HALDOR TOPSØE A/S

NATIONAL PETROCHEMICAL COMPANY
FANAVARAN PETROCHEMICAL COMPANY
CO PRODUCTION PLANT

NO. 4236156 | SHEET 7 OF 7 | REV. 1

COIL NO. E 1004-1

DUTY 0.83 Gcal/hr

PROCESS MEDIUM 1 NATURAL GAS

OP.CASE CASE 1: DESIGN CASE

DESIGN CODE *API RP530/**ASME B31.3
FLOW SHEET NO. 0235702
CALC.NO. 826753

FLOW DATA		FLUE GAS	PROCESS
MOL.WEIGHT		25.10	16.07
INLET TEMP.	° C	306	31.2
OUTLET TEMP.	° C	279	160
PRESSURE OP./DESIGN	bar g	-	29.0/33.0
FLOW RATE	Nm^3/hr	90513	15534
PRESSURE DROP ALLOWABLE/CALC.	bar	/0.0007	/0.162
FLOW PATTERN		CROSS FLOW/ COUNTER-CURRENT	
OVERALL 'U'	$kcal/m^2 hr\ °C$		

GEOMETRICAL DATA		
NO.OF TUBES /ROW		24
NO. OF INLETS		4
NO. OF ROWS		2
EFF.LENGTH OF TUBES	mm	3820
TUBE PITCH TYPE ST x SL	mm	STAGGERED 152x131.6
HEAT TRANSFER AREA (BARE TUBE BASIS)	m^2	51.21
TUBE SURFACE RATIO WITH FINS/WITHOUT FINS		6.20
INNER CHANNEL B x L	mm	3730x3820

