



**Bharat Heavy Electricals Limited
(A Govt. of India Undertaking)**

Piping Centre , 80, G. N. Chetty Road, CHENNAI – 600 017
Phone : 91 (044) 2815 8821, Fax : 91 (044) 2815 8869
e-mail: prs@bhelmpc.co.in

REF: ENQ NO:PC:9001

DT: 08.04.2009

Sub: Procurement of fabricated pipe fittings.

Ref: Enquiry No:PC:9001 dt 08.04.09

Please find the following tender documents for reference.

1. Annexure to Enquiry
2. List of items
3. Tech. delivery condition TDG: 108:02
4. Sample drawings

Pre qualification is the criteria for consideration for other than BHEL approved vendors. After qualifying for registration, the new vendors may be considered for future requirements, in line with BHEL system and policy. Such vendors will not be considered for this enquiry.

This is a limited tender and only vendors who are contacted though e-mail/courier shall submit their offers.

The New vendors may download vendor registration forms from BHEL web site www.bhel.com and relevant data for formal registration.

S.K. 8/4/09

Dy Manager / Purchase
BHEL / Piping Centre
80,GN Road, T.Nagar
Chennai-600017

BHARAT HEAVY ELECTRICALS LTD

PIPING CENTRE CHENNAI – 600017

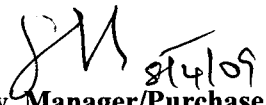
**ANNEXURE TO ENQUIRY PC:9001 dt 08.04.09 FOR FABRICATED Y-PIECES
AND TEE FITTINGS**

THIS IS A SINGLE PART BID ENQUIRY.

A. VENDORS ARE REQUESTED TO SUBMIT THEIR PRICE BID ONLY.

**B. ALL TECHNICAL AND COMMERCIAL TERM AND CONDITIONS SHALL BE AS
PER TERMS AND CONDITIONS AGREED AGAINST OUR EARLIER ENQUIRY
NO: PC 8002 DT 13.02.08.**

- 1) Assembly drawings for fabricated y-piece and fabricated tees are as per enquiry no:PC8002 dt 13.02.08.
- 2) Delivery shall be within **6 months** from the date of placement of purchase order.
- 3) Quantity indicated against first lot ordering is the minimum qty that will be ordered on L1 vendors after opening the price bid. Total quantity indicated for one year period in this enquiry is only tentative and ordering of subsequent lots will be made as when requirement arises till 31.12.2009. Suppliers are requested to keep the quoted price 'firm' till 31.12.2009. BHEL reserves the right to order part quantity. Vendor to confirm acceptance.
- 4) Rates shall be quoted in Euro currency only.
- 5) Packing shall be done project wise and details will be given in the purchase order.
- 6) The basis of price shall FOB-loading sea port (or) CFR/Chennai.


