



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

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REF: ENQ NO:41011000002

DT: 11.11.2011

Sub: Procurement of Butt welded carbon and alloy steel fittings - indigenous.

**Ref: Enquiry No:PC:4101100002 dt 11.01.2011**

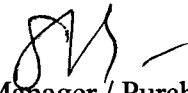
Please find the following tender documents for reference.

1. List of items and sample drawings.
2. Tech. delivery condition TDG: 102:04.

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.

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

| Sl no | Material     | Description                              | Drawing No        | qty nos | Cur | Unit rate |
|-------|--------------|--|-------------------|---------|-----|-----------|
| 1     | 921174180000 | ECC RED OD457X42/323.9X31-SA234WP91      | 4-80-301-63014/00 | 11      |     |           |
| 2     | 921174600000 | BWCONC RED 457 X42/ 323.9 X 31 SA234WP91 | As per standard   | 12      |     |           |
| 3     | 921174690000 | ECC RED 559X54 /457X43 SA234WP91         | 4-80-301-68291/00 | 5       |     |           |
| 4     | 921174710000 | BW CON RED 711 X 25/ 610X 23 SA234WP91   | As per standard   | 4       |     |           |
| 5     | 921174950000 | REDUCER OD 508X99 /OD457 X 43 SA234WP91  | 4-80-300-69302/00 | 10      |     |           |
| 6     | 921175000000 | REDUCER OD762X21 / OD 660 X 35 SA234WP91 | 4-80-310-69301/00 | 10      |     |           |
| 7     | 921175020000 | REDUCEROD910X55/OD762X21SA234WP91        | 4-80-310-69303/00 | 2       |     |           |
| 8     | 921175030000 | REDUCEROD813X43/OD762X21SA234WP91        | 4-80-311-69304/00 | 2       |     |           |
| 9     | 921175040000 | REDUCEROD814X52/OD762X21SA234WP91        | 4-80-311-69305/00 | 2       |     |           |
| 10    | 921175060000 | REDUCEROD711X20/OD660X36 SA234WP91       | 4-80-312-69326/00 | 10      |     |           |
| 11    | 921175070000 | REDUCEROD762X21/ OD711X 25 SA234WP91     | 4-80-312-69327/00 | 2       |     |           |
| 12    | 921175080000 | ECC REDOD965X 27/ OD762X21 SA234WP91     | 4-80-310-69332/00 | 1       |     |           |
| 13    | 921175120000 | RED OD 813X28/OD 762X21 SA234WP91        | 4-80-312-69529/00 | 10      |     |           |
| 14    | 921175170000 | BW RED OD355.6 X 29 / OD273X25 SA234WP91 | As per standard   | 2       |     |           |
| 15    | 921175950000 | CON RED OD355.6X54/OD323.9X50SA234WP91   | 4-80-304-71252/00 | 4       |     |           |
| 16    | 921175960000 | CONRED OD610X36/OD559X35SA234W91         | 4-80-312-71253/00 | 4       |     |           |
| 17    | 921175970000 | RED 406.4X38/ 323.9X31 SA234WP91         | As per standard   | 1       |     |           |
| 18    | 921175980000 | RED 406.4X38/355.6X29 SA234WP91          | As per standard   | 8       |     |           |
| 19    | 921175990000 | RED 711X45/355.6X29 SA234WP91            | As per standard   | 1       |     |           |
| 20    | 921176000000 | RED 711X45/406.4X38 SA234WP91            | As per standard   | 2       |     |           |
| 21    | 925179440000 | ECC RED OD 559X54/OD406.4X38-SA234WP91   | 4-80-301-62569/00 | 2       |     |           |
| 22    | 925247530000 | BW LR 90 DEG ELBOW OD 711 X 45 SA234WP91 | As per standard   | 11      |     |           |
| 23    | 925249590000 | BW LR 45 DEG ELL 273 X 25 SA234 WP91     | As per standard   | 8       |     |           |

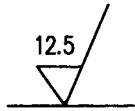
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| REV | DATE | ALTERED  |
|-----|------|----------|
| 01  |      | APPROVED |

