



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

Piping Centre, 80, G. N. Chetty Road, CHENNAI – 600 017  
Phone : 91 (044) 28161245, Fax 044 28161 341 e-mail: [prs@bhelmipc.co.in](mailto:prs@bhelmipc.co.in)

REF: ENQ NO: 4101200046

DT: 21.05.2012

Sub: Procurement of Forged pipe fittings – SA182F91.

**Ref: Enquiry No: PC: 4101200046 dt 21.05.2012**

Please find the following tender documents for reference.

1. List of items
2. Tech. delivery condition TDG: 104 Rev 04.

**This is a limited tender and only vendors who are already registered with BHEL and contacted through e-mail/courier may submit their offers. Unsolicited offers will not be considered for this enquiry.**

New vendors may download vendor registration forms from BHEL web site [www.bhel.com](http://www.bhel.com) and relevant data for formal registration may please be sent to Manager, Supplier development cell, BHEL Piping centre, 80, G N Road, T. Nagar, Chennai – 600017.

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.

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

| Sl no | Material code | ind | Description                              | qty nos | Drawing no        | Cur | Unit rate    | Total Value |
|-------|---------------|-----|--|---------|-------------------|-----|--------------|-------------|
| 1     | 920841100000  | *   | FORGING OD 200 X ID50- 200L SA182F91     | 20      | **                |     |              |             |
| 2     | 921175180000  |     | BW RED OD508X90 / OD355.6 X 29 SA182F91  | 1       | **                |     |              |             |
| 3     | 921175690000  | *   | MATPIECE ID390X135/ID350X60 SA182F91     | 8       | 4-80-301-70711/00 |     |              |             |
| 4     | 921175700000  |     | MAT PIECE OD762X81/ OD711X42 SA182F91    | 2       | 4-80-300-70215/04 |     |              |             |
| 5     | 921175710000  |     | MATPIECE ID730X58/OD711X42SA182F91       | 2       | 4-80-310-70712/00 |     |              |             |
| 6     | 921176860000  |     | MATCHING PIECE 406.4X72/323.9X31SA182F91 | 4       | 4 80 300 74459/00 |     |              |             |
| 7     | 925166700000  | *   | STUB OD114.3X13.49 L=122 SA 182 F91      | 6       | 4-80-999-93219/00 |     |              |             |
| 8     | 925167150000  | *   | TEMP.STUB RC 1.5" OD148 L=45SA182F91     | 84      | 4-80-999-93307/00 |     |              |             |
| 9     | 925167310000  | *   | SCREW PLUG RC 1.5 INCH SA182F91          | 90      | 4-80-999-93326/00 |     |              |             |
|       |               |     |  | 217     |                   |     | <b>Total</b> | -           |

\* Raw material or any other services shall not be sourced from China

\*\*detailed drawing shall be provided shortly



## 1.0 CODES

Materials shall meet Indian Boiler Regulations, (IBR) in addition to the latest Version of SA105, SA 182 & Code Case 2179 (for SA182 F92) 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.
- (c) Dimensions shall be as per Purchase Order.

## 4.0 HEAT TREATMENT

### 4.1 All fittings shall be heat treated as below:


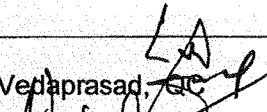
- SA 105 - Normalised
- SA 182 F11/F12/ F22 - Normalised & Tempered

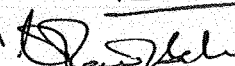

4.2 Fittings conforming to SA182 F91 & F92 shall be normalised at 1040 to 1070 deg C (for wall thickness larger than 75 mm, accelerated cooling may be done to obtain a fully martensitic structure) and tempered at 760±10 deg C. Soaking time: 1Hr. minimum. Still air cooling.

## 5.0 TESTING

- (a) **Product analysis:-** Product analysis shall be carried out on One piece / Heat / HT lot / Size.
- (b) **Corrosion test:-** Corrosion test (IGC) shall be carried out on one piece / Heat / HT lot / Size for SS fittings.
- (c) **MPI / LPI:-** 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:-** Tension test shall be carried out on one Test piece for each specification, heat, heat treatment lot and size.
- (e) **Bend test:-** (a) 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.  
(b) 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.

Approved by

G.Venkataramani, Engg&Quality  K. Vedaprasad, QC 

G.Panneer Selvam, QA  K. Ganeshan, OPC&MPL 



- (f) **Photomicrograph test for F91 & F92** :- Photomicrograph test shall be carried out on one per heat, per size. 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 Photomicrograph report to be provided. The actual magnification shall be indicated.
- (g) **Hardness test**:- (i) For SA 182 F91 :- 100% of fittings; Value: 191-250 BHN  
(ii) For SA 182 F92 :- 100% of fittings; Value: 196-250 BHN  
(iii) For other specn :- 10% of fittings; Value- As per specn.  
The hardness test values shall be indicated in the Test certificate.
- (h) **Ultrasonic Test**:- 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 F92  | = | Brown & Blue  |
| SA182 F316 | = | Black & Blue  |
- 8.3 MARKING (In English only) :-**
- 8.3.1** The fittings dispatched to **BHEL Stores** shall be hard punched / etched with Material code, Heat number, material specification, maker's emblem, Inspectors seal and Statutory authorities seal (as applicable).  
In addition, the above details along with size shall be paint stencilled on the fittings.

Approved by

|                               |  |                     |  |
|-------------------------------|--|---------------------|--|
| G.Venkataramani, Engg&Quality |  | K.Vedaprasad, QC    |  |
| G.Panneer Selvam, QA          |  | K.Ganeshan, OPC&MPL |  |



8.3.2 The fittings dispatched directly to project site as DTS shall be hard punched and paint stencilled 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 (In English only) :-**

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 IIC (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. Ladle 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. Photomicrograph test 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 Test certificate in lieu of chart/report is acceptable.

10.0 **Records of Revisions:-**

Revision 02 : Material specification SA 182 F316 added.

Revision 03 : i) Para 4.0, 6.0 included.

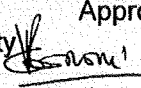

ii) Para 5.0 (b),(c),(h),(j), 8.0 and 9.0 (17) are revised.

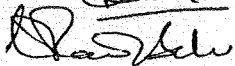
Revision 04 : i) New material specification SA 182 F92 added.

ii) Para 1.0, 3.0, 4.2, 5 (f), (g) & 8.2 are revised.

iii) Para 5 (a) to (h) are modified for better clarity.

Approved by

G.Venkataramani, Engg&Quality  K.Vedaprasad, QC 

G.Panneer Selvam, QA  K.Ganesan, OPC&MPL 