Dy. Manager/Purchase

S. VARADARAJAN
Dy. Manager - Purchase
BHEL / Piping Centre
80, G.N. Road, T. Nagar
Chennai - 600 017.

PC:9001 dt 08.04.09

LIST OF ITEMS

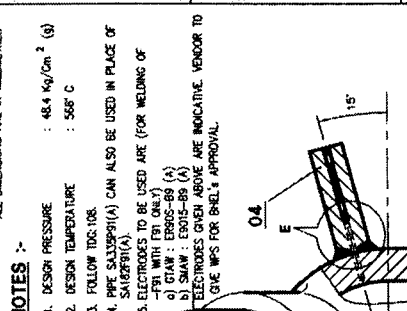
SL NO.	MATL CODE	Drawing No.	DESC	TOTAL TENTATIVE QTY (NOS) Annual requirement	FIRST LOT ORDERING (NOS)	Unit rate in Euro
1	925057880000	3-80-999-9706/00	FAB EQT 660X36 SA182F22CL3	3	2	
2	925057890000	3-80-999-97691/00	FAB UET 965X 57 / 711.2 X 40 SA182F22CL3	3	0	
3	925057920000	3-80-999-97707/00	FAB UET 711.2 X 40/660 X 36 SA182F22CL3	24	3	
4	925057930000	3-80-999-97688/00	FAB UET 864.0 X 27 / 323.9 X10.31 SA105	21	21	
5	925057940000	3-80-999-97689/00	FAB UET 864X 35 / 508X 25 SA182F11CL2	16	12	
6	925057950000	3-80-999-97690/00	FAB UET 864 X 35 / 323.9 X 20 SA182F22CL3	19	2	
7	925057960000	3-80-999-97702/00	FAB UET 368 X 48/ 219. X 30 SA105	26	12	
8	925057970000	3-80-999-97703/00	FAB UET 508 X 64 / 368 X 48 SA105	18	15	
9	925057980000	3-80-999-97700/00	FAB UET 508 X 64 / 273X 36 SA105	17	17	
10	925057990000	3-80-999-97701/00	FAB UET 508 X 64 / 368 X 48 SA105	8	0	
11	925058000000	3-80-999-97708/00	FAB UET 508X 64/ 168.3 X 27.5 SA105	11	10	
12	925058040000	3-80-999/97694/00	FAB UET 508X 71/ 273 X 40 SA105	2	2	
13	925058050000	3-80-999-99497/00	HDR L=2017 508X64/368X48/168.3X26 SA105	19	9	
14	925058060000	3-80-999-99498/00	FAB HEADER L = 2274 508X64/368X48 SA105	19	0	
15	925058100000	2-80-999-99495/00	FAB Y PIECE 965X57/711.2X40 SA182F22CL3	8	8	
16	925058120000	2-80-999-99496/00	FAB Y PIECE 864X 27/660 X 20 SA105	10	4	
17	925057820000	3-80-999-97699/00	FAB UET 559X54/ 323.9X31 SA182F91	35	6	
18	925057830000	3-80-999-97698/00	FAB UET 559X 54 / 406.4 X 38.0 SA182F91	19	4	
19	925057840000	3-80-999-97712/00	FAB UET559X 54/219.1X40SA182F91/SA335P22	19	8	
20	925057850000	3-80-999-97692/01	FAB UET 564 X 58/ 323.9 X 35 SA182F91	4	2	

PC:9001 dt 08.04.09

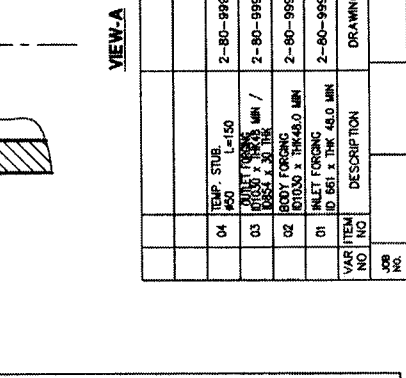
LIST OF ITEMS

SL NO.	MATL.CODE	Drawing No.	DESC	TOTAL TENTATIVE QTY (NOS) Annual requirement	FIRST LOT ORDERING (NOS)	Unit rate in Euro
21	925057860000	3-80-999-97693/01	FAB UET 564 X 58 /406.4 X 42 SA182F91	2	0	
22	925057870000	3-80-999-97713/00	FAB UET564X58/219.1X40SA182F91& SA335P22	2	0	
23	925057900000	3-80-999-97704/01	FAB UET 914 X 30 / 711 X 25 SA182F91	5	0	
24	925057910000	3-80-999-97705/01	FAB UET 711.2 X 25 / 610 X 20 SA182F91	14	1	
25	925058070000	3-80-999-97709/00	FAB UET 323.9 X 31/ 219.1X 25 SA182 F91	11	9	
26	925058080000	3-80-999-97711/01	FAB EQT 323.9 X 31SA182 F91	5	0	
27	925058090000	3-80-999-97710/00	FAB UET323.9 X 31/168.3 X 27.5SA 182 F91	6	0	
28	925058110000	2-80-999-99494/01	FAB Y PIECE 914X30/711.2X25SA182F91	7	2	
29	925058130000	2-80-999-99492/00	FAB Y PIECE 559X54/406.4X38 SA182F91	19	6	
30	925058140000	2-80-999-99493/00	FAB Y PIECE 564X58/406.4X42 SA182F91	2	0	
				374	155	

