



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

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REF: ENQ NO: 4101100097

DT: 22.08.2011

Sub: Procurement of Forgings - F91.

Ref: Enquiry No: PC: 4101100097 dt 22.08.2011

Please find the following tender documents for reference.

1. List of items and sample drawings
2. Tech. delivery condition TDG: 104 Rev 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. Offers from other vendors will not be considered for this enquiry.

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

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

LIST OF ITEMS _ FORGINGS 91 DT 22.08.2011

Sl. No	Material	Description	Enq Qty	Drg No	TDG	Currency	Unit Rate
1	921174400000	MACHINED RED OD 786X38/OD711X25 SA182F91	2	4-80-311-63825-R00	TDG 104 Rev 03		
2	921174410000	MACHINED RED OD814X52/OD711X25 SA182F91	2	4-80-311-63824-R00	TDG 104 Rev 03		
3	921174430000	MAT.PCEID800MAX X 43MIN/OD711X25SA182F91	4	4-80-310-63822-R00	TDG 104 Rev 03		
4	921174740000	MPCEID800MAXTHK43MIN/762X25SA182F91	2	4-80-310-68403-R01	TDG 104 Rev 03		
5	921175180000	BW RED OD508X90 / OD355.6 X 29 SA182F91	3	As per Standard	TDG 104 Rev 03		
6	921175700000	MAT PIECE OD762X81/ OD711X42 SA182F91	6	4-80-300-70215-R04	TDG 104 Rev 03		
7	921175710000	MATPIECE ID730X58/OD711X42SA182F91	6	4-80-310-70712-R00	TDG 104 Rev 03		
8	921175910000	MATCHING PIECE OD 445/330 SA182F91	40	4-80-999-93275-R00	TDG 104 Rev 03		
9	925166660000	TRUNNIONOD184X49.5L=75SA182F91(PIPEID262	50	4-80-999-93215-R00	TDG 104 Rev 03		
10	925166670000	TRUNNIONOD184X49.5L=100SA182F91(PIPE406.	100	4-80-999-93216-R00	TDG 104 Rev 03		
11	925166680000	TRUNNIONOD184X49.5L=100SA182 F91(PIPE457	200	4-80-999-93217-R00	TDG 104 Rev 03		
12	925166690000	TRUNNIONOD184X49.5L=100SA182 F91(PIPE559	100	4-80-999-93218-R00	TDG 104 Rev 03		
13	925166720000	STUB OD168.3X27.5 L=150 SA 182 F91	40	4-80-999-93221-R00	TDG 104 Rev 03		
14	925166730000	Safety valve stub OD220/215.9 SA182F91	40	4-80-999-93223-R00	TDG 104 Rev 03		
15	925166740000	ERV STUB OD223 SA182 F91	40	4-80-999-93224-R00	TDG 104 Rev 03		
16	925166950000	ERV STUB OD 139.7 SA182 F91	20	4-80-999-93247-R01	TDG 104 Rev 03		
17	925167290000	TEMPERATURESTUBM33X2 OD148 L=45 SA182F91	60	4-80-999-93322-R00	TDG 104 Rev 03		
18	925167300000	TEMPERATURESTUBM33X2 OD122 L=45 SA182F91	30	4-80-999-93323-R00	TDG 104 Rev 03		
19	925167390000	SAFETYVALVESTUB OD 200X61.9 SA182F91	30	4-80-999-93333-R00	TDG 104 Rev 03		
20	925178940000	M.PIEID262MAX X THK 59 MIN L=420SA182F91	34	As per Standard	TDG 104 Rev 03		
21	925179420000	M.PCE ID400X100MIN/OD406.4X38-SA182F91	4	4-80-301-62568-R00	TDG 104 Rev 03		
	Grand Total		813				



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 ± 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

G.Panneer Selvam, QA

Approved by

K. Vedaprasad, QC

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) .

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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.

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REV	DATE	ALTERED
01		APPROVED

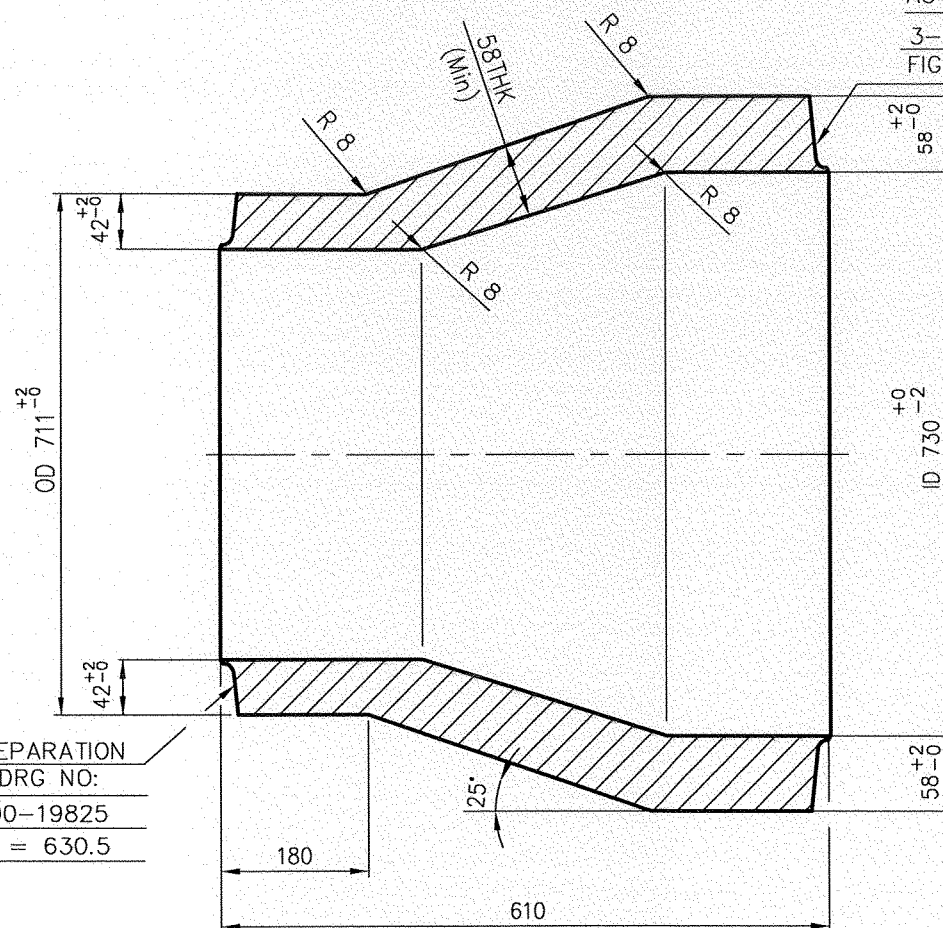
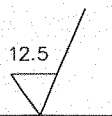
ALL DIMENSIONS ARE IN MILLIMETRES