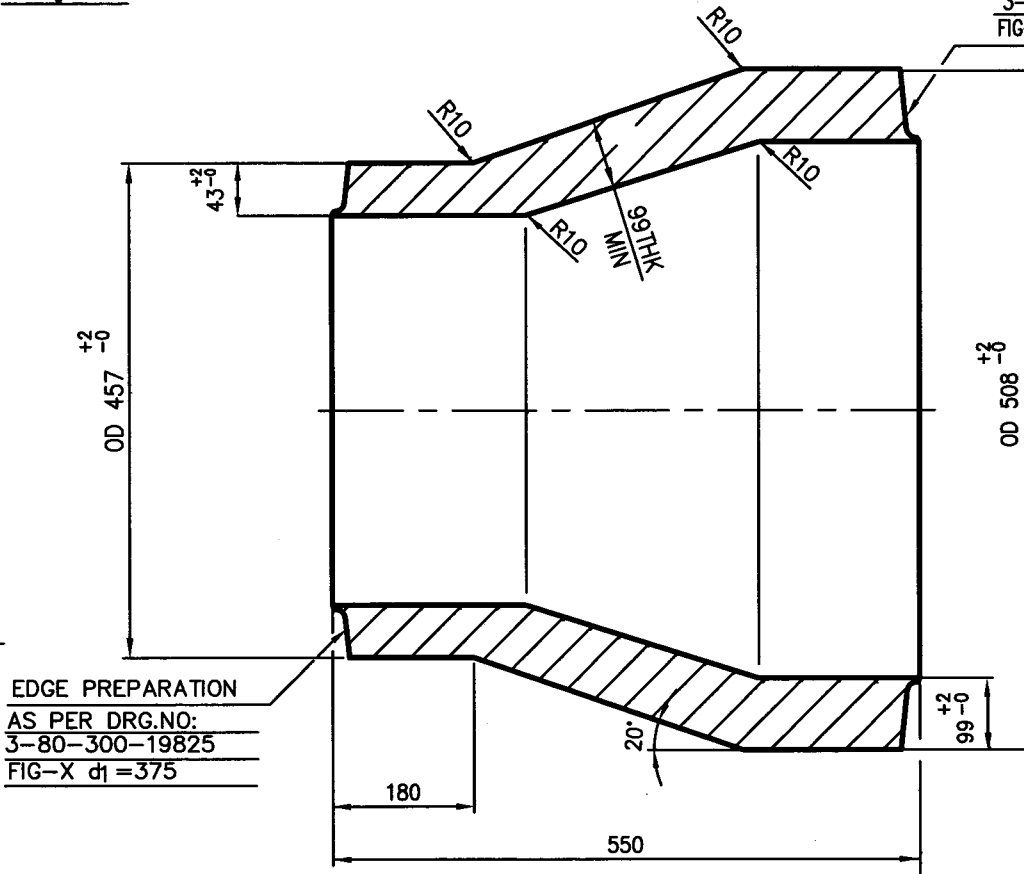
ALL DIMENSIONS ARE IN MILLIMETRES

**NOTES:**

- 1) DESIGN PRESSURE : 192 Kg/sq.cm(g)
- 2) DESIGN TEMPERATURE : 540°C



EDGE PREPARATION  
AS PER DRG.NO:  
3-80-300-19825  
FIG-X d<sub>1</sub>= 310



EDGE PREPARATION  
AS PER DRG.NO:  
3-80-300-19825  
FIG-X d<sub>1</sub>=375

|                   |             |                 |   |      |              |
|-------------------|-------------|-----------------|---|------|--------------|
| REDUCER           |             | 92 117 495 0000 | A | 435  | 000          |
| OD508x99/OD457x43 |             | SA234WP91       |   |      |              |
| VAR NO.           | DESCRIPTION | MATL. CODE      | A | UNIT | UNIT.WT.(Kg) |
|                   |             | MATL. SPECN.    | C | DI   | QTY.         |