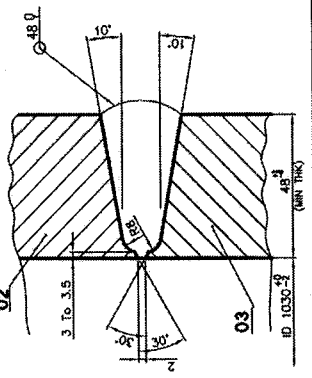

S. VARADARAJAN
 Dy. Manager - Purchase
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 80, G.N. Road, T. Nagar
 Chennai - 600 017.



1. DESIGN PRESSURE : 48.4 kg/cm^2 (3)
2. DESIGN TEMPERATURE : 565°C
3. FOLLOW TDS FOR: 108.
4. PIPE SALT/PIPE(A) CAN ALSO BE USED IN PLACE OF SALT/PIPE(A).
5. ELECTRODES TO BE USED ARE (FOR WELDING OF -F81 WITH T81 ONLY)
 - a) GTAW : ER80S-B9 (A)
 - b) GTAW : ER80S-B9 (A)
 - c) SMAW : E8015-B9 (A)
6. ELECTRODES WHEN ABOVE ARE INDICATIVE. VENDOR TO PROVIDE WPS FOR BHEL'S APPROVAL.



VAR	ITEM NO	DESCRIPTION	DRAWING NO	MATERIAL	SPEC	C	UNIT	WEIGHT	QUANTITY	DATE
	04	TEMP. STUB 450 L=150	2-80-999-99494	SA 182 F22 CL3		A		1 000		
	03	DRILL / FORGING MIN / DRESS & 30 THK	2-80-999-99494	SA 182 F91		A		540 000		
	02	BODY FORGING Ø103.0 X 1THK48.0 MIN	2-80-999-99494	SA 182 F91		A		1222 000		
	01	HEAT FORGING ID 561 X 1THK 4.0 MIN	2-80-999-99494	SA 182 F91		A		325 000		
						A		2		



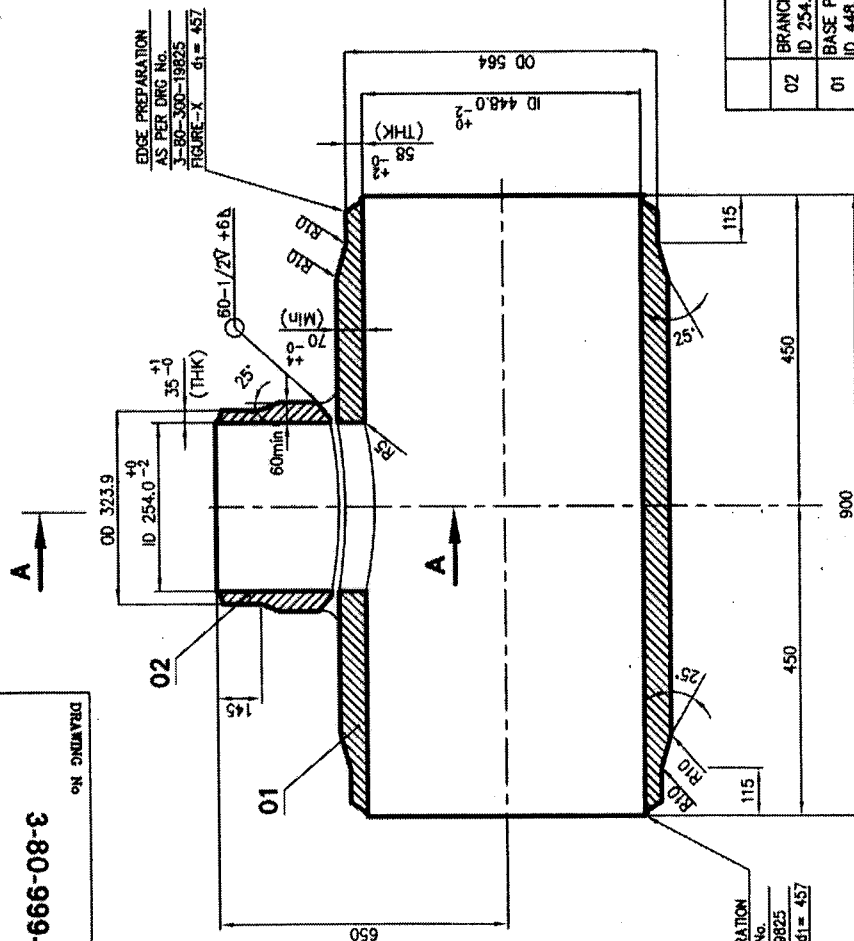
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT				BHARAT HEAVY ELECTRICALS LTD., PIPING CENTRE, CHENNAI 600 017		DSW R. ANANTH CHD R. ANANTH APPO S. JAYAKUMAR		NAME R. ANANTH S. JAYAKUMAR		SIGN		DATE 06.02.08 06.02.08		NO OF ITEMS ITEMS	
INSTR.		GRADE OF IN VOL INS C/M/F		SCALE		WEIGHT (KG)		SERIAL NO. REF. NO.		2-80-310-08123		ITEM NO.		REV	
COUNT						N.T.S.		2420.000							
TITLE				 		N.T.S.		2420.000		SERIAL NO.		2-80-999-99494		00	
						(OD914x30/OD711.2x25)		Y-PIECE							

