



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

Piping Centre , 80, G. N. Chetty Road, CHENNAI – 600 017  
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REF: ENQ NO:32

DT: 28.03.2011

Sub: Procurement of forged pipe fittings to SA182FP91 specification.

**Ref: Enquiry No:PC:4101100032 dt 28.03.2011**

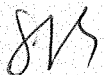
Please find the following tender documents for reference.

1. List of items and sample drawings
2. Tech. delivery condition TDG: 104:03.

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 through e-mail/courier may submit their offers.**

New vendors may download vendor registration forms from BHEL web site [www.bhel.com](http://www.bhel.com) and relevant data for formal registration.

 28/3/11  
Manager / Purchase  
BHEL / Piping Centre  
80,GN Road, T.Nagar  
Chennai-600017  
Ph: 044-28161243

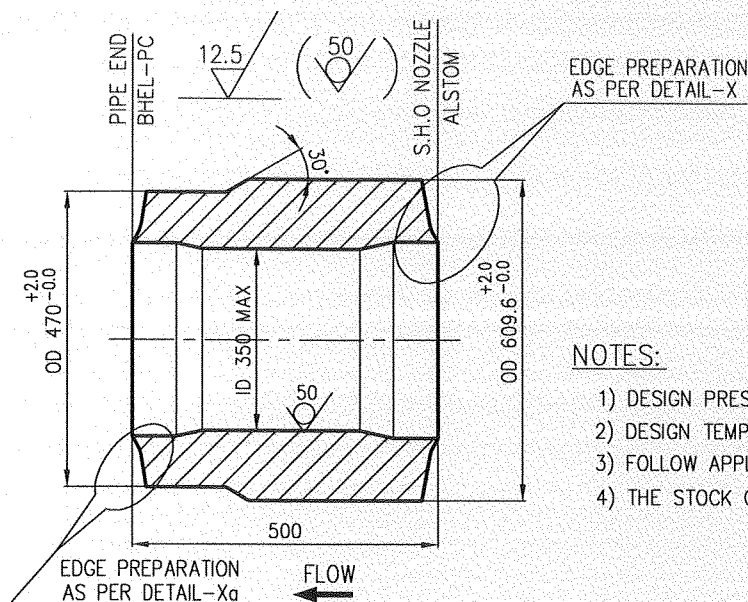
Sl no	Material	Drawing no	Description	qty nos	Cur	Unit rate
1	920840890000	4-24-345-06209/02	Matching Piece Drg 4-24-345-06209 (F91)	50		
2	921175670000	4-80-300-70214/04	MATPIECE OD609.6X123.8/ ID350X60SA182F91	6		
3	921175690000	4-80-301-70711/00	MATPIECE ID390X135/ID350X60 SA182F91	6		
4	921175740000	4-80-999-93253/00	MPCE ID262MAX59 MIN/OD323.9X31 SA182F91	30		
5	925166620000	4-80-999-93211/00	TRUNNIONOD100X25L=75SA182F91(PIPEOD249)	32		
6	925166630000	4-80-999-93212/00	TRUNNIONOD118X34L=100 SA182F91(PIPE323.9	260		
7	925166640000	4-80-999-93213/00	TRUNNIONOD118X34 L=100SA182F91(PIPE355.6	30		
8	925166650000	4-80-999-93214/00	TRUNNIONOD118X34L=100SA182F91(PIPE406.4)	48		
9	925166660000	4-80-999-93215/00	TRUNNIONOD184X49.5L=75SA182F91(PIPEID262	200		
10	925166670000	4-80-999-93216/00	TRUNNIONOD184X49.5L=100SA182F91(PIPE406.	100		
11	925166680000	4-80-999-93217/00	TRUNNIONOD184X49.5L=100SA182 F91(PIPE457	100		
12	925166690000	4-80-999-93218/00	TRUNNIONOD184X49.5L=100SA182 F91(PIPE559	100		
13	925167080000	4-80-999-93299/00	MATINGPCE ID310MAX100/OD406.4X38SA182F91	50		
14	925167310000	4-80-999-93322/00	SCREW PLUG RC 1.5 INCH SA182F91	7		
15	925179360000	3-80-301-23701/00	MATCHING PCE ID264X71 MIN L=420 SA182F91	4		

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IN ANY WAY DETRIMENTAL TO THE INTEREST OF BHEL

CAUTION:

