 12.5/



I
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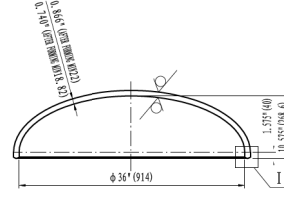
TECHNICAL REQUIREMENTS;

1. MATERIAL OF HEAD SHALL BE AS PER SA-516 GR. 70;
2. FABRICATION OF HEAD SHALL BE AS PER UC-79, UC-81, UCS-79, THE MINIMUM THICKNESS AFTER FORMING SHALL BE NOT LESS THAN 0.3" (7.62);
3. OTHER REQUIREMENTS SEE GENERAL DRAWING.



15	ELLIPTICAL HEAD	SA-516 Gr. 70	173	1:10	IS-4000-10-10	IS-4000-10-10
PARTS NO.	PARTS NAME	MAT'L	MASS (LB)	SCALE	DWG NO.	ASST. DWG NO.

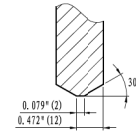
OTHERS 12.5/



I
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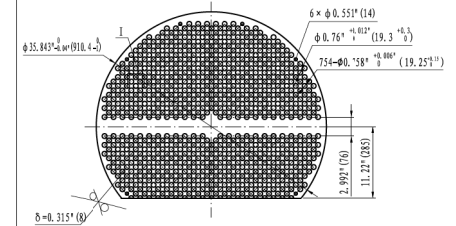
TECHNICAL REQUIREMENTS;

1. MATERIAL OF HEAD SHALL BE AS PER SA-516 GR. 70;
2. FABRICATION OF HEAD SHALL BE AS PER UC-79, UC-81, UCS-79, THE MINIMUM THICKNESS AFTER FORMING SHALL BE NOT LESS THAN 0.74" (18.82);
3. OTHER REQUIREMENTS SEE GENERAL DRAWING.



1-1	ELLIPTICAL HEAD	SA-516 Gr. 70	381	1:10	IS-4000-10-10	IS-4000-10-10
PARTS NO.	PARTS NAME	MAT'L	MASS (LB)	SCALE	DWG NO.	ASST. DWG NO.

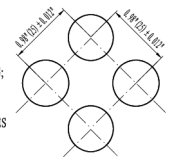
OTHERS 12.5/



I
NO SCALE

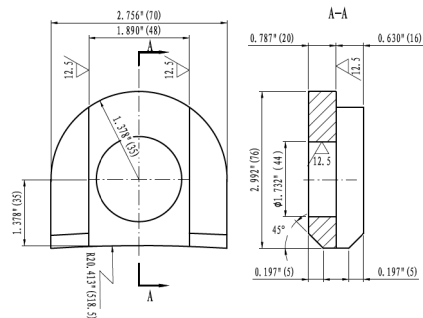
TECHNICAL REQUIREMENTS:

1. BAFFLE PLATE SHALL BE STEADY, FLAT FACE DEVIATION SHALL NOT MORE THAN 3MM.
2. REMOVING BURRS OF PIPE HOLES AFTER DRILLING;
3. DISTANCE LIMIT DEVIATION OF TWO ADJACENT HOLES IS ±0.3MM, 4% OF TWO HOLES ADJACENT LIMIT DEVIATION IS ±0.5MM, ANY TWO PIPE HOLES LIMIT DEVIATION IS ±1MM.



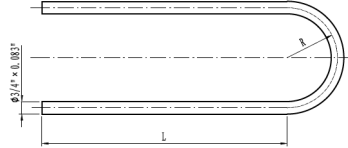
9-9	TRANSVERSE BAFFLE	SA-283 Gr. C	46.64	1:10	IS-4000-10-10	IS-4000-10-10
PARTS NO.	PARTS NAME	MAT'L	MASS (LB)	SCALE	DWG NO.	ASST. DWG NO.

OTHERS 25/



NOTES: UNLABELED PROCESSING DIMENSION SHALL BE AS PER ISO2768-1/1989 DEGREE M REQUIREMENTS.

1-8	LUG	SA-283 Gr. C	1.54	1:10	IS-4000-10-10	IS-4000-10-10
PARTS NO.	PARTS NAME	MAT'L	MASS (LB)	SCALE	DWG NO.	ASST. DWG NO.



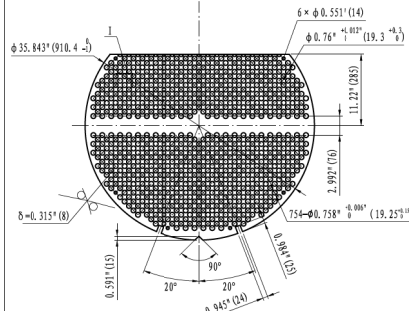
No.	1	2	3	4	5	6	7	8	9	10	11	12
QTY.	12	12	24	25	24	25	24	23	24	23	22	21
MASS (LB)	5000	5025	5050	5050	5050	5050	5050	5050	5050	5050	5050	5050
NET WEIGHT (KG)	41.9	41.9	55.7	73.3	35.9	40.1	108.7	28.4	44.1	161.7	179.3	157.1
NET WEIGHT (KG)	10158	10208	10302	10357	10413	10459	10524	10579	10634	10690	10744	10800
NET WEIGHT (KG)	9.31	9.36	9.44	9.50	9.55	9.60	9.65	9.70	9.76	9.81	9.86	9.91
NET WEIGHT (KG)	13	14	15	16	17	18	19	20	21	22	23	23
QTY.	22	11	18	9	18	17	16	15	12	11	6	
MASS (LB)	5050	5050	5050	5050	5050	5050	5050	5050	5050	5050	5050	5050
NET WEIGHT (KG)	232	5250	1267	8285	5303	2320	8338	5356	2373	9391	6409	2
NET WEIGHT (KG)	10857	10912	10968	11023	11079	11134	11190	11245	11301	11356	11412	
NET WEIGHT (KG)	9.96	11.6	10.2	10.07	10.12	10.17	10.23	10.28	10.33	10.38	10.43	10.49

TECHNICAL REQUIREMENTS

1. TUBES SHALL BE SA-179 COLD FORMING SEAMLESS TUBES. OUTER DIAMETER AND DEVIATION SHALL BE $\phi 3/4 \pm 0.004$ ($\phi 15.05 \pm 0.10$ MM).
2. U-TYPE TUBE SHALL BE COLD BENDED, ROUNDNESS DEVIATION OF BENDED TUBE SHALL NOT GREATER THAN 15% OF HEAT TUBE NOMINAL OUTER DIAMETER;
3. U-TYPE TUBE SHALL NOT BE SPLIT JOINT;
4. OTHERS AS PER THE GENERAL DRAWING.

9-15	U-TUBE GROUP	SA-179	7892	1:10	IS-4000-10-10	IS-4000-10-10
PARTS NO.	PARTS NAME	MAT'L	MASS (LB)	SCALE	DWG NO.	ASST. DWG NO.

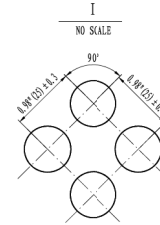
OTHERS 12.5/



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NO SCALE

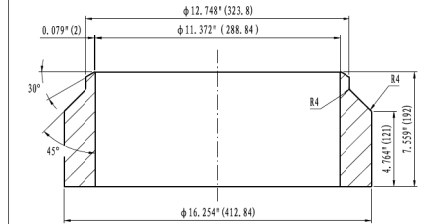
TECHNICAL REQUIREMENTS:

1. BAFFLE PLATE SHALL BE STEADY, FLAT FACE DEVIATION SHALL NOT MORE THAN 3MM.
2. REMOVING BURRS OF PIPE HOLES AFTER DRILLING;
3. DISTANCE LIMIT DEVIATION OF TWO ADJACENT HOLES IS ±0.3MM, 4% OF TWO HOLES ADJACENT LIMIT DEVIATION IS ±0.5MM, ANY TWO PIPE HOLES LIMIT DEVIATION IS ±1MM.



9-6	TRANSVERSE BAFFLE	SA-283 Gr. C	46.64	1:10	IS-4000-10-10	IS-4000-10-10
PARTS NO.	PARTS NAME	MAT'L	MASS (LB)	SCALE	DWG NO.	ASST. DWG NO.

OTHERS 12.5/



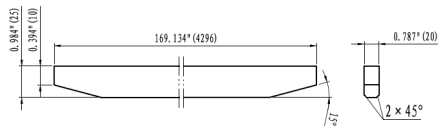
TECHNICAL REQUIREMENTS:

1. SA-105 SHALL COMPLY WITH ASME VIII-II (2010).
2. UNLABELED TOLERANCE OF PROCESS SURFACE DEVIATION SHALL BE AS PER ISO2768-1/1989 DEGREE 4 IS QUALIFIED.

1-3	FORGED PIPE	SA-105	105.6	1:10	IS-4000-10-10	IS-4000-10-10
PARTS NO.	PARTS NAME	MAT'L	MASS (LB)	SCALE	DWG NO.	ASST. DWG NO.

PARTS DRAWING FOR SALES GAS COMPRESSOR COOLER		ENGINEERING NAME	
REV.	A	DATE	E450445504
SCALE	1:10	PHASE	DETAILED DESIGN
TOTAL PAGES		DWG NO.	IS-4000-10-10
PAGE	7		

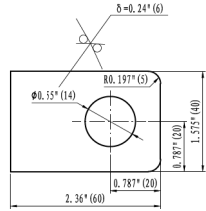
OTHERS 25/



NOTE: SLIDE THE BOTTOM SHOULD BE KEPT SMOOTH.

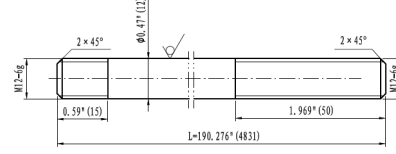
9-5	SKID WAY	SA-283 Gr. C	15.4	1:10	IS-H-HE-W-H-H	IS-H-HE-W-H-H
PARTS NO.	PARTS NAME	MAT'L	MASS (LB)	SCALE	DWG NO.	ASST. DWG NO.

OTHERS 25/



22	EARTH PLATE	SA-240 304	0.24	1:10	IS-H-HE-W-H-H	IS-H-HE-W-H-H
PARTS NO.	PARTS NAME	MAT'L	MASS (LB)	SCALE	DWG NO.	ASST. DWG NO.

OTHERS 12.5/

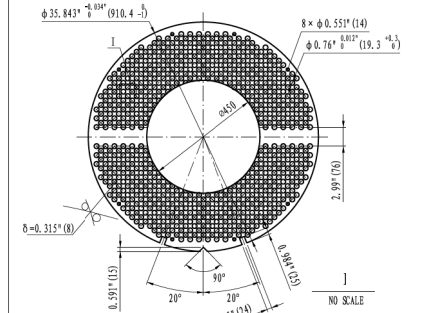


TECHNICAL REQUIREMENTS

1. DIMENSION OF SCREW THREAD SHALL BE AS PER ASME B1.3-2007.
2. BURRS, IRON SCURF ETC. SHALL BE REMOVED AFTER PROCESSING.

9-12	TIE ROD	SA-36	9.33	1:10	IS-H-HE-W-H-H	IS-H-HE-W-H-H
PARTS NO.	PARTS NAME	MAT'L	MASS (LB)	SCALE	DWG NO.	ASST. DWG NO.