FIRST ANGLE PROJECTION (ALL DIMENSIONS IN MILLIMETRES)

CAUTION THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

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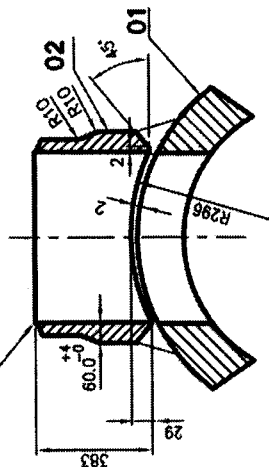
DRAWING No



NOTES :-

1. DESIGN PRESSURE : 188.5 Kg/Sq Cm (g) 12.5/
2. DESIGN TEMPERATURE : 540° C
3. FOLLOW TIG : 108
4. ELECTRODES TO BE USED ARE,
 - a) GTAW : ER90S-B9 (A)
 - b) SMAW : ER90S-B9 (A)
5. PIPE SA313P91(A) CAN ALSO BE USED IN PLACE OF SA182F91(A).

EDGE PREPARATION
AS PER DRG No.
3-80-300-19825
FIGURE-X d1= 261



SECTION-AA

STANDARD

ITEM NO.	DESCRIPTION	DRAWING NO.	UNIT WT.	QTY.
02	BRANCH NOZZLE L=383 ID 254.0 x THK 60.0 Min	3-80-999-97692	SA 182 F91	150,000
01	BASE PIPE L = 900 ID 448.0x THK 70.0 Min	3-80-999-97692	SA 182 F91	727,000
			MATERIAL CODE	A
			MATERIAL SPEC.	C

TYPE OF PRODUCT
OR NAME OF
CUSTOMER/PROJECT

SAMPLE

BHARAT HEAVY ELECTRICALS LTD., PIPING CENTRE, CHENNAI 600 017		NAME	DATE	NO. OF
DESIGN	USATEJULAE	DATE	07.02.08	ITEMS
CHECKED	R. ANANTH	DATE	07.02.08	
APPROVED	S. JAYAKUMAR	DATE	07.02.08	
DEPT.	SCALE	WEIGHT (KG)	877,000	ITEM No.
CODE	C/M/F	N.T.S.		
REV	DATE	ALTD		
01		APPRO		
ZONE				
TITLE FABRICATED UNEQUAL TEE (OD564.0x58.0/OD323.9x35.0)		CARD CODE	3-80-301-22705/00	REV
		DRAWING No.	3-80-999-97692	00
		SIZE	AS	