ALL DIMENSIONS ARE IN MILLIMETRES

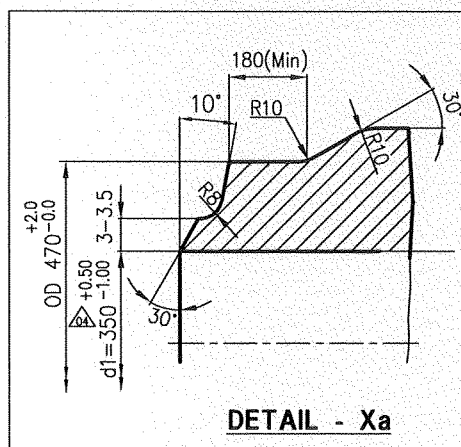
REV	DATE	ALTERED : MC. Sd.....	REV	DATE	ALTERED : MC. Sd.....	REV	DATE	ALTERED : LALIT
01	18-01-10	CHD & APPD : CS. Sd.....	02	16-04-10	CHD & APPD : CS. Sd.....	03	03-06-10	CHD & APPD : C.S
DRAWING PROFILE COMPLETELY REVISED AS PER ALSTOM's REQUIREMENT. DETAIL ALSO MODIFIED.			E.P PROFILE COMPLETELY REVISED AT HEADER END AS PER ALSTOM's REQUIREMENT.			DESIGN TEMPERATURE REVISED REVISION MARKED AS $\Delta$		



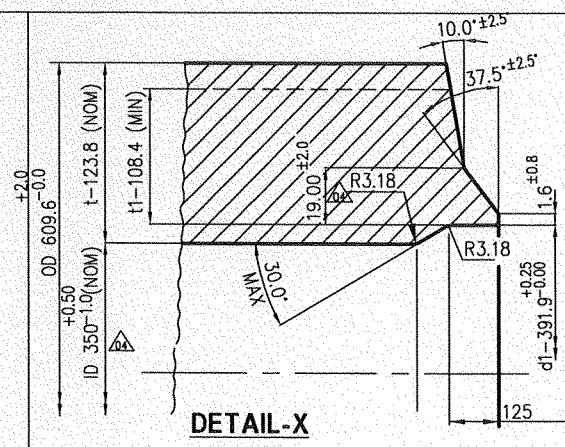
#### NOTES:

- 1) DESIGN PRESSURE : 269 Kg/sq.cm(g)
- 2) DESIGN TEMPERATURE : 568 °C  $\Delta$
- 3) FOLLOW APPLICABLE QP
- 4) THE STOCK CODE FOR THE MATCHING PIECE: 921175670000

REV	DATE	ALTERED : LALIT
04	18-08-10	CHD & APPD : C.S
REVISION MARKED AS $\Delta$		



**DETAIL - Xa**



**DETAIL-X**

	MATCHING PIECE OD609.6x123.8/ID350x60 L=500			A		580	000
VARIANT NUMBER	DESCRIPTION	STD	SA 182 F91	A/C/P	UNIT		
			MATERIAL CODE			UNIT WEIGHT(KG)	
			MATERIAL SPECN			QUANTITY	