OTHERS 12.5/

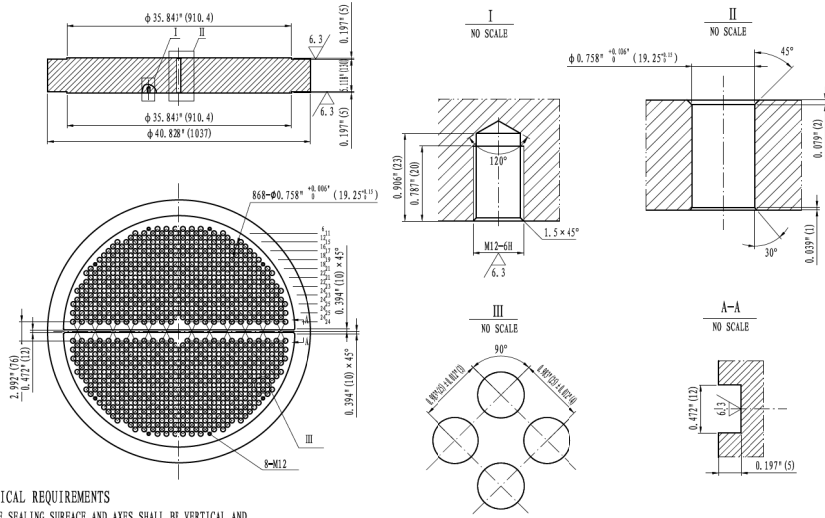


TECHNICAL REQUIREMENTS:

1. SUPPORT PLATE SHALL BE STEADY, FLAT FACE DEVIATION SHALL NOT MORE THAN 3MM.
2. REMOVING BURRS OF PIPE HOLES AFTER DRILLING;
3. DISTANCE LIMIT DEVIATION OF TWO ADJACENT HOLES IS ±0.3MM, 4% OF TWO HOLES ADJACENT LIMIT DEVIATION IS ±0.5MM, ANY TWO PIPE HOLES LIMIT DEVIATION IS ±1MM.

9-15	SUPPORT PLATE	SA-283 Gr. C	56	1:10	IS-H-HE-W-H-H	IS-H-HE-W-H-H
PARTS NO.	PARTS NAME	MAT'L	MASS (LB)	SCALE	DWG NO.	ASST. DWG NO.

OTHERS 12.5/

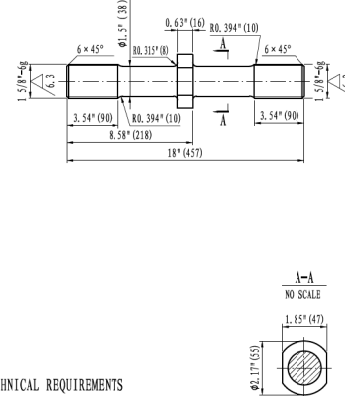


TECHNICAL REQUIREMENTS

1. PLATE SEALING SURFACE AND AXES SHALL BE VERTICAL AND PERPENDICULARITY TOLERANCE SHALL BE 0.25MM;
2. TUBE HOLE AXES SHALL BE STRICTLY VERTICAL TO PLATE SEALING FACE AND PERPENDICULARITY TOLERANCE SHALL BE 1.06MM;
3. AFTER TUBES DRILLED, NO LESS THAN 90% BRIDGE WIDTH SHALL BE MORE THAN 4.76MM, MIN. BRIDGE WIDTH SHALL BE 1.98MM;
4. DIMENSION WITHOUT INDICATIONS OF MACHINING SURFACE SHALL BE AS PER ISO2768-1/1989.
5. OTHER REQUIREMENTS SEE GENERAL DRAWING.

9-1	STATIONARY TUBESHEET	SA-266 Gr. 2	1329	1:10	IS-H-HE-W-H-H	IS-H-HE-W-H-H
PARTS NO.	PARTS NAME	MAT'L	MASS (LB)	SCALE	DWG NO.	ASST. DWG NO.

OTHERS 12.5/

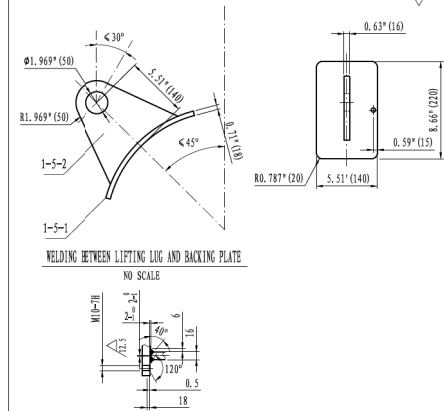


TECHNICAL REQUIREMENTS

1. PROCESSING DIMENSION OF SCREW THREAD SHALL BE AS PER ASME B1.3-2007;
2. SURFACE OF STUDS SHALL CONDUCT CHEMICAL TREATMENT TO PREVENT CORROSION;
3. NDE SHALL BE CONDUCTED AFTER FABRICATION;

24	STUDS	SA-193 Gr. B7	10.56	1:10	IS-H-HE-W-H-H	IS-H-HE-W-H-H
PARTS NO.	PARTS NAME	MAT'L	MASS (LB)	SCALE	DWG NO.	ASST. DWG NO.

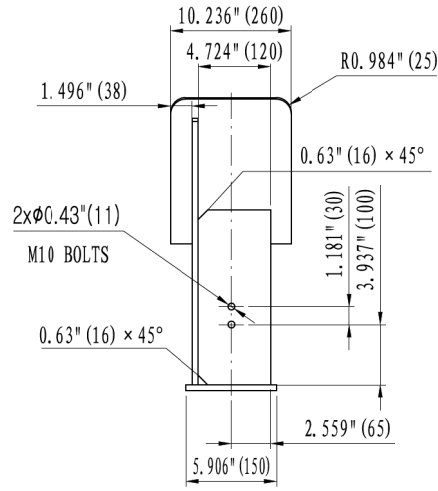
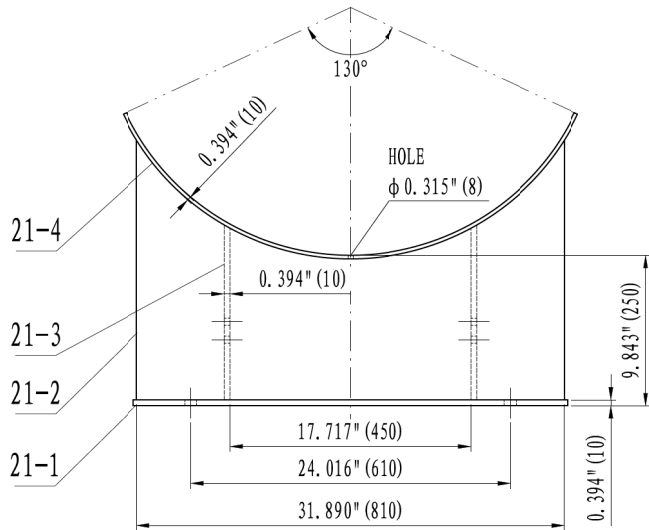
OTHERS 12.5/



WELDING BETWEEN LIFTING LUG AND BACKING PLATE

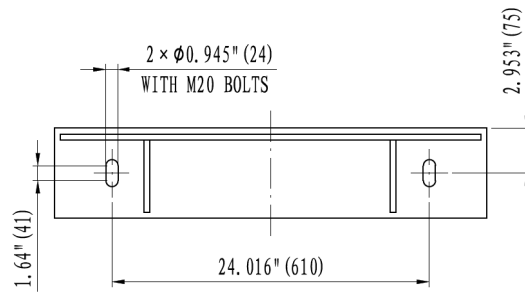
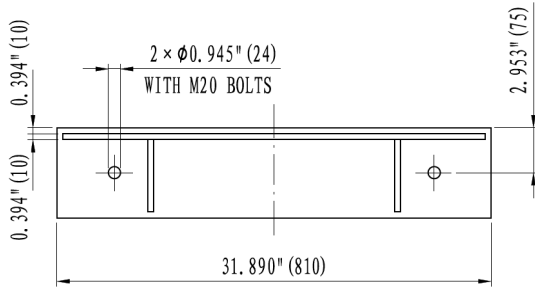
1-8-2	LUG PLATE	1	SA-283 Gr. C	5.94		
1-8-1	WEAR PLATE	1	SA-516 Gr. 70	9.68		
PARTS NO.	DWG NO.	QTY	PARTS NAME	QTY	MAT'L	SINGLE/TOTAL MASS (lb)
1-8	CHANICAL LUG	COMPONENT	15.62	1:10	IS-H-HE-W-H-H	IS-H-HE-W-H-H
PARTS NO.	PARTS NAME	MAT'L	MASS (LB)	SCALE	DWG NO.	ASST. DWG NO.

PARTS DRAWING FOR SALES GAS COMPRESSOR COOLER		ENGINEERING NAME	
PHASE	DETAILED DESIGN	DATE	E450445504
DWG NO.	IS-H-HE-W-H-H		
REV.	A	SCALE	1:10
TOTAL PAGES			
PAGE #			