|  |                                    |   |                |                         |                                      |      |                  |                 |
|--|------------------------------------|---|----------------|-------------------------|--------------------------------------|------|------------------|-----------------|
|  |                                    | <b>BHARAT HEAVY ELECTRICALS LIMITED</b><br>PIPING CENTRE<br>CHENNAI 600 017 |                | DRN                     | NAME                                 | SIGN | DATE             | NO.OF<br>VAR    |
|  |                                    |   |                | CHD                     | SUDHAKAR                             |      | 17.08.09         |                 |
|  |                                    |   |                | APPD                    | PARAM                                |      | 17.08.09         |                 |
| DEPT<br>CODE                                   | GRADE OF<br>UNTOL.DIM<br>C / M / F |   | SCALE<br>N.T.S | WEIGHT (KG).<br>435.000 | BHEL PO REF.NO:                      |      | ITEM NO.         | NO. OF<br>ITEMS |
| TITLE<br><b>REDUCER</b><br>(OD508x99/OD457x43) |                                    |   |                | CARD<br>CODE<br>U 01    | DRAWING NO.<br><b>4-80-300-69302</b> |      | REV<br><b>00</b> |                 |

Size A4



**1.0 CODES:-**

The fittings shall meet Indian Boiler Regulations (IBR) and the following requirements in addition to the standards specified in the Purchase Order (PO).

**2.0 RAW MATERIALS:-**

- a) All pipes used for fittings shall meet the respective specification. The test certificate shall be furnished.
- b) All mother pipes used for fittings shall be subjected to a hydraulic test as per SA 530 or UT as per ASTM E 213 at the mill
- c) All plates used for fittings shall be UT tested as per S1 of SA578 and acceptance norms shall be as per Level B of SA578
- d) The raw material forging shall be ultrasonically tested as per SA 388 and the acceptance norm shall be as per 3.3.4 of ASME Sec VIII Div 2.
- e) Steel for SA182 F11, F12 & F22 if indigenously procured, to be from following manufacturers approved under IBR for creep resistant steels: i ) Alloy Steel Plant Durgapur, ii ) Tata Iron & Steel company, Jamshedpur & iii ) Mahindra Ugine Steel Company, Mumbai.
- f) Carbon content of SA 234 WPB, WPC, SA 105 fittings shall be restricted to 0.25% max

**3.0 PROCESS:-**

- a) Process of manufacture shall conform to applicable standards.
- b) All fittings shall be of seamless unless otherwise specified in the purchase order.
- c) In case of welded fittings, WPS, PQR & welder qualification shall be approved by BHEL - PC, prior to start of welding.
- d) All fittings shall have smooth surfaces, workman like finish and free from loose scales and defects like laps, seams, folds, cracks, pitting etc.. Repair by welding is NOT permitted.
- e) Dimensions shall be as per ASME B16.9 or B16.28, Butt Weld edges shall be as given in Purchase Order. The ends of reducers shall have a straight portion of Minimum 13mm.
- f) Unless otherwise specified in the P.O SA 234 WP 11/12/22 fittings shall be supplied as per class 1, SA 182 F11/12 shall be supplied as class 2, SA 182 F22 shall be of class 3 only .

**4.0 HEAT TREATMENT:-**

4.1 All fittings shall be heat treated as below.

|                             |                         |
|-----------------------------|-------------------------|
| SA 234 WP B                 | - As per specification  |
| SA 105, SA234 WP C          | - Normalised            |
| SA234 WP11/ WP12/ WP22      | - Normalised & Tempered |
| SA182 F11/ F12/ F22         | - Normalised & Tempered |
| Stainless Steel :-          |                         |
| SA 182 F304/ 316/ 321/ 347  | - Solution annealed     |
| SA 403 WP304/ 316/ 321/ 347 | - Solution annealed     |

4.2 Fittings conforming to SA 234 WP91 and 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) All ferrous fittings shall be tested by MPI as per ASTM E-709 and SS fittings shall be LPI tested as per ASTM E 165.