MECHANICAL DESIGN

TUBES — BARE SURFACE (SEAMLESS) *

ROW NO.	MATERIAL	O.D. x tnom.	DESIGN TEMP°C	MAX. TEMP.	MIN. THK.*
1-2	ASTM A106 Gr.B	88.9x5.49	300	238	

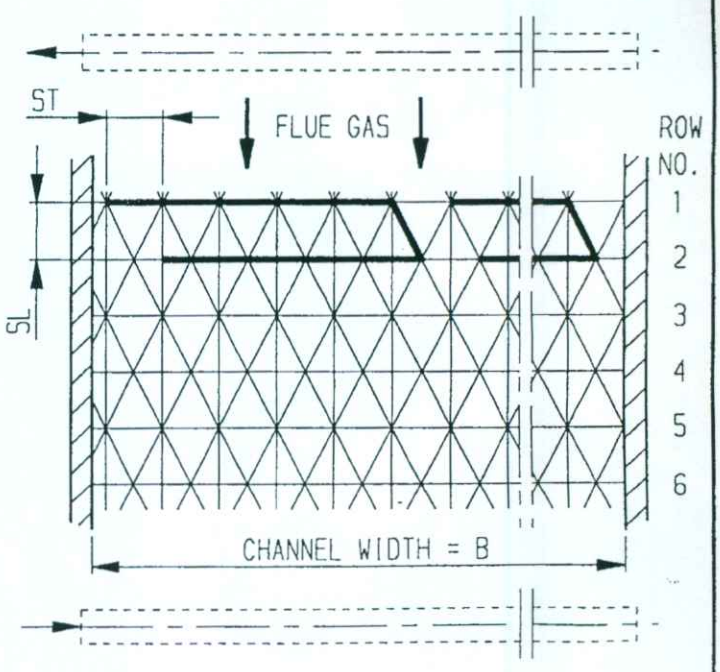
EXTENDED SURFACE

NO./m	HEIGHT mm	THK. mm	TYPE	MAT.
177	12.7	1.25	SOLID HELICAL FULLY WELDED	CS

MANIFOLDS **

INLET	ASTM A106 Gr.B	168.3x7.11	150
OUTLET	ASTM A106 Gr.B	219.1x8.18	300
CROSS-OVER			

NOTE: BASED ON 25% BYPASS OF E 1004-1 1



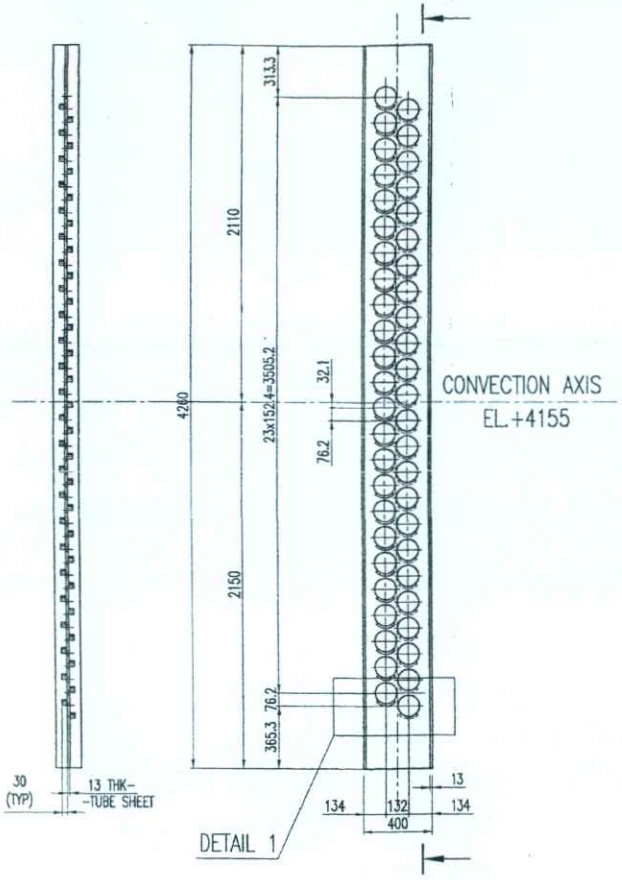
INTERMEDIATE TUBE SHEET

QUANTITY : ONE
MATERIAL : ASTM A283 Gr.C
SPACING :

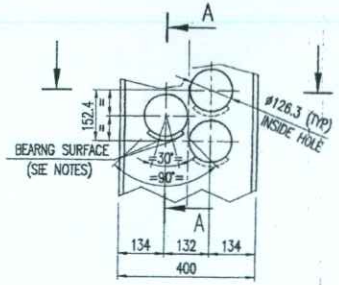
RETURN BENDS

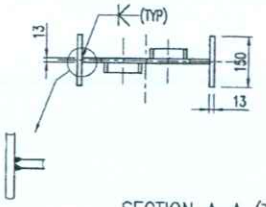
TYPE : SEAMLESS
LOCATION : NON EXPOSED

ELEVATION
(VIEW FROM 180°)

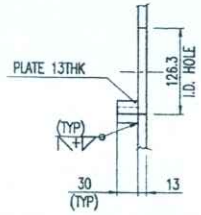


DETAIL 1
SCALE 1/10





SECTION A-A (TYP)
SCALE 1/5



NOTES:

MATERIAL: ASTM A283 Gr.C
- ALL INDICATED THICKNESS ARE MINIMUM.
- ROUGH GRIND ALL HOLES AND BEARING SURFACES AND BEVEL ALL SHARP EDGES.

MASTER

CERTIFIED FINAL

2

APPROVED FOR CONSTRUCTION

MASTER

Snamprogetti Ltd		
APPROVAL STATUS	DATE	SIGNED
A. Proceed & Submit Certified Final Transparency		
B. Proceed Change as Noted and Re-Submit		
C. Do not Proceed Change as noted & Re-submit		
I0. For Information Only No Review Required		
SOF. Supplier Certified Final	27/11/03	
PROJET/PO NUMBER 10772	ITEM/EQUIP No 02-X-1004	
DOCUMENT NUMBER 10-PY-C-74755	REV 2	
AUTHORISATION TO PROCEED DOES NOT RELIEVE SUPPLIER OF RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT/ PURCHASE ORDER		

NATIONAL PETROCHEMICAL COMPANY
FANAVARAN PETROCHEMICAL COMPANY
CO PRODUCTION PLANT - BANDAR IMAM - IRAN

	Owner Job No.	REV	DATE	SIGNATURE
Snamprogetti	Owner Doc./Dwg. No. 10-3-PY-755	1	3/12/03	
	Contractor Job No. 233040	2	27/12/03	
SAZEH CONSULTANTS	Contractor Doc./Dwg. No. 10-PY-C-74755			
	Sh. 1 of 1			

REV	DATE	DESCRIPTION	PREP.	CHK'D	APPR'D	APPR'D
3						
4						
3						
2	05.05.02	MODIF. STICK	K.D.	G.M.	J.C.N.	
1	28.08.02	MODIF. STICK	I.O.	G.M.	J.C.N.	
0	28.06.02	ISSUE	Z.D.	G.M.	J.C.N.	