**BHARAT HEAVY ELECTRICALS LIMITED**

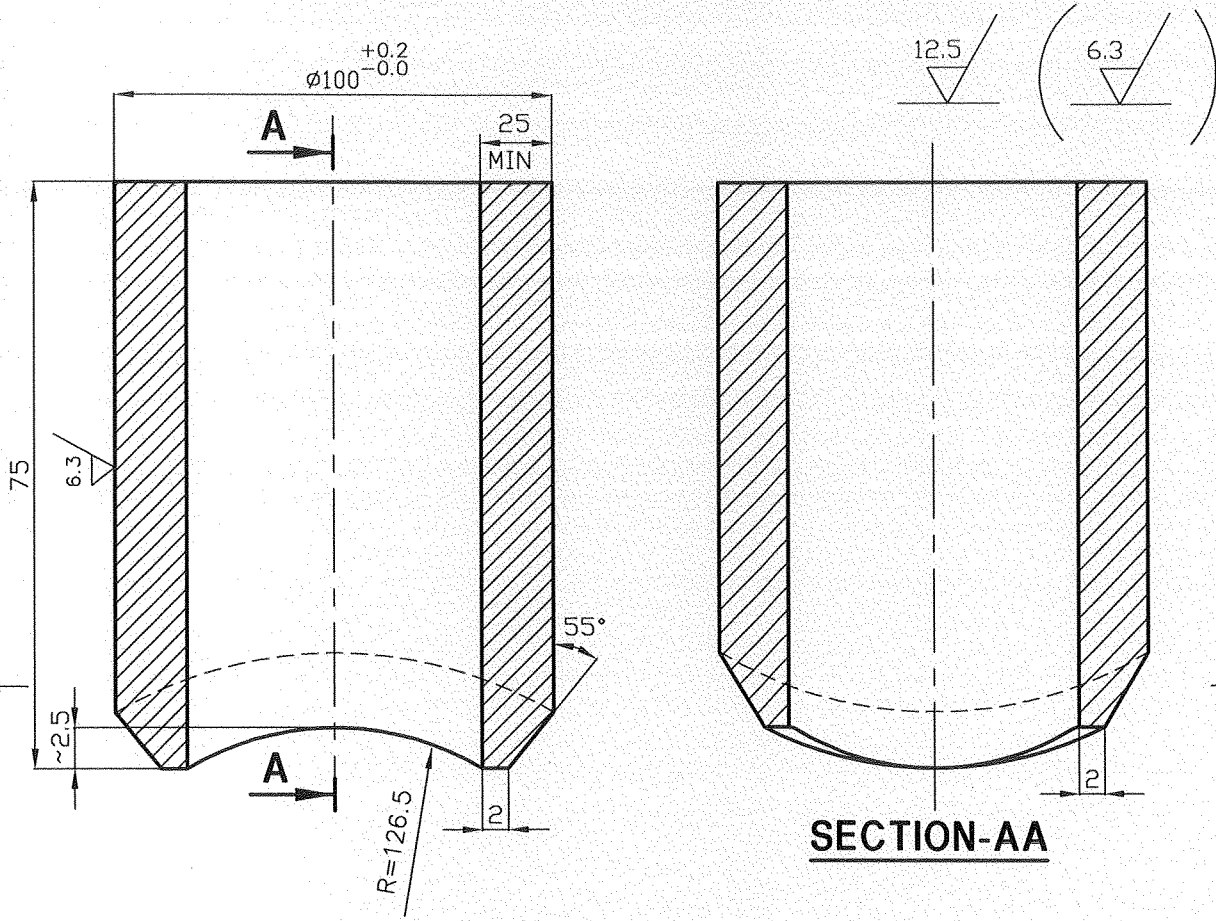
PIPING CENTRE  
CHENNAI 600 017

DEPT	ALL DIMENSIONS ARE IN MM	PROJECTION	SCALE	WEIGHT (Kg)	REF TO ASSY / OLD DWG	DRN	NAME M.C.SEKARAN	SIGNATURE Sd.....	DATE 04.01.10
CODE			N.T.S	580.0		CHD	M.C.SEKARAN	Sd.....	04.01.10
						APPD	C.SARAVANAN	Sd.....	04.01.10
TITLE <b>MATCHING PIECE</b> OD609.6x123.8/ID350x60					DRAWING NO : <b>4-80-300-70214</b>				REV 04

ALL DIMENSIONS ARE IN MM


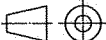
REV	DATE	ALTERED
01		APPROVED

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VAR NO.	DESCRIPTION	STD	92 516 662 0000	P	UNIT	QTY.
			SA 182 F91			
			MATL. CODE	A/C	DI	
			MATL. SPECN.			

STANDARD

			BHARAT HEAVY ELECTRICALS LIMITED PIPING CENTRE CHENNAI 600 017			DRN	NAME R.ANANTH	SIGN	DATE 03.09.09	NO. OF VAR
						CHD	R.ANANTH		03.09.09	
						APPD	M.N.VASUDEVAN		03.09.09	
DEPT	GRADE OF UNTOL DIM		SCALE	WEIGHT (KG).	REF. TO ASSY./OLD DRG.			ITEM NO.	NO. OF ITEMS	
CODE	C / M / F		N.T.S	3.400						
TITLE TRUNNION OD100x25 L75 F91 (FOR PIPE OD249)					CARD CODE U 01	DRAWING NO. 4-80-999-93211			REV 00	



## 1.0 CODES

Materials shall meet Indian Boiler Regulations, (IBR) in addition to the latest Version of SA105 & SA182 as on date specified in the Purchase Order (PO).

## 2.0 RAW MATERIAL

(a) The raw material used shall meet the respective specification and the test certificate shall be furnished.

(b) Steel for SA 182 F11, F12 & F22 if indigenously procured, to be procured from following manufacturers i) Alloy Steel Plant, Durgapur, ii) Tata Iron & Steel company, Jamshedpur & iii) Mahindra Ugine Steel Company, Mumbai, who are approved by IBR for creep resistant steels.