92861-008-08-3
ON DRAWING

NOTES:-

01. APPLICABLE FOR P91 MATERIAL
02. FOR OD MISMATCHING REF. FIGURE-Xa.
03. $\alpha = 6^\circ$ FOR WALL THICKNESS ≤ 30 mm
04. $\alpha = 10^\circ$ FOR WALL THICKNESS > 30 mm

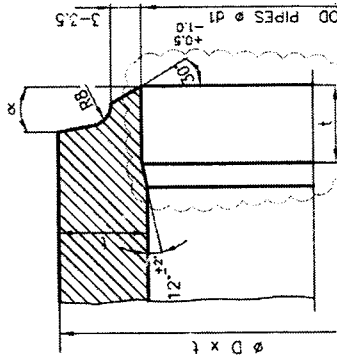


FIGURE - X

MATCHING EDGE PREPARATION FOR MISMATCH OD

DIAMETRICALLY GREATER THAN 8 mm
(ie. OD1 - OD2 > 8mm.) APPLICABLE FOR
ELBOWS OTHER THAN P91 MATERIALS

NOTES:-

01. OD = OUTSIDE DIA OF CONNECTING PIPE (STRAIGHT) TO BE PHYSICALLY MEASURED/VERIFIED.
02. t = THK OF CONN. PIPE (STRAIGHT)

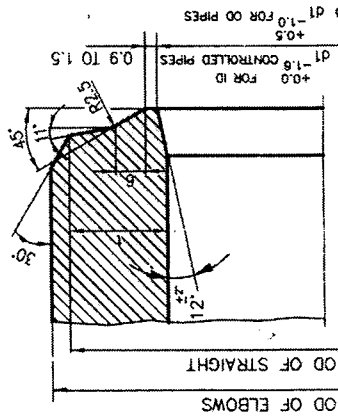


FIGURE - Z

MATCHING EDGE PREPARATION FOR MISMATCH OD
DIAMETRICALLY GREATER THAN 8 mm
(ie. OD1 - OD2 > 8mm.) APPLICABLE FOR
BENDS/FITTINGS OF P91 MATERIALS

NOTES:-

01. OD OF STRAIGHT TO BE PHYSICALLY MEASURED/VERIFIED.
02. $\alpha = 6^\circ$ FOR WALL THICKNESS ≤ 30 mm
03. $\alpha = 10^\circ$ FOR WALL THICKNESS > 30 mm

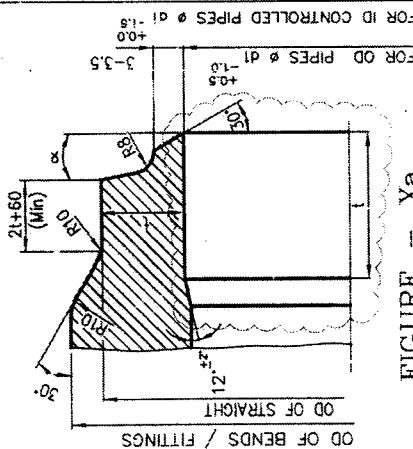
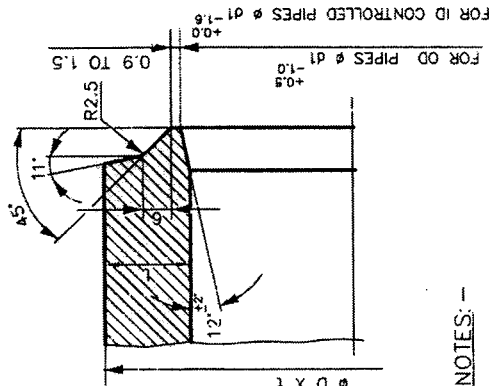