Kvaerner Heurtey

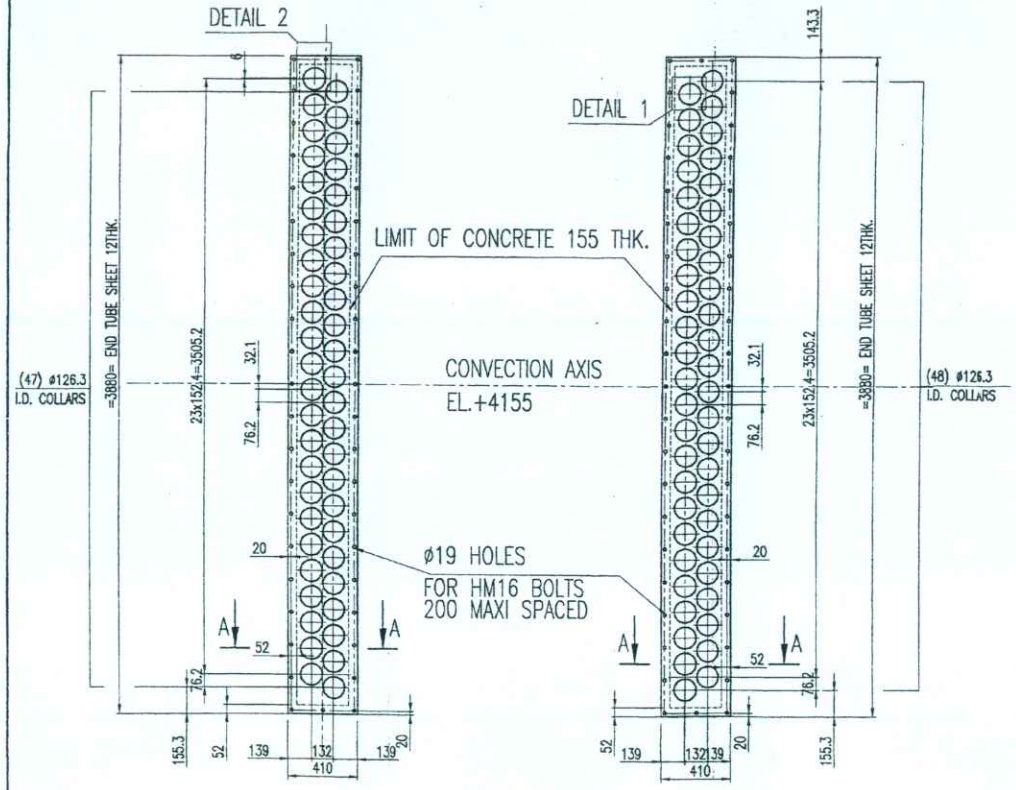
FOLDER/FILE : 1001-FD-327-R*
ECHELLE/SCALE : 1/20
ROW/NAME : Z.D.

SNAMPROGETTI BANDAR IMAM IRAN
TUBULAR REFORMER 02-H-1001
INTERMEDIATE TUBE SHEET FOR E-1004-1

A2 | ER02009 | 1001-FD-327 | 2 REV

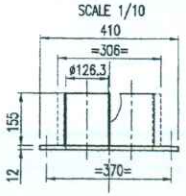
0512

ELEVATION
END TUBE SHEET – VIEW FROM 180°

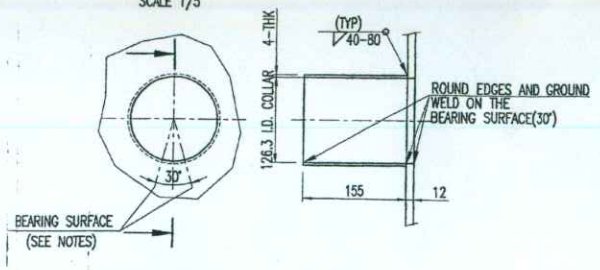


ELEVATION
END TUBE SHEET – VIEW FROM 0°

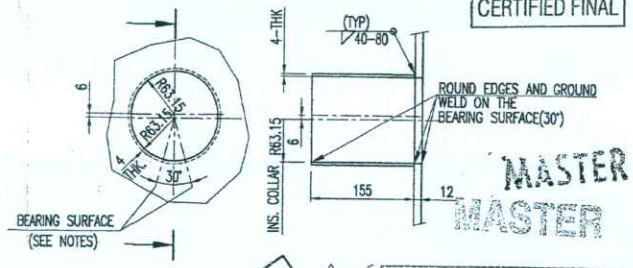
SECTION A–A
SCALE 1/10



DETAIL 1 (TYPx95)
SCALE 1/5



DETAIL 2 (TYPx1)
SCALE 1/5



CERTIFIED FINAL

MASTER
MASTER

APPROVED FOR CONSTRUCTION 2

GENERAL NOTES

MATERIAL: C.S.