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S



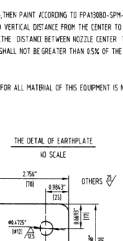
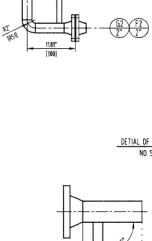
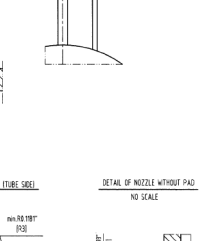
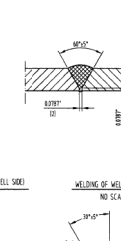
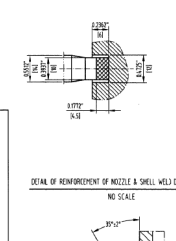
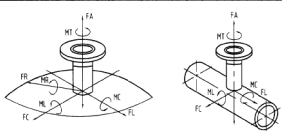
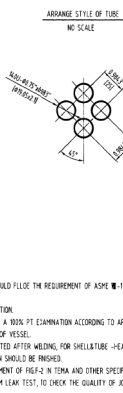
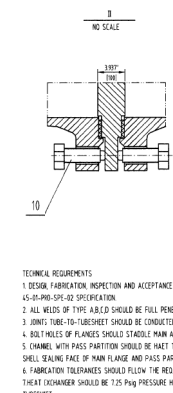
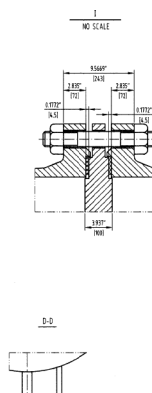
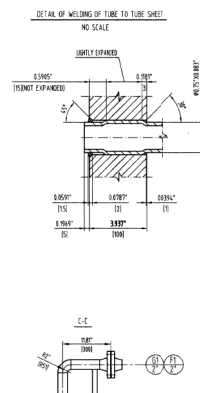
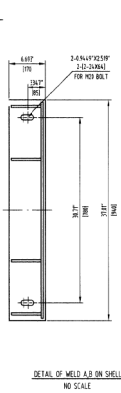
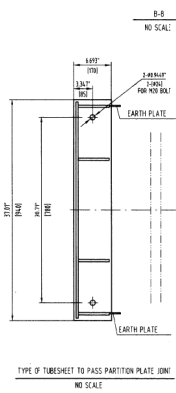
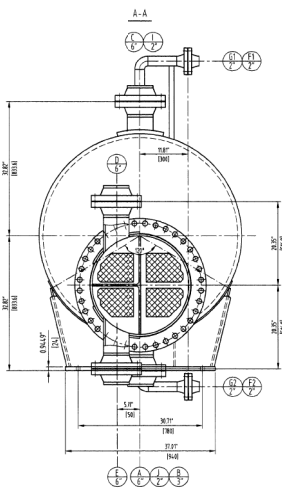
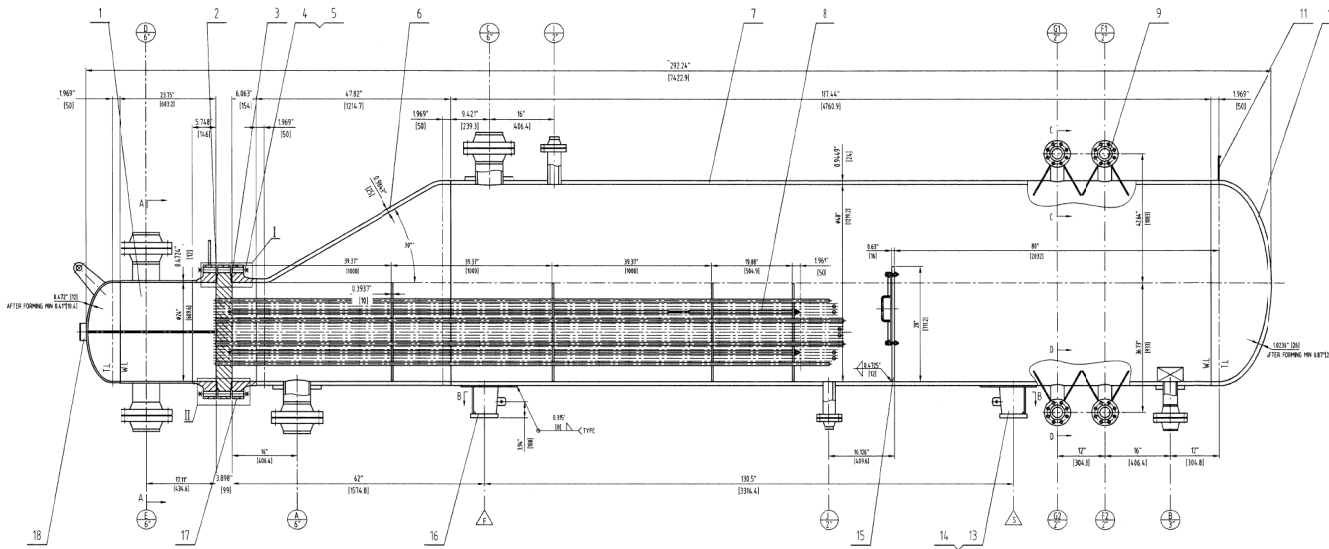
TECHNICAL REQUIREMENTS

1. SADDLE WELDING SHALL BE DOUBLE CONTINUOUS FILLETS, SADDLE AND VESSEL SHELL SHALL BE CONTINUOUS WELDING, WELDING HEIGHT SHALL CHOOSE 0.5-0.7 TIMES OF THE THINNER PLATE.
2. NOT ALLOWING SURFACE CRACK, LACK OF PENETRATION, NON-FUSION, SURFACE PORES, CRATER, SLAG AND SPATTER ETC. ;
3. ALL PARTS OF SADDLE ROUGHNESS IS RA50MM.

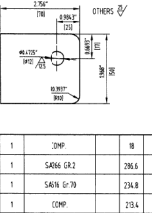
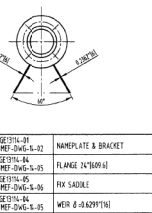
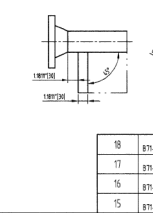
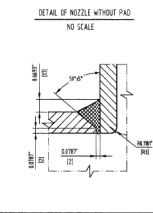
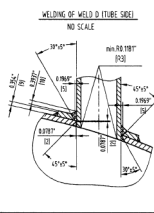
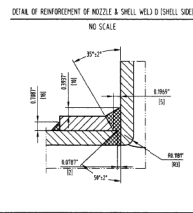
21-4		WEARING PLATE	1	SA-516 Gr. 70		48.71
21-3		RIBS	2	SA-283 Gr. C	6.16	12.32
21-2		WEBS	1	SA-283 Gr. C		64.9

21-1		BACKING PLATE	1	SA-283 Gr. C		20.99	
PARTS NO.	DWG NO. OR STD NO.	PARTS NAME	QTY	MAT'L	SINGLE MASS (Ib)	TOTAL MASS (Ib)	REMARKS
21&23		SADDLE COMPONENT	147	1: 10	B45-01-MEF-DWG-10-06	B45-01-MEF-DWG-10-01.01	
PARTS. NO.	PARTS. NAME	MAT'L	MASS (IB)	SCALE	DWG NO.	ASSY. DWG NO.	
				ENGINEERING NAME			
				EQUIP TAG. E4504&5504			
				PHASE DETAILED DESIGN			
				DWG. NO. B45-01-MEF-DWG-10-06			
REV.	A	SCALE	1: 10	TOTAL 9 PAGES		PAGE 9	

PARTS DRAWING FOR
SALES GAS COMPRESSOR COOLER



ALLOWABLE NOZZLE LOADS FOR PRESSURE VESSEL							
SYMBOL	NPS	FORCE (lbf)			MOMENT (lbf-ft)		
		FA	FL&FC	FR	MT	ML&MC	MR
A,C	6"	2107.58	2107.58	3650.45	4148.79	3319.03	6226.02
D,E	6"	1686.07	1686.07	2920.27	3317.85	2654.28	5012.67
B	3"	1053.9	1053.9	1825.45	1036.74	829.5	1566.14
F12,G12	2"	703	703	1217.6	1412.25	369	696.9



DESIGN SPECIFICATION

CODE		ASME DIV 1 EDITION ADD 2011, TEMA CLASS R NINTH EDITION	
EXCHANGER TYPE	BHS-HORIZONTAL	SHELL SIDE	CONDENSATE
FLUID	HOT OIL	TUBE SIDE	NON-LETHAL FLAMMABLE (L.F.)
FLUID PROPERTY	NON-LETHAL FLAMMABLE (L.F.)	WELDING CODE	ASME IX
WORKING TEMP. (IN / OUT)	324.0/429.0	THICK OF FILLET WELD EXCEPT INDICATED	TAKE THE THICKER OF TWO WELDMENTS
WORKING PRESS.	PSIG 355 / 50	WELDING BETWEEN PIPE FLANGE AND PIPE	PER RELEVANT CODE
DESIGN TEMP.	PSIG 600 / 125	CONNECTION OF TUBESHEET TO SHELL	STITCH WELDED AND FULLY EXPANDED
PMNT	PSIG 36 / 36	WELDED JOINT CATEGORY	EX-METHOD K
MEAN METAL TEMP.	PSIG	A,B SHELL SIDE	FILL UNWELD
MAWP	PSIG 600 / 125	TUBE SIDE	SPOT UNWELD
MAEMP	PSIG	C,D SHELL SIDE	TECHNICAL REQUIREMENTS/STANDARD
CORR. ALLOW.	INCH 0.188" / 0.188"	TUBE SIDE	REQUIREMENTS/STANDARD
JOINT EFF.	SHELL HEAD 1 / 0.85	TUBE TYPE / NO.	100% WELDMENTALLY / 100%
NUMBER OF PASS	1 / 4	FRANK SURFACE(S)	PP1 / 4750
PMWT	NO / YES (CHANNEL)	NET WEIGHT	8700
VESSEL IMPACT TEST	NO (SEE NOTE 9)	WEIGHT	BUNDLE 3470
HYDRO. TEST PRESS.	PSIG 804.0/ 172.872	OPERATION WEIGHT	5400
GAS LEAKAGE TEST PRESS.	PSIG / /	WEIGHT FILLED WITH WATER	3415
INSULATION	INCH 4.9212 / 4.9212	EARTHQUAKE LOAD	USE 1992A
VOLUME	CU FT 221 / 13.829	WIND LOAD	1990 / 46
LIFE OF SERVICE	25 YEARS	REQUIREMENT FOR ANTI-CORROSION	SEE TECHNICAL SPEC

LIST OF NOZZLE

ITEM	N MATERIAL (FLANGE/NOZZLE)	N SIZE	CLASS	CON. STD.	TYPE	FACE	SR OR ID	SERVICE	PROJ. FROM CL TO E.F.
A	SANSUSGAIN GRB	6"	CLASS	ASME B16.5-2009	WN	RF	SOBHD	CONDENSATE INLET	520"
B	SANSUSGAIN GRB	3"	CLASS	ASME B16.5-2009	WN	RF	SOBHD	CONDENSATE OUTLET	824" 32.82"
C	SANSUSGAIN GRB	6"	CLASS	ASME B16.5-2009	WN	RF	SOBHD	BOLUP VAPOR OUTLET	824" 32.82"
D	SANSUSGAIN GRB	6"	CLASS	ASME B16.5-2009	WN	RF	SOBHD	HOT OIL INLET	507" 28.92"
E	SANSUSGAIN GRB	6"	CLASS	ASME B16.5-2009	WN	RF	SOBHD	HOT OIL OUTLET	517" 28.92"
F12	SANSUSGAIN GRB	2"	CLASS	ASME B16.5-2009	WN	RF	SOBHD	LEVEL GAUGE TRANSMITTER	SEE DWG
G12	SANSUSGAIN GRB	2"	CLASS	ASME B16.5-2009	WN	RF	SOBHD	LEVEL SWITCH/SIGNAL CALL	SEE DWG
I	SANS	2"	CLASS	ASME B16.5-2009	LWN	RF	0270949H	VENT	824" 32.82"
J	SANS	2"	CLASS	ASME B16.5-2009	LWN	RF	0270949H	DRAIN	824" 32.82"

14	SEE DRAW	EARTH PLATE 8-R232425	2	S30408	0.5	0.67
13	FIGURE-45 B71-01-MEF-DWG-14-16	SLICING SADDLE	1	SAS16 G-7H	234.8	
12		WELLSPE HEAD (W/RTN/DIRECTION)	1	SAS16 G-7H	786.6	
11	FIGURE-04 B71-01-MEF-DWG-14-17	INSULATION SUPPORT	1	COMP.	45.3	
10	FIGURE-01 B71-01-MEF-DWG-14-15	JACK BOLTS	4	304S.5	/	
9	FIGURE-01 B71-01-MEF-DWG-14-15	NOZZLE SUN	1	COMP.	686.5	
8	FIGURE-03 B71-01-MEF-DWG-14-13	TUBE BUNDLE	1	COMP.	3471.1	
7	FIGURE-04 B71-01-MEF-DWG-14-15	SHELL (D/RTN/D/DR/AL/PL/EN)	1	SAS16 G-7H	7952.1	L=1074.1476H
6	FIGURE-04 B71-01-MEF-DWG-14-15	CONE	1	SAS16 G-7H	1627.4	
5	ASME B16.2	NUTS "S"	72	SAS16-2H	0.16	26.9
4	ASME B16.21	FULL THREADED BOLTS "L" (L=14.378750)	36	SAS16-37	2.24	158.1
3	FIGURE-04 B71-01-MEF-DWG-14-15	RIGHT GASKET	1	304L-GRAPHITE	/	
2	FIGURE-04 B71-01-MEF-DWG-14-15	LEFT GASKET	1	304L-GRAPHITE	/	
1	FIGURE-04 B71-01-MEF-DWG-14-13	CHANNEL	1	COMP.	1336	