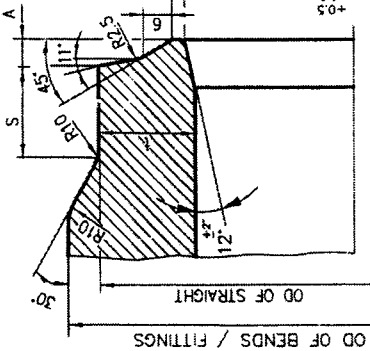
FIGURE - Xa



NOTES:-

01. USE WHEN $t \geq 14.2$ mm.
02. FOR OD MISMATCHING REF. FIGURE-Pa

STYLE - P



STYLE - Pa

GENERAL NOTES:-

01. THE MINIMUM THICKNESS AT WELD END SHALL NOT BE LESS THAN
a) 0.875 TIMES t NOM. FOR OD PIPES.
b) t MIN. FOR ID CONTROLLED PIPES.
02. t NOM & t MIN SHALL BE AS PER SPECIFIED PIPE SIZE.

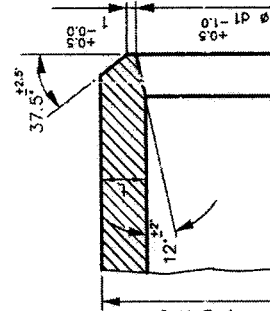
NOTES FOR WELDING:

01. WELD REINFORCEMENT TO BE FLUSH GROUND AND MERGED WITH PARENT METAL WITHOUT ANY UNEVENNESS.

STYLE - D

NOTES:-

01. USE WHEN $t < 14.2$ mm.



STANDARD

TYPE OF PRODUCT
OR NAME OF
CUSTOMER/PROJECT

DEPT.

CODE

GRADE OF
UN TOL. DIM

C/M/F

SCALE

WEIGHT (kg)

MADE OF ORIGINAL
ORGANISATION

DATE

SIGN

NAME

NO OF
ITEMS

DATE

ITEMS

NO OF
ITEMS

DATE

ITEMS

NO OF
ITEMS

DATE

ITEMS

BHARAT HEAVY ELECTRICALS LTD.,

PIPING CENTRE, CHENNAI

APPROVED

DATE

SIGN

NAME

NO OF
ITEMS

DATE

ITEMS

NO OF
ITEMS

DATE

ITEMS

NO OF
ITEMS

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NO OF
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DATE

ITEMS

EDGE PREPARATION

DETAILS

CARD
CODE

U 01

DRAWING No.

3-80-300-19825

REV

01

REV

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REV

01

	Bharat Heavy Electricals Limited, Piping Centre, Chennai Technical Delivery Conditions for Fabricated Tees and Y- pieces (Imported)	TDG:108 Rev 02 08.02.2008 Page 1 of 4
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1.0 GENERAL

Fabricated Tees and Y-piece shall meet Indian Boiler Regulations (IBR) and the following requirements in addition to the latest version of relevant material specifications namely ASME SA 105, SA 106, SA 182, SA 335.

2.0 FORGINGS.

- 2.1 Material : SA 105, SA 182 F11, F12, F22, F91.
- 2.2 Carbon content of SA105 items shall be restricted to 0.25% maximum.
- 2.3 SA 182 F91 forgings shall be normalised at 1040 to 1070 deg C (for wall thickness larger than 75 mm, accelerated cooling may be done to obtain a fully martensitic structure) and tempered at 760 ± 10 deg C
- 2.4 Unless otherwise specified in the P.O, items of SA182 F11/12 shall be supplied as per class 2 and SA182 F22 shall be supplied as per class 3 only
- 2.5 Product analysis shall be carried out on One piece / Heat / HT lot / Size.
- 2.6 Tension test shall be carried out on one Test piece for each specification, heat, heat treatment lot and size.
- 2.7 Bend test for CS (SA 105) : One sample of 19 mm thick and 25mm width to be bent 180 deg around mandrel of radius 6.35mm.
- 2.8 Bend test for AS (SA182): One Sample of 25.4 mm width and thickness = t to be bent 180 deg around mandrel of radius $= 1.5 t$. Test on representative sample is also acceptable.
- 2.9 Hardness test shall be carried out on all items of F91, and minimum 10% for other material Grades; acceptance norm shall be as per SA 105 / SA 182.
- 2.10 All fittings shall be tested by MT as per ASTM E-709 and acceptance norm shall be as per ASME B 31.1 Clause 136.4.3
- 2.11 Forgings of all thickness shall be ultrasonically tested as per SA 388 and acceptance norms shall be as per 3.3.4 of ASME Section VIII Division 2.
- 2.12 Metallography :- Metallography shall be carried out one per heat, per size, per heat treatment lot of F91 items.