- FOR CONVECTION STEEL STRUCTURE SEE DWG 1001-FD-329
- WELD SYMBOLS SEE DG.0030-2
  BUTT WELDS FULL PENETRATION

ANGLE WELDS $a = \frac{\text{MINI THK.}}{2} + 1$

a=4mm(MINI) UNLESS OTHERWISE NOTED

- ALL INDICATED THICKNESS ARE MINIMUM.
- ROUGH GRIND ALL HOLES AND BEARING SURFACES AND BEVEL ALL SHARP EDGES.
- MATERIAL FOR COLLARS: 18/8 TP304-4THK.

Snamprogetti Ltd

	APPROVAL STATUS	DATE	SIGNED
A.	Proceed & Submit Certified Final Transparency		
B.	Proceed Change as Noted and Re-Submit		
C.	Do not Proceed Change as noted & Re-submit		
10.	For Information Only No Review Required		
SCF.	Supplier Certified Final	27/11/03	

PROJET/PO NUMBER 10772 | ITEM/EQUIP No 02-X-1004
DOCUMENT NUMBER 10-PY-C-74756 | REV 2

AUTHORISATION TO PROCEED DOES NOT RELIEVE SUPPLIER OF RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT/ PURCHASE ORDER

NATIONAL PETROCHEMICAL COMPANY
FANAVARAN PETROCHEMICAL COMPANY
CO PRODUCTION PLANT - BANDAR IMAM - IRAN

			REV	DATE	SIGNATURE
Snamprogetti	Owner Job No.	050078001			
	Owner Doc./Dwg. No.	10-2-FN-764	1	3/10/02	
	Contractor Job No.	J33040	2.	27/11/03	
SAZEH CONSULTANTS	Contractor Doc./Dwg. No.	10-PY-C-74756			
	Sh. 1 of 1				

REV.	DATE	DESCRIPTION	PAR/BY	VERIF./ CHK'D	APPR./ APPR'D	APPR./ APPR'D
5						
4						
3						
2	05.09.02	MODIF. STICK	K.D.	G.M.	J.C.N.	
1	28.08.02	MODIF. STICK	I.O.	G.M.	J.C.N.	
0	04.07.02	ISSUE	Z.D.	G.M.	J.C.N.	

Kvaerner Heurtey

FICHIER/FILE : 1001-FD-328-R*
ECHELLE/SCALE : 1/20
NOM/NAME : Z.D.

SNAMPROGETTI BANDAR IMAM IRAN

TUBULAR REFORMER 02-H-1001
END TUBE SHEETS FOR E-1004-1

A2 | ER02009 | 1001-FD-328 | 2 REV.

0.13

DESIGN DATA		
CODE : API RP 530-1996 EDITION		
BEVELS : ANSI B16-25	DESIGN TEMP : 300°C	OFFICIAL TEST PRESSURE : 5.94 MPa
CORROSION ALLOWANCE : 3 mm	DESIGN PRESSURE: 33 bar g(3.3 MPa)	FABRICATOR TEST PRESSURE : 5.94 MPa
HEAT TREATMENT : NO	-	SITE TEST PRESSURE : 5.94 MPa
X RAY : 100% (*)	-	NATURE OF TEST :HYDRAULIC
COIL CAPACITY	PER PASS : 265 LITERS COMPLETE COIL (WITH MANIFOLDS) : 1290 LITERS	

COIL E-1004-1 (NATURAL GAS)

(*)-100% RADIOGRAPHY REQUIRED FOR ALL COIL BUTT WELDS

DESIGN DATA		
CODE : ASME B31.3-1999 EDITION		
BEVELS : ANSI B16-9	DESIGN TEMP : 150°C	OFFICIAL TEST PRESSURE : 5.94 MPa
CORROSION ALLOWANCE : 1.5mm	DESIGN PRESSURE: 33 bar g(3.3 MPa)	FABRICATOR TEST PRESSURE : 5.94 MPa
HEAT TREATMENT : NO	-	SITE TEST PRESSURE : 5.94 MPa
X RAY : 100% (*)	-	NATURE OF TEST :HYDRAULIC