PART	DWG(S) AND NO.	DESCRIPTION	QTY	MATERIAL	SINGLE TOTAL WEIGHT (LBS)	REMARK
18	FIGURE-01 B71-01-MEF-DWG-14-12	NAMEPLATE B BRACKET	1	COMP.	18	
17	FIGURE-04 B71-01-MEF-DWG-14-15	FLANGE (L=1069.4)	1	SAS16 CR-2	286.6	
16	FIGURE-05 B71-01-MEF-DWG-14-16	FIX SADDLE	1	SAS16 G-7H	234.8	
15	FIGURE-04 B71-01-MEF-DWG-14-15	WEIR & DRAIN/PTN	1	COMP.	234.4	

Docent name: _____

General Drawing For: Stationer Ablester E-7008-7008

Docent no: B71-01-MEF-DWG-14-21

DR. INCH	SCALE
1" = 1"	1:1

Sheet No. 1 of 2

Rev. B

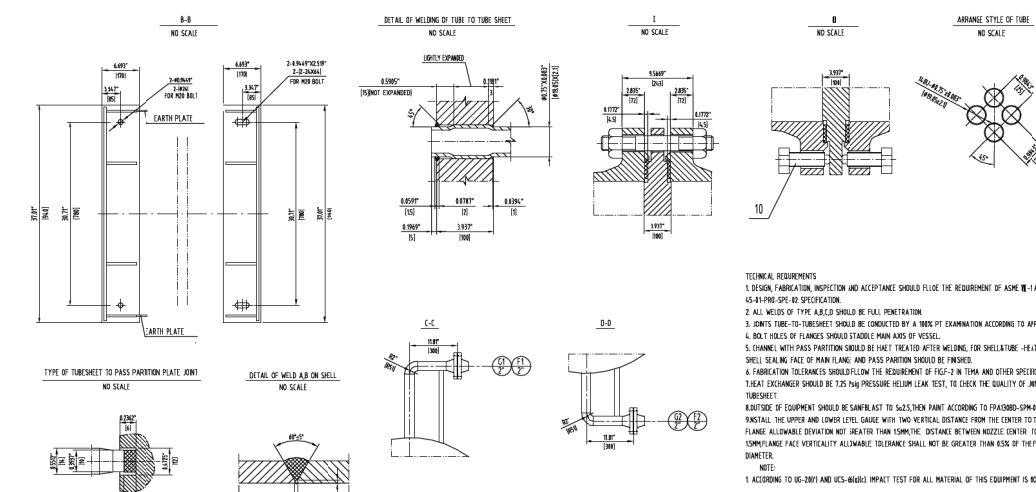
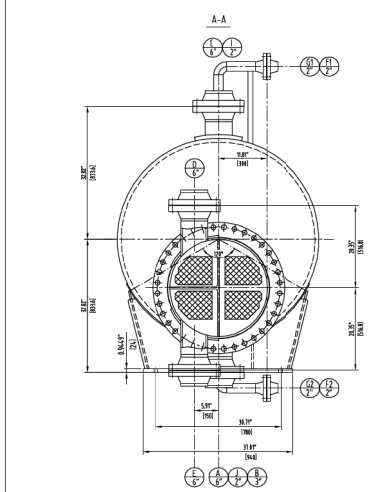
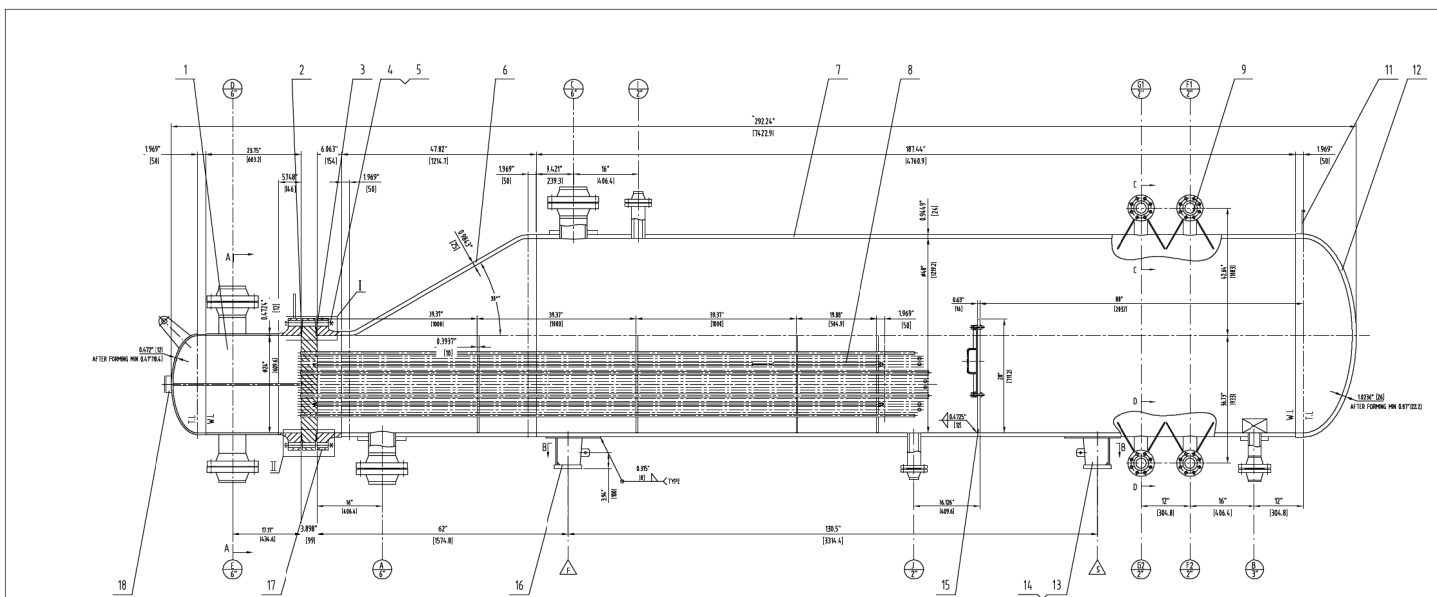
DESIGN SPECIFICATION

CODE	ASME VIII DIV 1 ED 2010 ADD 2011, TEMA CLASS R NINTH EDITION				
EXCHANGER TYPE	EMU-HORIZONTAL	SHELL SIDE	TUBE SIDE	STAMP	ASME EDITION MARK WITH "R" REGISTER
FLUID	CONDENSATE	HOT DL	NR REGISTER		NO
FLUID PROPERTY	NON-LETTAL, NON-FLAMMABLE (UG 1100.1)	NON-LETTAL, NON-FLAMMABLE (UG 1100.1)			NONE
WORKING TEMP. IN / OUT	PT1	206.64/429.58	615.538	THK. OF FILLET WELD EXCEPT INDICATED	THK. THE THINNER BUT TWO WELDED
WORKING PRESS.	PSIG	355	50	WELDING BETW. PIPE FLANGE AND PIPE	FOR RELEVANT CODE
DESIGN TEMP.	PT1	600	600	CONNECTION OF TUBESHEET TO SHELL	
DESIGN PRESS.	PSIG	600	15	CONNECTION OF TUBE TO TUBESHEET	STRENGTH WELDER AND LOCALLY CORNERED
WELD.	PT1	36	38		
MEAN METAL TEMP.	PT1			WELDED JOINT CATEGORY	EXEMPTED % (CLASS)
MANWP	PSIG	600	15	A,B SHELL SIDE	FILL (UNWLD)
MAOWP	PSIG	-	-	C,D TUBE SIDE	SPOT (UNWLD)
CORR. ALLOW.	INCH	0.100"	0.100"	TUBE SIDE	TECHNICAL REQUIREMENT/STANDARD REQUIREMENT 2
JOINT EFF.	DRY/LL/HAZ	1	0.85	TUBE TYPE / NO.	INWLD OR WLD
NUMBER OF PASS		1	-	TRANS. SUPP (ACC'D)	0/1
PAWIT	NO	YES (W/INWLD)		NET WEIGHT	1470
VESSEL IMPACT TEST	NO	SEE NOTE 9		BUNDLE	3470
HYDR. TEST PRESS.	PSIG	864.24	1728.2	OPERATION WEIGHT	3400
GAS LEAKAGE TEST PRESS.	PSIG	/	/	WEIGHT FILLED WITH WATER	3845
INSULATION	INCH	4.923	4.913	EARTHQUAKE LOAD	IBC 992.2A
VOLUME	CU FT	221	13.19	WIND LOAD	IBC 992.2A
LIFE OF SERVICE		25 YEARS		REQUIREMENT FOR ANTI-CORROSION	SEE TECHNICAL SPEC

LIST OF NOZZLE

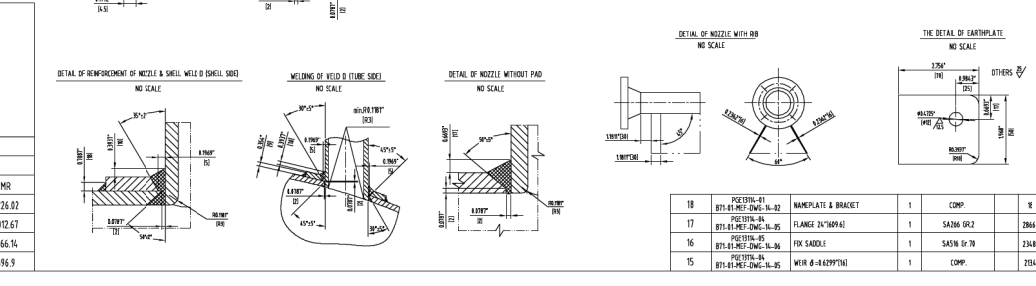
ITEM	N. MATERIAL (FLANGE/NOZZLE)	N. SIZE	CLASS	CON. STD.	TYPE	FLANG. SCH OR D.	SERVICE	PROJ. FROM CL TO F.F.
A	SANSARA GRB	6"	CL400	ASME B16.5-2019	WN	RF	SO/NO	CONDENSATE INLET 529 28.95"
B	SANSARA GRB	3"	CL400	ASME B16.5-2019	WN	RF	SO/NO	CONDENSATE OUTLET 436 35.82"
C	SANSARA GRB	6"	CL400	ASME B16.5-2019	WN	RF	SO/NO	BOILUP VAPOR OUTLET 517 35.82"
D	SANSARA GRB	6"	CL300	ASME B16.5-2019	WN	RF	SO/NO	HOT DL INLET 517 28.95"
E	SANSARA GRB	6"	CL300	ASME B16.5-2019	WN	RF	SO/NO	HOT DL OUTLET 517 28.95"
FV1	SANSARA GRB	2"	CL400	ASME B16.5-2019	WN	RF	SO/NO	LEVEL GAUGE/TRANSMITTER SEE DWS
GV1	SANSARA GRB	2"	CL400	ASME B16.5-2019	WN	RF	SO/NO	LEVEL SWITCH(SIGNAL) SEE DWS
V	SANS	2"	CL400	ASME B16.5-2019	LWN	RF	DD276AR	VENT 516 35.82"
V	SANS	2"	CL400	ASME B16.5-2019	LWN	RF	DD276AR	DRAIN 516 35.82"