3.0 PIPES.

- 3.1 Material : SA 106 Gr.C, SA 335 P11, P12, P22, P91.
- 3.2 The pipes used shall meet the requirements indicated in Technical delivery condition ref. TDG : 101. The applicable / latest revision number of this document is indicated in the Tender / Purchase order.

S. Jayakumar, Engg	Approved by K. Vedaprasad, QC
P. Elangovan, QA	K. Ganeshan, MPL



4.0 FABRICATION OF Y Piece and Tees

- 4.1 Fit up, fabrication, dimension and tolerance shall be as per BHEL drawing
- 4.2 Welding : WPS and PQR shall be approved by well known independent inspecting agencies like Lloyds, BV, SGS, Copy of approved WPS & PQR shall be furnished along with the Technical part of the bid for approval by BHEL
- 4.2.1 Welding of F91 / P91 material :
GTAW rods (ER 90S – B9) and SMAW electrodes (E9015 – B9) used shall be of following makes.
a) Bohler Schweisstechnik Austria, Austria
b) Bohler Thyssen Schweisstechnik, Germany
c) Kobe Steels Ltd., Japan
d) Oerlikon Welding Ltd, Switzerland
e) Metrode Products, U.K
The core wire chemistry shall be equivalent to F91/ P91 . Synthetic electrodes are not permitted.
- 4.3 PWHT for F91 / P91 material shall be 760 ± 10 deg C. Holding time shall be minimum 2 hours for thickness up to 50mm; minimum 4 hours for thickness 51 to 100 mm. PWHT for other material shall be as per ASME B31.1.

5.0 NON DESTRUCTIVE EXAMINATION

- 5.1 All NDE shall be done after PWHT only – and witnessed by Inspection authorities.
- 5.2 NDE procedures (MT-Wet, PT,RT,UT and Hardness)shall be approved by BHEL
- 5.3 All welds shall be subjected to RT, Wet MT and PT as per ASME Sec V. Evaluation and acceptance norms shall be as per ASME B31.1 Clause 136.4.5 for RT, Clause 136.4.3 for MT, Clause 136.4.4 for PT. Hardness shall be as per SA 234.
- 5.4 All welds shall also be subjected to UT and its methodology and acceptance shall be as per AD 2000 Merkblatt HP 5/3-2002 Edition, with additional requirements as in 5.4.1 through 5.4.3 below.
- 5.4.1 The examination shall be conducted by Pulse Echo contact testing.
The following digital equipments or its equivalent models with A-scan presentation that generates and receives frequencies in the range of 1 MHz to 5 MHz. shall be used for examination:
GE Inspection Technology (Krautkramer make), Olympus (EPOCH IV, XT), Sonatest (Master scan series-350M/380M)U.K

The calibration blocks used shall be of same material specification, dia & thickness.

The UT equipment shall be calibrated at the beginning of each period of extended use or every 3 months whichever is less.

S. Jayakumar, Engg

P. Elangovan, QA

Approved by

K. Vedaprasad, QC

K. Ganeshan, MPL

- 5.4.2 All recordable indications will be stored in memory of either the digital flaw detector or a PC for review at a later period.
- 5.4.3 The equipment calibration data for specific weld as well as the hard copy of 'Static echo-trace pattern'— showing the flaw-echo amplitude with respect to DAC, flaw depth, projection surface distance (probe position) and beam-path shall be attached to UT test report. This hard-copy of echo-trace with equipment calibration data will form part of test documentation.
- 5.5 Qualified Level II personnel shall perform the examination as well as evaluation, and a test report shall be issued.