S. Jayakumar, Engg

P. Elangovan, QA

Approved by

K. Vedaprasad, QC

K. Ganeshan, MPL



- (b) One fitting of each specification, heat, heat treatment lot and size shall be subjected to Tension Test as per applicable standard.
- (c) All fittings of wall thickness above 6mm or NB 200mm and above shall be Ultrasonically Tested as per SA 388; acceptance norms shall be 3.3.4 of ASME section VIII Div.2.
- (d) Hardness test shall be carried out on each fittings of WP91 / F91. For other fittings hardness shall be checked on 10% of the fittings.
- (e) In case of welded fittings; all the welds shall be 100% RT tested and acceptance norms shall be UW 51 of ASME Sec VIII DIV-1
- (f) The following supplementary tests shall be carried out for specifications namely SA105, SA 182 F11 / F12 / F22 / F91, SA 234 WPC / WP11 / WP12 / WP22 / WP91 ( No supplementary test applicable for SA 234 WPB )
  - a) Product analysis – one / heat / size.
  - b) Tension test – one / heat / heat treatment lot / size.
- (g) 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.

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

7.1 **PAINTING** : All fittings (except stainless steel and galvanised) shall be **painted** on the external surface as given below

- a) surface preparation : Blast cleaning
  - b) Primer coat : 50 microns of Red oxide zinc phosphate confirming to IS 12744
  - c) Final coat : 70 microns of Synthetic enamel paint confirming to IS2934 .
  - d) Shade : (i) smoke grey – shade no 692 of IS5 for all carbon steel fittings  
(ii) Sea green -- shade no 217 of IS5 for all Alloy steel fittings
- The internal surface shall be protected with rust preventive coating or rust inhibitor. Stainless steel and Galvanised fittings need not be painted.

7.2 **COLOUR CODING** : All fittings shall be colour coded circumferentially at ends as given below

|                   |   |      |
|-------------------|---|------|
| SA 234 WPB / WPBW | = | Red  |
| WPC / SA105       | = | Blue |

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|                           |   |                |
|---------------------------|---|----------------|
| WP11 / SA182 F11          | = | Green & White  |
| WP12 / SA182 F12          | = | Black & Red    |
| WP22 / SA182 F22          | = | Blue & Red     |
| WP91 / SA182 F91          | = | Brown & Red    |
| SA182 / SA 403 F / WP 304 | = | Blue & Yellow  |
| 316                       | = | Black & Green  |
| 321                       | = | Blue & Brown   |
| 347                       | = | Yellow & Black |

### 7.3 MARKING :

7.3.1 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).

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

If the thickness of the fitting is less than 6 mm, punching is not permitted and the above details shall be paint stenciled only. Fittings of size up to 2" (50mm) shall be tied together and the above details shall be punched / etched in a separate tag and tied to it.

7.3.2 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 7.3.1.

7.4 **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.

### 8.0 INSPECTION & CERTIFICATION : -

All fittings 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 III C shall be submitted along with the Work Test Certificate countersigned by the above authorities and shall include the following.

1. Test Certificate Number & date.
2. BHEL P.O Number & Amendment Number
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. Starting material details.
9. Steel making process
10. Laddle Analysis of Raw Material and product analysis of fitting.
- \*11. Positive Material Identification (PMI) report for Alloy steel fittings.
- \*12. Supplementary Test(Product analysis, Tension test..) results.
- \*13. Heat Treatment Chart.
- \*14. NDE report. (VISUAL.MPI, LPI,UT)
- \*15. Tensile Test Report
- \*16. Hardness Test Report

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- 17. Metallography Report along with photomicrograph with 500x ( min ) magnification.
- \*18. Dimensional conformance.
- \*19. RT test report / Results (for welded fittings)
- \*20. Guarantee of HTP shall be given as follows:- "Fittings are capable of withstanding without failure, leakage 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.

#### 9.0 RECORDS OF REVISION :-

- Rev 01 : a) Fully revised for better clarity.  
: b) Para 2.0 e added.
- Rev 02 : a) Para 2.0 (c): UT acceptyance norms revised from level A to B.
- Rev 03 : a) Fully revised for better clarity.  
: b) Para 4.2,6.0, 8.0 (11) added.  
c) Para 2 (d) ,4.1, 5 (d) are revised.
- Rev 04 : a) Para 5.0 (g), 7.0 and 8.0 (17) are revised.

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