NO.	DESCRIPTION	QTY	MATERIAL	REMARK
14	SEE DRAW	2	S30408	0 15 0.47
13	SEWING SADDLE	1	SANS G-70	236.8
12	2-DIMPLE HEAD (NON-DIVISION)	1	SANS G-70	706.4
11	INSULATION SUPPORT	1	COMP.	653
10	JACK BOLTS	4	304SS	/
9	NOZZLE LUM	1	COMP.	486.5
8	TUBE BUNDLE	1	COMP.	3472.1
7	SHELL (LENGTH 2006.64) INCL	1	SANS G-70	1992.1 L=1674.76 IN
6	CONC	1	SANS G-70	625.6
5	ASME B16.22 NUTS T	72	SANS-21	0.19 26.9 CADWOM PLATING
4	ASME B16.21 FULL THREAD BOLTS 1" -13UNF-2B	36	SANS-27	2.24 158.1 CADWOM PLATING
3	RIGHT GASKET	1	PHL-GRAPHITE	/
2	LEFT GASKET	1	COMP.	108
1	CHANNEL	1	COMP.	108



ALLOWABLE NOZZLE LOADS FOR PRESSURE VESSEL

SYMBOL	NPS	FORCE (lbf)						MOMENT (ft-lbf)					
		FA	FL&FC	FR	MT	ML&MC	MR	FA	FL&FC	FR	MT	ML&MC	MR
A/C	6"	2107.58	2107.58	3650.45	4.6	8.79	3319.03	6226.02					
DC	6"	1686.07	1686.07	2920.27	3.87	8.85	2654.28	5012.67					
E	3"	1053.9	1053.9	1825.45	1016.74	829.5	1566.14						
FV/GV	2"	703	703	1217.6	441.25	369	696.9						



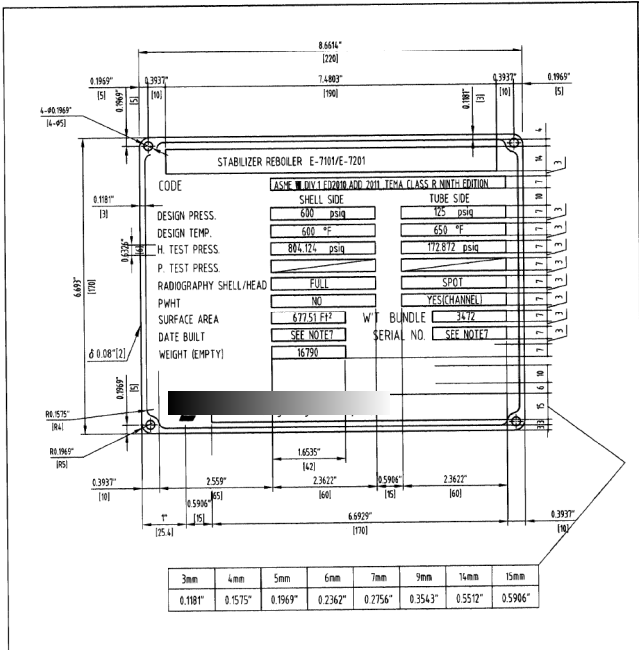
NO.	DESCRIPTION	QTY	MATERIAL	REMARK
18	MANPLATE & BRACKET	1	COMP.	11
17	FLANGE 24" (1609.6)	1	SANS G-70	2866
16	FIX SADDLE	1	SANS G-70	2368
15	WEIR 8" (489.77)	1	COMP.	214

Document name: General Drawing for Shell and Header (1-7004C-1001)

Sheet no. 1 of 1

Revised: 1/15

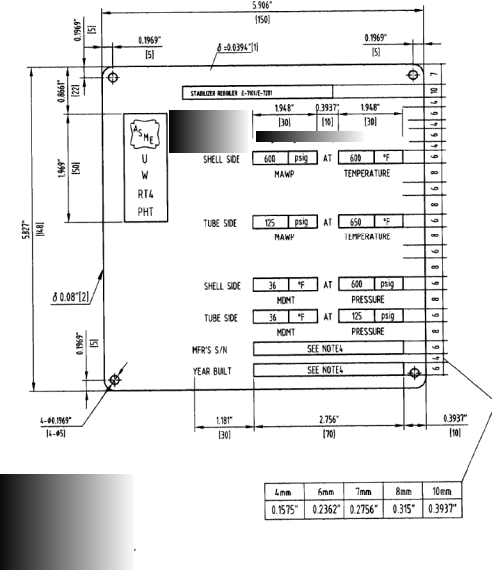
Rev. B



TECHNICAL REQUIREMENT

1. ALL MARKS ON NAMEPLATE SHALL HIGHER THAN 0.197"(5mm).
2. DEPTH OF CHARACTERS ON 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.

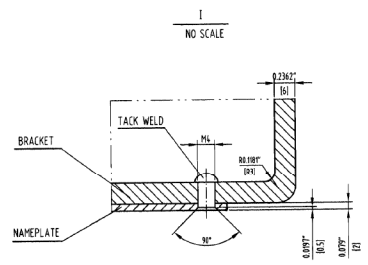
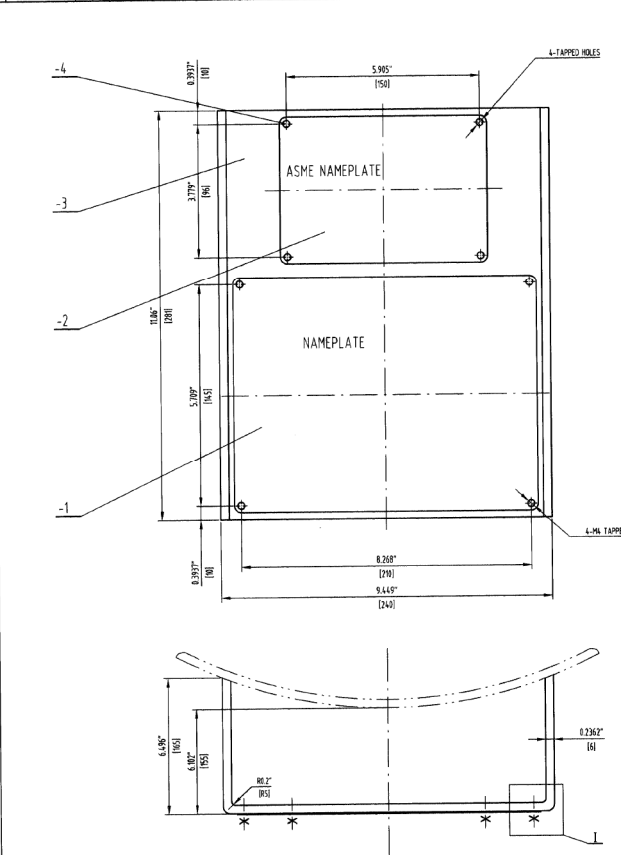
18-1	NAMEPLATE	SA-240 Gr.316L	0.6	/	PGE13114-01	PGE13114-01
PARTS.NO	PARTS.NAME	MAT'L	MASS(lb)	SCALE	DWG.NO	ASSY.DWG.NO



TECHNICAL REQUIREMENT

1. ALL MARKS ON NAMEPLATE SHALL HIGHER THAN 0.197"(5mm).
2. DEPTH OF CHARACTERS ON 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.

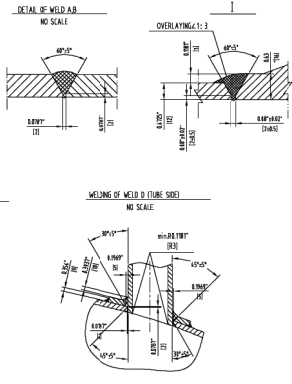
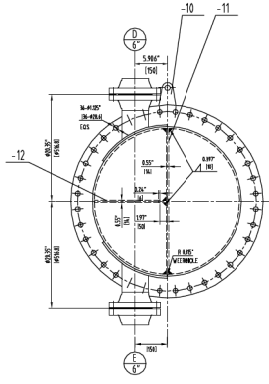
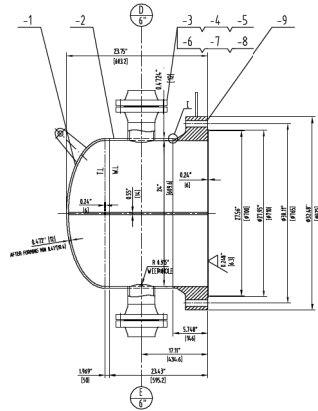
18-2	ASME NAMEPLATE	SA-240 Gr.316L	0.6	/	PGE13114-01	PGE13114-01
PARTS.NO	PARTS.NAME	MAT'L	MASS(lb)	SCALE	DWG.NO	ASSY.DWG.NO



-4		RIVETS	8	304.5 S	/	
-3		SUPPORT	1	SA-516 Gr-70	16.7	
-2	PGE13114-01	ASME NAMEPLATE	1	SA-240 Gr.316L	0.6	
-1	PGE13114-01	NAMEPLATE	1	SA-240 Gr.316L	0.6	
PART	DWG.&STD.NO.	DESCRIPTION	QTY	MATERIAL	SINGLE MASS(lb)	TOTAL MASS(lb) REMARK

18	NAMEPLATE & BRACKET	COMP.	18	/	PGE13114-01	PGE13114-00
PARTS.NO	PARTS.NAME	MAT'L	MASS(lb)	SCALE	DWG.NO	ASSY.DWG.NO

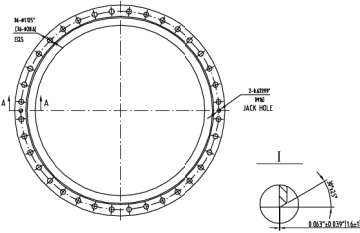
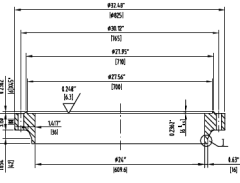
Document name	Equipment Name Plate	Document no.	B71-01-MEF-DWG-14-02
Drawing For Stabilizer Reboiler	E-71018E-7201	dra. mark	wei (kg)
scale		115	
sheet no. 2	of 7	Rev. A	



TECHNICAL REQUIREMENTS
 1. WELDING SHALL BE DONE IN ACCORDANCE WITH THE DRAWING. THE THROAT THICKNESS FOR ALL FILLET WELDS SHALL BE EQUAL TO THE THICKNESS OF THINNER PLATE. NOZZLE SHALL BE ATTACHED TO SHELL WITH FULL PENETRATED WELD AND ROUND THE WELDING OF FLANGE TO NOZZLE SHALL BE DONE ACCORDING TO CORRESPONDING FLANGE STANDARD.
 2. THE SEALING SURFACE OF FLANGE SHALL BE PERPENDICULAR TO THE AXIS OF SHELL. THE TOLERANCE IS 0.005(0.001).
 3. REMOVING THE SEALING SURFACE OF FLANGE AND PASS PARTITION AFTER CHANNEL WELDED.
 4. LIFTING LUG USED AS LIFTING CHANNEL ONLY.
 5. REQUIREMENT OF EXAMINE IS PER ASSEMBLY DRAWING.