INLET MANIFOLD E-1004-1 (NATURAL GAS)

(*)-100% RADIOGRAPHY REQUIRED FOR ALL COIL BUTT WELDS

DESIGN DATA		
CODE : ASME B31.3-1999 EDITION		
BEVELS : ANSI B16-9	DESIGN TEMP : 300°C	OFFICIAL TEST PRESSURE : 5.94 MPa
CORROSION ALLOWANCE : 1.5mm	DESIGN PRESSURE: 33 bar g(3.3 MPa)	FABRICATOR TEST PRESSURE : 5.94 MPa
HEAT TREATMENT : NO	-	SITE TEST PRESSURE : 5.94 MPa
X RAY :100% (*)	-	NATURE OF TEST :HYDRAULIC

OUTLET MANIFOLD E-1004-1 (NATURAL GAS)

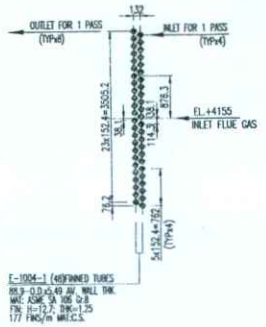
(*)-100% RADIOGRAPHY REQUIRED FOR ALL COIL BUTT WELDS

NOTES
COIL FABRICATED FOLLOWING KVF REQUISITION : 0000-MT401
KVAERNER HEURTEY FINANCE SUPPLY ITEM : 111.1 TO 128.4 AND 1.
COIL FABRICATOR SUPPLY ITEM : 2 ; 3 AND ALL ITEMS NOT LISTED IN ☞1 OF MATERIALS

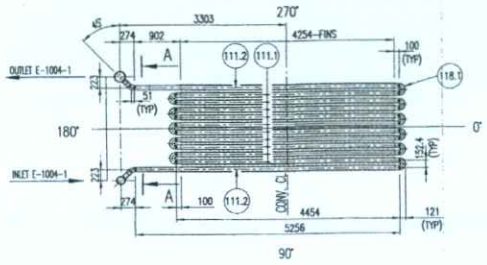
BILL OF MATERIAL
(FOR 1 HEATER)

ITEM	DESIGNATION	LENGTH	QUANTITY CONV.	LOWER	RAD.	MATERIAL	OBSERVATIONS
111.1	FINNED TUBES O.D. 88.9 AV. WALL THK. 5.49	4454	40	-	-	ASTM A106M Grade B	INTER. CONVECTION
111.2	FINNED TUBES O.D. 88.9 AV. WALL THK. 5.49	5256	8	-	-	ASTM A106M Grade B	INLET/OUTLET CONVECTION
111.4	TUBE O.D. 88.9 AV. WALL THK. 5.49	2000	1	-	-	ASTM A106M Grade B	INLET MANIFOLD E-1004-1 -CONNECTIONS
115.1	TUBE O.D. 219.1 AV. WALL THK. 8.18	6000	1	-	-	ASTM A106M Grade B	OUTLET MANIFOLD E-1004-1
116.1	TUBE O.D. 168.3 AV. WALL THK. 7.11	6000	1	-	-	ASTM A106M Grade B	INLET MANIFOLD E-1004-1
118.1	RETURN BEND 180° SR O.D. 88.9 AV. WALL THK. 5.49	-	44	-	-	ASTM A234M Grade WPB	INTER. CONNECTION
118.2	ELBOW 45° LR O.D. 88.9 AV. WALL THK. 5.49	-	8	-	-	ASTM A234M Grade WPB	INLET & OUTLET MANIFOLD E-1004-1
128.2	WROUGHT WELDING CAPS O.D. 219.1 AV. WALL THK. 8.18	-	1	-	-	ASTM A234M Grade WPB	OUTLET MANIFOLD E-1004-1
128.4	WROUGHT WELDING CAPS O.D. 168.3 AV. WALL THK. 7.11	-	1	-	-	ASTM A234M Grade WPB	INTER. MANIFOLD E-1004-1
1	PLATE 8THK.	-	-	-	-	ASTM A515 Gr. 60	REINFORCEMENT PLATE
2	PLATE 8THK.	-	-	-	-	C.S.	GUSSETS
3	PLATE 20THK.	-	-	-	-	C.S.	BASE PLATE SUPPORTS