(c) Carbon content of Carbon steel fittings (SA 105) shall be restricted to 0.25% max

## 3.0 PROCESS

(a) Process of manufacture shall conform to applicable standards.

(b) Unless otherwise specified in the P.O, SA182 F11/12 fittings shall be supplied as per class 2 and SA182 F22 shall be of Class 3 only.

## 4.0 HEAT TREATMENT

4.1 All fittings shall be heat treated as below:

SA 105	- Normalised
SA182 F11/ F12/ F22	- Normalised & Tempered

4.2 Fittings conforming to SA182 F91 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  $760 \pm 10$  deg C

## 5.0 TESTING

(a) Product analysis shall be carried out on One piece / Heat / HT lot / Size.

(b) Corrosion test (IGC) shall be carried out on one piece / Heat / HT lot / Size for SS fittings.

(c) All CS & AS items shall be tested by MPI as per ASTM E-709 & SS items by LPI as per E 165.

(d) Tension test shall be carried out on one Test piece for each specification, heat, heat treatment lot and size.

(e) 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.

(f) 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.

S. Jayakumar, Engg

Approved by

K. Vedaprasad, QC

G.Panneer Selvam, QA

K. Ganeshan, MPL



- (g) Dimensions shall be as per Purchase Order.
- (h) **Metallography:-** Metallography shall be carried out on one per heat, per size, per heat treatment lot of WP91 / F91 fittings. Acceptance norms - The Material shall be free from any micro fissures. Microstructure shall show tempered martensite and also to be examined for any grain growth. Photomicrograph with 500x (Min) magnification along with Metallography report to be provided. The actual magnification shall be indicated.
- (i) Hardness test shall be carried out on all items of F91, and 10% on other material grades.
- (j) All items shall be ultrasonically tested as per SA388 and acceptance norms shall be as per 3.3.4 of ASME Sec VIII Div 2

#### 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 WORKMANSHIP, 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 PAINTING , COLOUR CODING, MARKING, PACKING & END PROTECTION

- 8.1 **PAINTING :** All fittings except SS to be applied with resin type rust preventive coating with visibility to punched and stenciled details on outside and either with rust preventive coating or rust inhibitor inside. SS fittings to be surface treated as per ASTM A380 both inside and outside.
- 8.2 **COLOUR CODING :** All fittings shall be colour coded circumferentially at ends as given below

SA105	=	Blue
SA182 F11	=	Green & White
SA182 F12	=	Black & Red
SA182 F22	=	Blue & Red
SA182 F91	=	Brown & Red
SA182 F316	=	Black & Blue

#### 8.3 MARKING :

- 8.3.1 The fittings dispatched to **BHEL Stores** shall be punched / etched with Material code, Heat number, material specification, maker's emblem, Inspectors seal and Statutory authorities seal (as applicable) .

S. Jayakumar, Engg

G.Panneer Selvam, QA

Approved by

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K. Ganeshan, MPL





In addition, the above details along with size shall be paint stenciled on the fittings.

8.3.2 The fittings dispatched directly to project site as **DTS** shall be punched and paint stenciled with DU code (14 digit work order du detail) as given by purchase in addition to marking done as per para 8.3.1.

8.4 **PACKING AND END PROTECTION** : Machined ends of the fittings shall be well protected using end caps and fittings shall be suitably packed in box / crate to avoid transit & other damages.

#### 9.0 **INSPECTION & CERTIFICATION :-**

All items are to be Inspected at the manufacturer's works by the Inspection agencies / authorities as per IBR and as indicated in the P.O. Inspection certificate in IBR Form IIIC (for items under IBR purview) shall be submitted along with the Work Test Certificate countersigned by any of the above authorities and shall include the following.

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 / forming process
9. Laddle and product Analysis of Raw Material.
- \*10. Product analysis report.
- \*11. Heat Treatment Chart.
- \*12. NDE report. (VISUAL.MPI, LPI, UT)
- \*13. Tensile Test report
- \*14. Bend Test report.
- \*15. Hardness Test report
- \*16. Intergranular corrosion test report for SS
17. Metallography Report along with photomicrograph with 500x ( min ) magnification.

\*18. Dimensional conformance.

\*19. Starting material details.

\*20. Guarantee of HTP shall be given in the test certificate as follows if hydro test is not carried out :- "Forgings 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.

#### 10.0 **Records of Revisions:-**

Revision 02 : Material specification SA 182 F316 added.

Revision 03 : a) Para 4.0, 6.0 included.

b) Para 5.0 (b),(c),(h),(j), 8.0 and 9.0 (17) are revised.

S. Jayakumar, Engg

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