PARTS NO.	DWG NO. OR STD NO.	PARTS NAME	QTY.	MAT'L	MASS (lb)	SCALE	DWG. NO.	ASSY. DWG. NO.	REMARKS
-9	PIE019A-02	VESSEL FLANGE	1	SA766 GR2	3737	/			
-8	ASME B 16.20-2007	SPIRAL WOUND GASKET 6"-300#	2	316L-GRAPHITE	/				
-7	ASME B 16.22-2010	NUT 3/4"-10UNC-2B	48	SA193-2H	/				EXAMIN PLATING
-6	ASME B 16.22-2010	STUD BOLT 3/4"-10UNC-2A L=5.31"	24	SA193-B7	/				EXAMIN PLATING
-5	PIE019A-02	REINFORCING PAD 6" (DN150)	2	SA516 Gr 70	10.4	/			
-4		NOZZLES 6"x5.5" (DN150x125)	2	SA193 GR B	225	/			
-3	ASME B16.5-2009	FLANGE 6"-300 W.N.W.R. Scl 80	2-2	SA195	45	/			
-2		SHELL (D24"x14.724"x14.724")	1	SA503 GR 70	95.41	/			L.H.P. (AST 2)
-1		2-WELLSPE HEAD (D24"x14.724"x14.724")	1	SA503 GR 70	95.4	/			

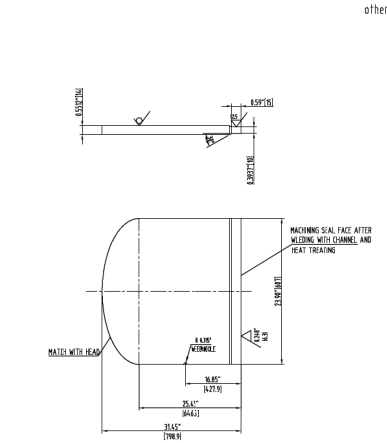
PARTS NO.	DWG NO. OR STD NO.	PARTS NAME	QTY.	MAT'L	MASS (lb)	SCALE	DWG. NO.	ASSY. DWG. NO.	REMARKS
-12	PIE019A-02	PASS PARTITION II	1	SA516 GR 70	59	/			
-11	PIE019A-02	PASS PARTITION I	1	SA516 GR 70	115	/			
-10	PIE019A-02	CHANNEL LIFTING LUG	2	SA516 GR 70	22	/			EACH ONE



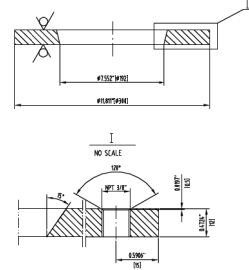
TECHNICAL REQUIREMENTS
 1. FORGES MUST BE MANUFACTURED AND CHECKED ACCORDING TO SA366-2 FORGING ON NOT BE WELDING ZONE.
 2. THE SEALING FACE AND SURFACE OF FLANGE SHALL NOT HAVE CRACKS AND OTHER DEFECTS WHICH MAY REDUCE THE STRENGTH OF FLANGE AND CONNECTION RELIABILITY.
 3. THE ALLOWANCE OF B.L.D AND THE CHORD LENGTH BETWEEN TWO ADJACENT BOLT HOLES IS 48.0(1.5) (0.001). THE CHORD LENGTH ALLOWANCE BETWEEN TWO ARBITRARY BOLT HOLES IS 48.0(1.5) (0.001).
 4. UNLESS OTHERWISE NOTED, ALL THE TOLERANCE OF UNINDICATED DIMENSION SHALL BE ACCORDING TO TEMA.

PARTS NO.	PARTS NAME	MAT'L	MASS (lb)	SCALE	DWG. NO.	ASSY. DWG. NO.
1-9	VESSEL FLANGE	SA766 GR2	3737	/	PIE019A-02	PIE019A-02

PARTS NO.	PARTS NAME	MAT'L	MASS (lb)	SCALE	DWG. NO.	ASSY. DWG. NO.
1	CHANNEL	COMP.	106	/	PIE019A-02	PIE019A-00

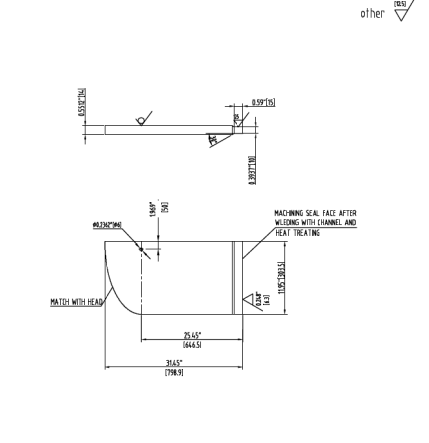


PARTS NO.	PARTS NAME	MAT'L	MASS (lb)	SCALE	DWG. NO.	ASSY. DWG. NO.
1-11	PASS PARTITION I	SA516 GR 70	115	/	PIE019A-02	PIE019A-02



NOTE: EXHAUST HOLE SHOULD SET LOWER SIDE.

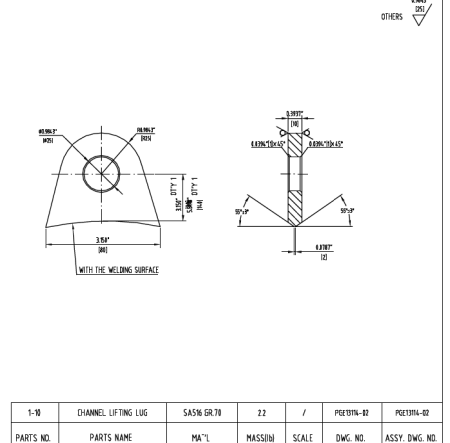
PARTS NO.	PARTS NAME	MAT'L	MASS (lb)	SCALE	DWG. NO.	ASSY. DWG. NO.
1-5	REINFORCING PAD 6" (DN150)	SA516 Gr 70	10.4	/	PIE019A-02	PIE019A-02



PARTS NO.	PARTS NAME	MAT'L	MASS (lb)	SCALE	DWG. NO.	ASSY. DWG. NO.
1-12	PASS PARTITION II	SA516 GR 70	59	/	PIE019A-02	PIE019A-02

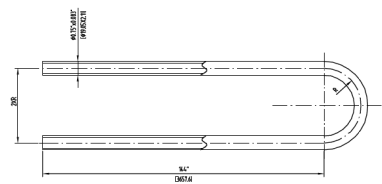
PARTS NO.	PARTS NAME	MAT'L	MASS (lb)	SCALE	DWG. NO.	ASSY. DWG. NO.
-7	RIB LIFTING (DN14.724")	SA516 GR 70	2	/		
-6	ASME B 16.20-2007	SPIRAL WOUND GASKET 2"-300#	4	316L-GRAPHITE	/	
-5	ASME B 16.22-2010	NUTS 5/8"-10UNC-2B	44	SA193-2H	0.66	336L
-4	ASME B 16.22-2010	STUD BOLTS 5/8"-10UNC-2A L=4.31(110)	32	SA193-B7	0.4	12.8
-3		NOZZLES 2" Scl 80	4	SA193 GR B	12	4.8
-2	ASME B16.5-2009	90° SHORT RADIUS ELBOW 2" Scl 80	3	SA193 GR B	3	9
-1	ASME B 16.5-2009	FLANGE 2"-600 W.N.W.R. Scl 80	8	SA-195	10	80
-5	ASME B 16.20-2007	SPIRAL WOUND GASKET 2"-300#	2	316L-GRAPHITE	/	
-4	ASME B 16.22-2010	NUTS 5/8"-10UNC-2B	32	SA193-2H	0.66	132
-3	ASME B 16.22-2010	STUD BOLTS 5/8"-10UNC-2A L=4.31(110)	16	SA193-B7	0.4	6.4
-2	ASME B 16.5-2009	FLANGE 2"-600 W.N.W.R. Scl 80	2	SA-195	10	20
-1	ASME B 16.5-2009	FLANGE 2"-600 W.N.W.R. Scl 80 (ASTM)	2	SA-195	20	40
-7	PIE019A-05	VORTEX BREAKER	1	COMP.	/	7.6
-6	PIE019A-05	REINFORCING PAD 3" (DN80)	1	SA516 Gr 70	/	7.74
-5	ASME B 16.20-2007	SPIRAL WOUND GASKET 3"-300#	1	316L-GRAPHITE	/	
-4	ASME B 16.22-2010	NUTS 3/4"-10UNC-2B	16	SA193-2H	0.12	1.9
-3	ASME B 16.22-2010	STUD BOLT 3/4"-10UNC-2A L=4.31(110)	8	SA193-B7	0.71	5.7
-2		NOZZLES 3"x5.5" (DN80x125)	1	SA-193B	4.9	
-1	ASME B 16.5-2009	FLANGE 3"-600 W.N.W.R. Scl 80	2	SA-195	10	36
-5	ASME B 16.22-2010	NUT 1"-10UNC-2B	48	SA193-2H	0.3	14.4
-4	ASME B 16.22-2010	STUD BOLT 1" (DN25)	24	SA193-B7	1.87	44.3
-3	PIE019A-05	REINFORCING PAD 6" (DN150)	2	SA516 Gr 70	20.68	41.4
-2		NOZZLES 6"x5.5" (DN150x125)	2	SA-193B	12.34	24.68
-1	ASME B 16.5-2009	FLANGE 6"-600 W.N.W.R. Scl 80	2-2	SA-195	73.87	292.28

PARTS NO.	PARTS NAME	MAT'L	MASS (lb)	SCALE	DWG. NO.	ASSY. DWG. NO.
9	NOZZLE SUM	COMP.	48.5	/	PIE019A-02	PIE019A-00



PARTS NO.	PARTS NAME	MAT'L	MASS (lb)	SCALE	DWG. NO.	ASSY. DWG. NO.
1-10	CHANNEL LIFTING LUG	SA516 GR 70	22	/	PIE019A-02	PIE019A-02

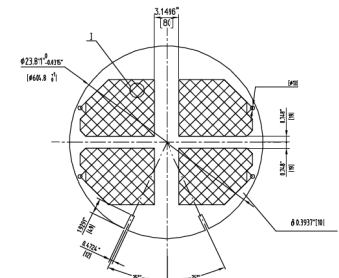
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 Parts Drawing For
 Stabilizer Roboter
 E-70842-7201
 sheet no. 3 of 7
 Decree no. 871-81-MEF-DWG-16-83
 dx. no. x
 vel. 4 kg/s
 scale - 1:5
 Rev. A