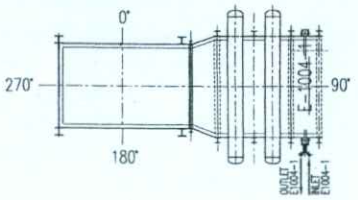
ELEVATION
VIEW FROM 180°



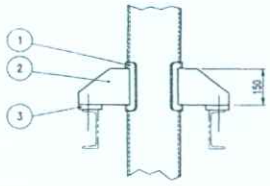
1 PASS DEVELOPPED-4 PASSES REQUIRED
VIEW FROM ABOVE



KEY PLAN

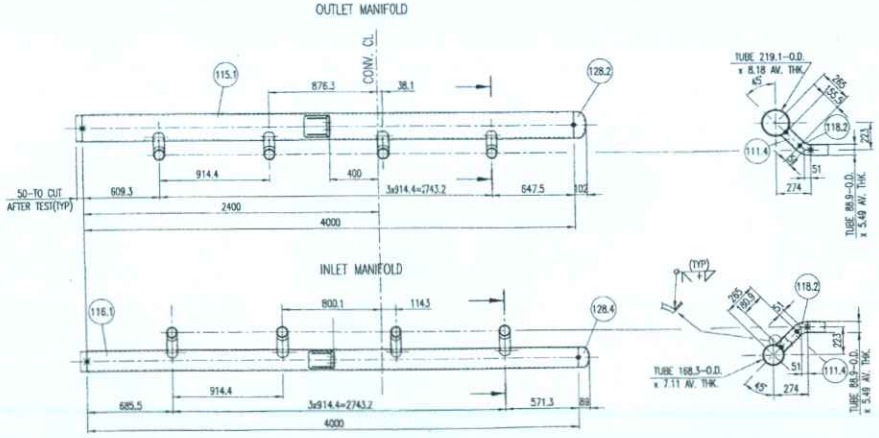


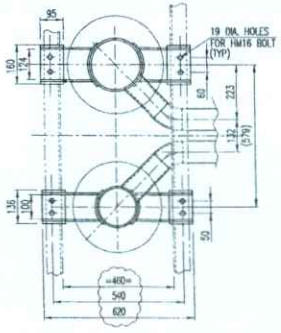
4 DETAIL
FOR MANIFOLD SUPPORTS
SCALE 1:10



SHOP WELD
SHOP WELD AFTER ASSEMBLY
FIELD WELD

SECTION A-A
VIEW FROM 0° ○
SCALE 1:20





CERTIFIED FINAL

MASTER

Snamprogetti Ltd		
APPROVAL STATUS	DATE	SIGNED
A. Proceed & Submit Certified Final competency		
B. Proceed Change as noted and Re-Submit		
C. Do not Proceed Change as noted & Re-submit		
XO. For Information Only No Review Required		
SCF. Supplier Certified Final	23/10/02	
PROJECT/PO NUMBER 10772	ITEM/EQUIP No 02-E-1004	
DOCUMENT NUMBER	10-PC-B-74678	REV 4 3
AUTHORISATION TO PROCEED DOES NOT RELIEVE SUPPLIER OF RESPONSIBILITY OR LIABILITY UNDER THE CONTRACT/ PURCHASE ORDER		

NATIONAL PETROCHEMICAL COMPANY
FANAVARAN PETROCHEMICAL COMPANY
CO PRODUCTION PLANT - BANDAR IMAM - IRAN

Snamprogetti | SAIPEM

REV.	DATE	DESIGNATION	PREP/DR	VERIF./CHKD	APPR./APPD	APPR./APPD
4	13.11.02	FINAL DRAWING	I.O.	G.M.	JCN	
3	24.10.02	MODIF. STICK CLIENT	I.O.	G.M.	JCN	
2	24.09.02	MODIF. STICK CLIENT & MATERIALS	Z.D.	G.M.	JCN	
1	09.07.02	MODIF. INLET ; OUTLET E1004-1 AND DESIGN DATA	B.C.	G.M.	JCN	
0	21.06.02	FIRST ISSUE	B.C.	G.M.	JCN	

Kvaerner Heurtey

FICHIER/FILE : 1001-FD-406-R4
ECHELLE/SCALE : 1/50
NOM/NAME : B.C.

SNAMPROGETTI BANDAR IMAM IRAN

TUBULAR REFORMER 02-H-1001
CONVECTION COIL
COIL E-1004-1

A1 | ER02009 | 1001-FD-406 | 4 REV.

0.05