6.0 POSITIVE MATERIAL IDENTIFICATION (PMI) FOR ALLOY STEEL FITTINGS.

Each alloy steel fitting shall be checked for the correctness of the material during manufacturing and final inspection using X-ray fluorescence principle or spark emission spectrography.

7.0 WORK MAN SHIP, FINISH AND REPAIR

All items shall have smooth, workman like finish, and to be free from scale & defects like laps, seams, folds, cracks, etc. Surface defects can be removed by mechanical means and defective areas smoothly dressed up with the adjacent surface. Minimum dimension after repair shall meet drawing / Specification. Repairs by fusion welding are prohibited.

8.0 MARKING , COLOUR CODING & PACKING

- 8.1 All items shall be punched with specification, Grade, Heat No, maker's emblem and Inspection Authorities Seal. In addition, Specification, Grade, Heat No, and Size shall be stenciled.

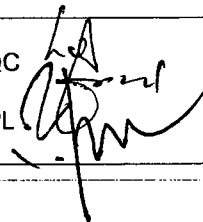
8.2 Colour Coding:-

SA 105 / SA 106 Gr.C	=	Blue
SA 182 F11 / SA 335 P11	=	Green & White
SA 182 F12 / SA 335 P12	=	Black & Red
SA 182 F22 / SA 335 P22	=	Blue & Red
SA 182 F91 / SA 335 P91	=	Brown & Red

- 8.3 Packing: All items shall be suitably packed in boxes / crate to avoid transit / other damages

9.0 PRESERVATION

- Outside:- resin type rust preventive coating with visibility to punched , stenciled details.
- Inside:- rust inhibitor or resin type rust preventive coating.
- Ends of the fittings shall be secured with caps.

 S. Jayakumar, Engg	Approved by K. Vedaprasad, QC
 P. Elangovan, QA	 K. Ganeshan, MPL

10.0 MANUFACTURING QUALITY PLAN.

Vendor shall submit manufacturing Quality plan along with technical part of the bid for BHEL approval.

11.0 INSPECTION & CERTIFICATION

All items are to be Inspected at the manufacturer's works by the Inspection agencies / authorities as per IBR. Inspection certificate in IBR Form IIIC shall be submitted along with the Work Test Certificate countersigned by authorities as per IBR and shall include the following. (Three ink signed originals required)

1. Test Certificate Number & date.
2. BHEL P.O Number & Amendment Number(if any)
3. BHEL P.O. Serial Number
4. BHEL TDC Number
5. Size-wise Quantity
6. Specification, Grade & Year of code.
7. Heat/Melt Number
8. Steel making process.
9. Starting material details
10. Positive Material identification (PMI) report for Alloy steel finished fitting.
- *11. Ladle and product Analysis of Raw Material.
- *12. Product analysis report.
- *13. Heat Treatment Chart.
- *14. NDE reports [VT,MT, PT,RT, UT (UT Reports in soft copy + hard copy)]
- *15. Tensile Test report
- *16. Bend Test report.
- *17. Hardness Test report
- *18. Metallography report for F 91 / P91.
- *19. Dimensional conformance.
- *20. Guarantee of HTP shall be given in the test certificate as follows, if hydro test is not carried out :- "Fabricated Y.piece / welded Tees are capable of with standing without failure, breakage or impairment of their serviceability a hydrostatic test pressure equal to that prescribed for the specified matching pipe of equivalent material".

*Details furnished in the Tests certificate in lieu of chart/report is acceptable.

12.0 RECORDS OF REVISION.

Rev 01 : a) Para 3.0, 4.2.1 ,6.0 , 10.0 are included
b) Para 1.0,4.2,4.3,8.2,11.0 are revised

Rev 02 : a) Para 2.10,4.2.1,8.1, 8.2, 9.0 are revised

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 S. Jayakumar, Engg	Approved by K. Vedaprasad, QC
P. Elangovan, QA 	K. Ganeshan, MPL 