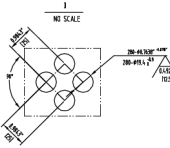
NO.	ITEM NO.	QTY.	UNIT	WEIGHT	VOL.	
16	1.575(14)	295	(174.4)	12	14.5	174
13	2.271(51.7)	295	(174.96.4)	10	14.6	146
12	2.847(75.4)	297	(175.2)	12	14.7	176.4
11	3.643(93.0)	299.5	(174.75)	10	14.8	148
10	4.359(110.7)	301.7	(176.3)	12	14.9	178.8
9	5.055(128.4)	303.9	(177.9)	10	15.0	150
8	5.751(146.1)	306.1	(179.4)	12	15.1	181.2
7	6.447(163.7)	308.3	(181.0)	10	15.2	152
6	7.143(181.4)	310.4	(182.5)	12	15.3	183.6
5	7.839(199.1)	312.6	(184.1)	10	15.4	154
4	8.535(216.8)	314.7	(185.6)	12	15.5	155
3	9.231(234.5)	317	(187.2)	8	15.7	125.6
2	9.927(252.1)	319.2	(188.7)	8	15.8	126.4
1	10.623(269.8)	321.4	(190.3)	4	15.9	63.6
SERIAL NO.	BENDING RADIUS (in)	LENGTH OF RUN (in)	QTY.	EACH WT(lb)	TOTAL WT(lb)	
B-3	U TUBES	SAT79	216.6	/	PCE019-03	PCE019-03

PARTS NO.	PARTS NAME	MAT'L	MASS(lb)	SCALE	DWG. NO.	ASSY. DWG. NO.
B-4	SUPPORT PLATE	S458 GR.70	119.56	/	PCE019-03	PCE019-03

OTHERS ∇

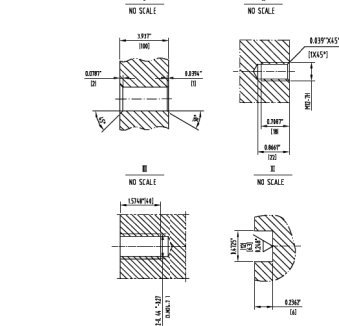
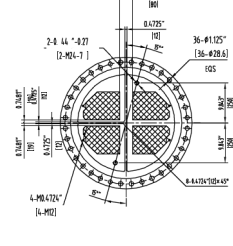
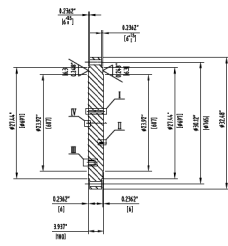


TECHNICAL REQUIREMENTS
 1. THE BAFFLE SHALL BE PLANISHED. THE FLATNESS IS 0.170mm(0.0067).
 2. THE SPACING OF ADJACENT TUBE HOLES CENTER TO CENTER IS 3.1416(125.0)mm(12.500) INCHES. THE POINT TO POINT IS 4.000(157.48)mm(157.48) INCHES. THE HOLE IS 0.875(34.6)mm(0.875) INCHES.
 3. AFTER DRILLING THE HOLE EDGE SHALL BE CHAMFERED OF 0.875(34.6)mm(0.875) INCHES.
 4. THE SHARP ANGLE OF BAFFLE OUTER CIRCLE MUST BE ABATE. SMOOTHED WITH TUBESHEET TOGETHER.



PARTS NO.	PARTS NAME	MAT'L	MASS(lb)	SCALE	DWG. NO.	ASSY. DWG. NO.
B-1	TUBESHEET	S424 GR.2	164	/	PCE019-03	PCE019-03

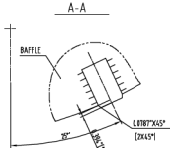
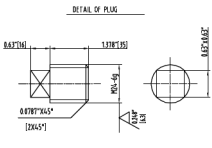
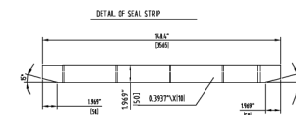
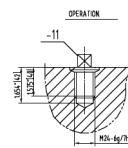
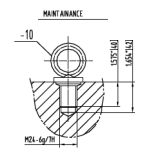
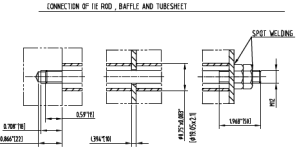
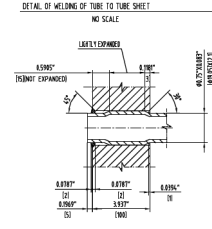
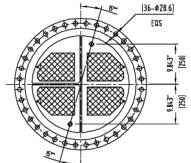
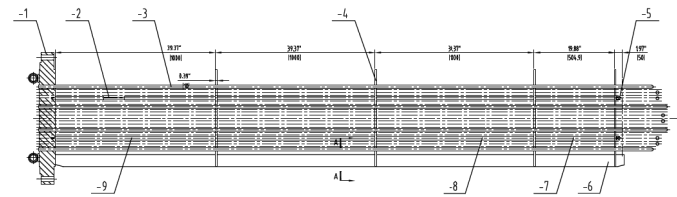
OTHERS ∇



TECHNICAL REQUIREMENTS
 1. THE FORMING SHOULD BE FABRICATED AND INSPECTED ACCORDING TO SA36-2 ZONING CAN NOT BE WELDING JOINT.
 2. SEALING SURFACE OF TUBESHEET MUST BE VERTICAL TO THE AXIS. SQUARENESS TOLERANCE IS 0.10mm(0.0039).
 3. THE TUBESHOULDS MUST BE VERTICAL TO SEALING SURFACE OF TUBESHEET. TOLERANCE IS 0.0025(0.10)mm(0.10) PERMISSON OF THROUGH FORE-AND-AFT STREAK ON HOLE SURFACE.
 4. AFTER DRILLING, THE WIDTH OF HOLE BRIDGE MUST BE 0.0375(1.492)mm(0.0015) INCHES. PERMITTED MINIMUM WIDTH IS 0.09mm(0.0035).
 5. TWO TUBESHOULDS AND BAFFLES SHOULD BE WITHIN THE DRILL.
 6. TO CLEARANCE BETWEEN BOLT OR HOLE CIRCLE DIAMETER AND CHORD LENGTH OF TWO ADJACENT HOLES SHALL BE 0.025(1.0)mm(0.01) INCHES. TO CLEARANCE OF CHORD LENGTH BETWEEN ANY TWO ADJACENT HOLES SHALL BE 0.05(2.0)mm(0.02) INCHES.
 7. THERE IS NO PERMISSON FOR REITS AND FLAWS WHICH CAN REDUCE THE FLANGES INTENSITY OR RELIABLE JOINTS IN THE SEAL SURFACE AND OUTSIDE OF TUBESHEET.

NOTE:
 MAX DEVIATION OF TUBE HOLE MUST CONFORM TO THE +0.002(0.05)mm(0.0008) INCHES. THE REST IS NOT MORE THAN 0.01(0.25)mm(0.001) INCHES.

PARTS NO.	PARTS NAME	MAT'L	MASS(lb)	SCALE	DWG. NO.	ASSY. DWG. NO.
B-1	TUBESHEET	S424 GR.2	164	/	PCE019-03	PCE019-03



TECHNICAL REQUIREMENTS
 1. THIS BUNDLE SHALL BE MANUFACTURED TESTED AND INSPECTED IN ACCORDING WITH TEMA CLASS 2.
 2. TUBE TO TUBESHEET JOINT STRENGTH MUST BE AS LIGHT EXPANDED.
 3. THE OTHER REQUIREMENTS ACCORD TO ASSEMBLY DRAWING.

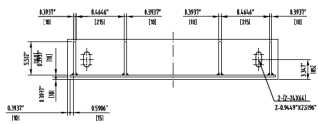
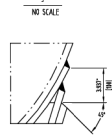
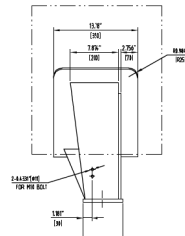
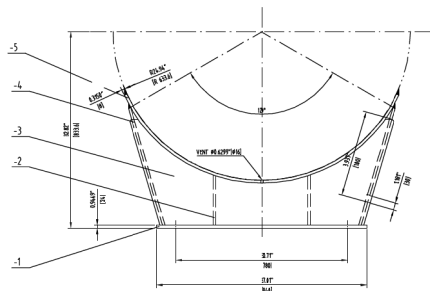
PARTS NO.	DWG NO OR STD NO	PARTS NAME	QTY.	MAT'L	SINGLE MASS (lb)	TOTAL MASS (lb)	REMARKS
-10	SEE DRAWING	PLUG	2	304SS	/	/	
-9	SEE DRAWING	EYE SCREW	2	304SS	/	/	
-8		SPACER 0.75"X0.083"(0.05X2.1)	4	SAT79	1.07	7.5	L-98.37(2006)
-7		SPACER 0.75"X0.083"(0.05X2.1)	4	SAT79	0.6	2.4	L-98.48(249.5)
-6	SEE DRAWING	SLIDE RAIL 0.875"(21.9)	2	S458 GR.70	22.6	45.2	
-5	ASME B16.2.4.1	NUTS 0.475"(12.2)	8	SAT79	1.1	8.8	
-4	PCE019-03	SUPPORT PLATE	4	S458 GR.70	119.56	478.2	
-3	PCE019-03	U TUBES	1 SET	SAT79	216.6	216.6	
-2	PCE019-04	TIE ROD	8	S458	3.56	28.5	
-1	PCE019-03	TUBESHEET	1	S424 GR.2	164	164	

PARTS NO.	TUBE BUNDLE	COMP.	SCALE	/	PCE019-03	PCE019-03
PARTS NO.	PARTS NAME	MAT'L	MASS(lb)	SCALE	DWG. NO.	ASSY. DWG. NO.

Decomposed
 Parts Drawing For
 Stabilizer Rebar
 E-71084-7201
 sheet no. 4 of 7

Decomposed no.	871-01-MET-DWG-16-01
dra. no.	wt. (kg)
scale	1:15

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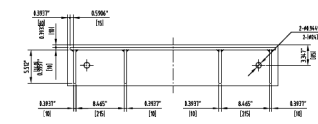
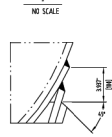
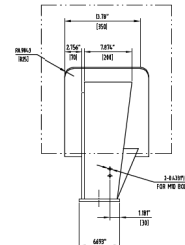
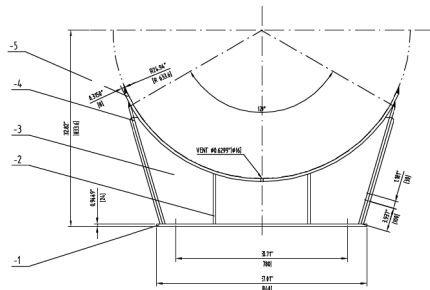


TECHNICAL REQUIREMENTS:
 1 THE WELD IS ARC-WELDING THE STYLE OF WELDING ELECTRODES SEE MFS.
 2 THE WELD FOR SADDLE BODY SHALL BE DOUBLE CONTINUOUS FILLET WELD. THE WELDING BETWEEN THE SADDLE AND THE VESSEL SHELL SHALL BE CONTINUOUS.
 3 THE FILLET WELDING ROOT SHALL BE CHISEN THE 5/16"-7/8" THE THINNER PLATE THICKNESS, AND NO LESS THAN 5 mm.
 4 NO CRACK, SLAG, GAS HOLES AND CRATER DEFECTS ETC. ON THE SURFACE OF THE WELDED SEAM, AND NO REMAINING SLAG AND SPATTER IS ALLOWED.
 5 THE ARC SURFACE OF THE BATTLE PLATE SHALL BE JOINED CLOSE WITH THE SHELL WALL, AND THE HOLE GAP SHALL BE NO MORE THAN 2mm AFTER BEING ASSEMBLED.
 6 THE TWO ENDS OF HB PLATE SHALL BE CHAMFERED INTO 25x45°, WHICH JOINED WITH THE WEB PLATE.
 7 THE SURROUNDING ROUGHNESS FOR ALL WELDED PARTS OF SADDLE, SHALL BE Ra12.5µm.
 8 WHEN SADDLE IS WELDED, EVERY PARTS SHALL BE FLAT, NO CURL IS ALLOWED.