NOTES :-

- DESIGN PRESSURE : 68 Kg/Cm² (g)
- DESIGN TEMPERATURE : 596° C
- FITTING SHALL CONFORM TO ALL THE REQUIREMENTS OF ASME B16.9 & A 234(LATEST).
- THIS DRAWING IS FOR INDICATING THE OVER ALL DIMENSIONS, CONNECTING PIPE SIZE AND MATERIAL SPECIFICATION.

EDGE PREPARATION
AS PER DRG NO:

3-80-300-19825
FIG-X, d1=730



EDGE PREPARATION
AS PER DRG NO:

3-80-300-19825
FIG-X, d1 = 630.5

	MATCHING PIECE L=610 ID730max x thk58min/ OD 711X42		92 117 571 0000	A		719	000
			SA 182 F91				
VAR NO.	DESCRIPTION	STD	MATL. CODE	A	UNIT	UNIT.WT.(Kg)	
			MATL. SPECN.	C	DI	QTY.	



BHARAT HEAVY ELECTRICALS LIMITED
PIPING CENTRE
CHENNAI 600 017

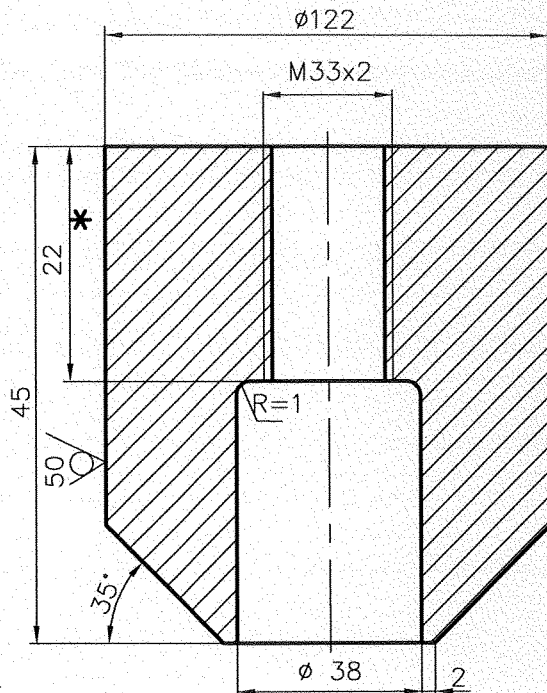
DRN	NAME	SIGN	DATE	NO.OF VAR
CHD	C.SARAVANAN		16.05.10	
APPD	C.SARAVANAN		16.05.10	

DEPT	GRADE OF UNTO L.DIM	SCALE	WEIGHT (KG).	BHEL PO REF.NO:	ITEM NO.	NO. OF ITEMS
CODE	C / M / F	N.T.S	719.000			
TITLE				CARD CODE	DRAWING NO.	REV
MATCHING PIECE (ID730maxXthk58min/OD711X42)SA182F91				U 01	4-80-310-70712	00

REV	DATE	ALTD
01		APPD

NOTES:

- 01 DESIGN PRESSURE : 70kg/sq.cm(g)
- 02 DESIGN TEMPERATURE : 596°C
- 03 HARD PUNCH "F91" AT PLACE MARKED WITH *
- 04 FINISHED COMPONENT CODE IS 925167300000
- 05 ALTERNATE/SUITABLE SIZE OF SA182 F91 FORGING CAN ALSO BE USED.
- 06 FOLLOW TDC: TDG:104, REV.03
- 07 THIS STUB IS REQUIRED FOR HRH SYSTEM OF 660/800 MW UNITS.
- 08 RAW MATERIAL CODE IS 15 339 407 0000



STANDARD

	ROD Ø130; L=45		SA 182 F91	A		3	340
VAR NO.	DESCRIPTION	STD	MATL. CODE	A	UNIT	UNIT.WT.(Kg)	
			MATL. SPECN.	C	DI	QTY.	



BHARAT HEAVY ELECTRICALS LIMITED
PIPING CENTRE
CHENNAI 600 017

DRN	NAME	SIGN	DATE	NO. OF VAR
CHD	SVR.KALAISELVAN		16.12.10	
APPD	AP.MADHAVANKUTTY		16.12.10	

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	3.340			
TITLE	TEMPERATURE STUB M33x2 OD122 L=45 SA182F91			CARD CODE U 01	DRAWING NO. 4-80-999-93323	REV 00