PARTS NO	DWG NO. OR STD. NO.	PARTS NAME	QTY.	MAT'L	SCALE	SINGLE MASS (lb)	TOTAL MASS (lb)	REMARKS
-5		PAD PLATE Ø=Ø.3937(10)	1	SAS56 Gr.70		87	156.47(34.34)	
-4		RIBS Ø=Ø.3937(10)	2	SAS56 Gr.70	155	27		
-3		WEB Ø=Ø.3937(10)	1	SAS56 Gr.70		43.7		
-2		RIBS Ø=Ø.3937(10)	2	SAS56 Gr.70	5.4	10.8		
-1		SOLEPLATE Ø=Ø.9449(24)	1	SAS56 Gr.70		66.3		

PARTS NO.	DWG NO. OR STD. NO.	PARTS NAME	MAT'L	MASS(lb)	SCALE	DWG. NO.	ASSY. DWG. NO.
13		SLIDING SADDLE	SAS56 Gr.70	234.8	/	PEE191H-05	PEE191H-00

OTHERS



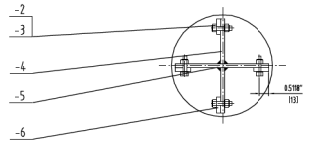
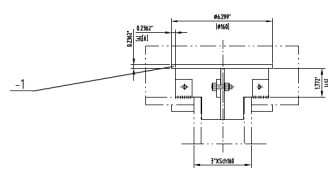
TECHNICAL REQUIREMENTS:
 1 THE WELD IS ARC-WELDING THE STYLE OF WELDING ELECTRODES SEE MFS.
 2 THE WELD FOR SADDLE BODY SHALL BE DOUBLE CONTINUOUS FILLET WELD. THE WELDING BETWEEN THE SADDLE AND THE VESSEL SHELL SHALL BE CONTINUOUS.
 3 THE FILLET WELDING ROOT SHALL BE CHISEN THE 5/16"-7/8" THE THINNER PLATE THICKNESS, AND NO LESS THAN 5 mm.
 4 NO CRACK, SLAG, GAS HOLES AND CRATER DEFECTS ETC. ON THE SURFACE OF THE WELDED SEAM, AND NO REMAINING SLAG AND SPATTER IS ALLOWED.
 5 THE ARC SURFACE OF THE BATTLE PLATE SHALL BE JOINED CLOSE WITH THE SHELL WALL, AND THE HOLE GAP SHALL BE NO MORE THAN 2mm AFTER BEING ASSEMBLED.
 6 THE TWO ENDS OF HB PLATE SHALL BE CHAMFERED INTO 25x45°, WHICH JOINED WITH THE WEB PLATE.
 7 THE SURROUNDING ROUGHNESS FOR ALL WELDED PARTS OF SADDLE, SHALL BE Ra12.5µm.
 8 WHEN SADDLE IS WELDED, EVERY PARTS SHALL BE FLAT, NO CURL IS ALLOWED.

PARTS NO	DWG NO. OR STD. NO.	PARTS NAME	QTY.	MAT'L	SCALE	SINGLE MASS (lb)	TOTAL MASS (lb)	REMARKS
-5		PAD PLATE Ø=Ø.3937(10)	1	SAS56 Gr.70		87	156.47(34.34)	
-4		RIBS Ø=Ø.3937(10)	2	SAS56 Gr.70	155	27		
-3		WEB Ø=Ø.3937(10)	1	SAS56 Gr.70		43.7		
-2		RIBS Ø=Ø.3937(10)	2	SAS56 Gr.70	5.4	10.8		
-1		SOLEPLATE Ø=Ø.9449(24)	1	SAS56 Gr.70		66.3		

PARTS NO.	DWG NO. OR STD. NO.	PARTS NAME	MAT'L	MASS(lb)	SCALE	DWG. NO.	ASSY. DWG. NO.
16		FIXED SADDLE	SAS56 Gr.70	234.8	/	PEE191H-05	PEE191H-00

OTHERS

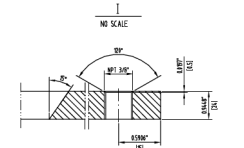
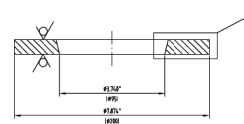
CUT PLATE



PARTS NO	DWG NO. OR STD. NO.	PARTS NAME	QTY.	MAT'L	SCALE	SINGLE MASS (lb)	TOTAL MASS (lb)	REMARKS
-6		PLATE Ø198.37(50) 198.37(50) 2.812(71.52)	4	SAS56 Gr.70	0.07	0.28		
-5		PLATE Ø=Ø.2382(6)	1	SAS56 Gr.70		1.1		
-4		PLATE Ø=Ø.2382(6)	2	SAS56 Gr.70	0.55	1.1		
-3		ASME B18.2.2 NUT M10	4	SA193-2H	/			
-2		ASME B18.2.1 BOLT M10X1.18(28)	4	SA193-B7	/			
-1		PLATE Ø=Ø.2382(6)	1	SAS56 Gr.70		5.09		

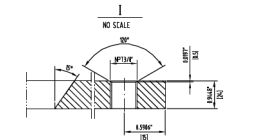
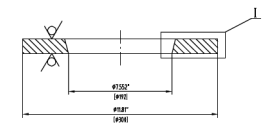
PARTS NO.	DWG NO. OR STD. NO.	PARTS NAME	MAT'L	MASS(lb)	SCALE	DWG. NO.	ASSY. DWG. NO.
B-7		VORTEX BREAKER	COMP.	7.6	/	PEE191H-05	PEE191H-11

OTHERS



NOTE: EXHAUST HOLE SHOULD SET LOWER SIDE.

PARTS NO.	DWG NO. OR STD. NO.	PARTS NAME	MAT'L	MASS(lb)	SCALE	DWG. NO.	ASSY. DWG. NO.
B-6		REINFORCING PAD 3" (DN80)	SAS56 Gr.70	7.74	/	PEE191H-05	PEE191H-11



NOTE: EXHAUST HOLE SHOULD SET LOWER SIDE.

PARTS NO.	DWG NO. OR STD. NO.	PARTS NAME	MAT'L	MASS(lb)	SCALE	DWG. NO.	ASSY. DWG. NO.
A,C-3		REINFORCING PAD 6" (DN150)	SAS56 Gr.70	20.08	/	PEE191H-05	PEE191H-01

Docucent name
 Parts Drawing For
 Stabilizer Roller
 E-71084-7201

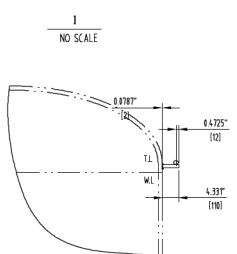
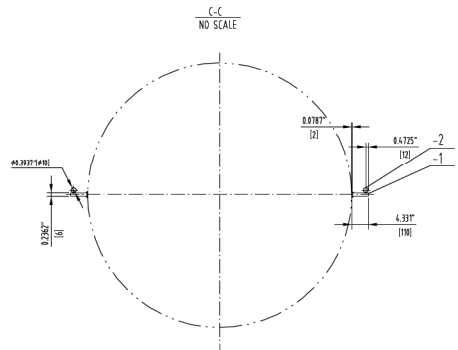
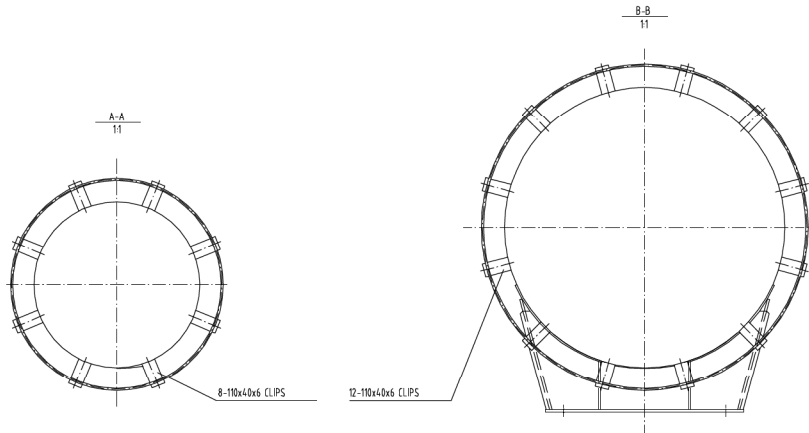
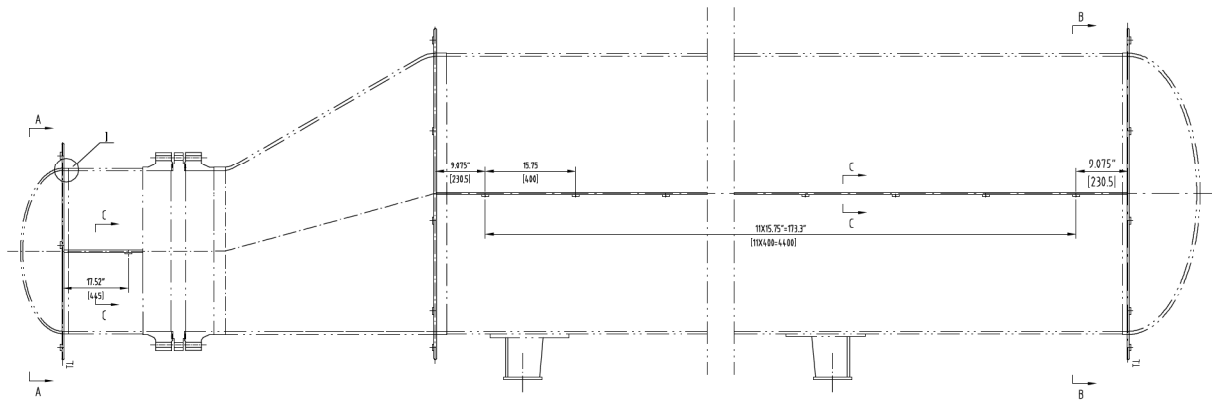
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 B71-01-MEF-DWG-16-06

dra. mark
 vel.4 kpt

scale
 1:5

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sheet no. 6 of 7



NOTE: THE INSULATION SUPPORT RING CAN AUTOMATIC DISCONNECTED WHEN INTERFERED WITH NOZZLE AND NAMEPLATE ETC.

-2		BAR #0.33937*(#10)	60.17F1 18.34m	SA 36		25	
-1		CLIPS 110X40X6	46	SAS16 Gr:70	0.44	20.24	
PART	DWG.&STD NO	DESCRIPTION	QTY	MATERIAL	SINGLE MASS(lb)	TOTAL	REMARK
11	INSULATION SUPPORT	COMP.	45.3	/	PGE13114-06	PGE13114-00	
PARTS NO	PARTS NAME	MAT'L	MASS(lb)	SCALE	DWG NO	ASSY DWG NO	

Document name
Part's Drawing For
Stabilizer Reboiler
E-7101&E-7201

Document no. B71-01-MEF-DWG-14-07

dra. mark	wei (kg)	scale
	-	1:15

sheet no. 7 of 7

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