



**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: PC9023

DT: 01.09.2010

RATE CONTRACT

Sub: Procurement of BW fittings.

Ref: Enquiry No:PC:9023 dt 01.09.2010

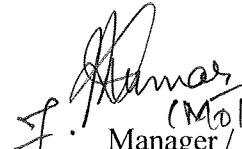
Please find the following tender documents for reference.

1. List of items and sample drawings.
2. Bank Guarantee format.
3. Terms and conditions as per existing MOU
4. TDC & QP.

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 and relevant data for formal registration.


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

Engl no	Material code	Drawing no.	Material Description	Tentative RC qty(nos)
1	921044930000	As per standard	BW LR 45DEG ELL 355.6 X 7.92 SA234WPB	10
2	921171320200	As per standard	BW CON RED 73X7.01 60.3X5.54 SA234WPB	10
3	925041570000	As per standard	BW LR 90DEG ELL 48.3 X 10.15 SA234WPC	400
4	925174220000	As per standard	BW CON RED 88.9X15.24/73X9.53 SA234WP22	60
5	925174330000	As per standard	BW CON RED 88.9X5.49/33.4X4.55 SA234WPB	50
6	925253850000	As per standard	BW EQT 219.1 X 8.18 SA234WPC	50
7	925243180000	As per standard	BW LR 90DEG ELL 368 X 48 SA234WPC	300
8	925248900000	As per standard	SR 90DEG ELBOW 457.2X22.2SA234WP22CL1	30
9	925256180000	As per standard	BW EQT 114.3 X 3.05 SA403WP304H	30
10	925259360000	As per standard	BW UEQT323.9X4.57/273X4.18SA403WP304H	10
11	925259360500	As per standard	BW UEQT 323.9X4.57/273X4.18 SA403WP304H	20
12	925166930000	3-80-999-97758	PIPECAP 168.3 X27.5 WITH SWSTUB NB25 AS	60
13	925179400000	As per standard	BW CON RED 558.8X32/508X30SA234WP22CL1	10
14	925259280000	As per standard	BW EQT 355.6 X 6.35 SA403WP304H	20
15	925259310000	As per standard	BWUEQT355.6X6.35/323.9X4.57 SA403WP304H	10
16	961753850000	3-80-999-97738	PIPECAP168.3 X7.11WITH NB 50 SW STUB(CS)	30
17	961753860000	3-80-999-97739	PIPECAP219.1X6.35WITH NB 50 SW STUB(CS)	30
18	961753870000	3-80-999-97740	PIPECAP219.1X8.18WITH NB 50 SW STUB(CS)	30
19	961753880000	3-80-999-97741	PIPECAP323.9X10.31WITH NB 50 SW STUB(CS)	60
20	961753890000	3-80-999-97742	PIPECAP168.3X10.97WITH NB 50 SW STUB(AS)	60
21	961753900000	3-80-999-97743	PIPECAP323.9X20WITH NB 50 SW STUB(AS)	30



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:-

- All pipes used for fittings shall meet the respective specification. The test certificate shall be furnished.
- 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
- 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
- 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.
- 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.
- Carbon content of SA 234 WPB, WPC, SA 105 fittings shall be restricted to 0.25% max

3.0 PROCESS:-

- Process of manufacture shall conform to applicable standards.
- All fittings shall be of seamless unless otherwise specified in the purchase order.
- In case of welded fittings, WPS, PQR & welder qualification shall be approved by BHEL - PC, prior to start of welding.
- 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.
- 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.
- 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, SA 234 WP C	- Normalised
SA 234 WP 11/ WP 12/ WP 22	- Normalised & Tempered
SA 182 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 SA 182 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) 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 conforming to IS 12744
 - c) Final coat : 70 microns of Synthetic enamel paint conforming 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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P. Elangovan, QA			K. Ganeshan, MPL



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 acceptance 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.

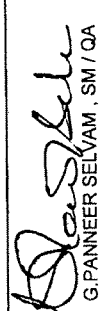
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K. Ganeshan, MPL

BHARAT HEAVY ELECTRICALS LIMITED PIPING CENTRE, MADRAS - 17 QUALITY ASSURANCE & CONTROL DEPT.			STANDARD QUALITY PLAN FOR PIPE CAP WITH SW STUB AS PER BHEL DRAWING UNDER PVM CATEGORY Specification : SA105, SA182F11, F12, F22				QP NO : QPG: 44 REV.NO : 00 DATE : 02-06-2009					
REF: BHEL TDC No. : TDG:102 (latest revision)												
SL. NO.	COMPONENT OR OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	TYPE OF RECORD			AGENCY	REMARKS
1	2	3	4	5	6	7	8	9	D	M	B	15
1.0	RAW MATERIAL											
1.1	Plate & Rod	Chemical Composition, Mechanical Properties & UT	Major	Verification of MTC & Ladle Analysis Report	100%	As per Required Material Specification & BHEL TDG:102		MTC	X	V	V	MTC - Mill Test Certificate
1.2		Surface defect	Major	Visual	100%	As per Required Material Specification		Report	X	V	V	
2.0	PIPE CAP											
2.1	Forming	Process parameters	Major	Temperature, Measurement & Visual	100%	ASME B16.9, Appd.Procedure & BHEL Drg.		Internal report	---	P		
2.2	Heat Treatment after forming	Rate of Heating, Rate of Cooling & Soaking time	Critical	Temp & Time graph	100%	ASME SA 234 & BHEL TDG:102		HT Chart	X	P	V	Review of HT chart by BHEL
2.3		Hardness	Major	Hardness test	10%	ASME SA 234 & BHEL TDG:102		Test Report	X	P	W	
2.4	Mechanical test (Mandatory)	YS, UTS, % Elongation	Major	Tensile test,	One Sample / Heat / Size/ HT Batch	ASME SA 234 & BHEL TDG:102		Test Report	X	P	W	
2.5	Supplementary tests as per TDC on Finished Product	Product Analysis	Major	Chemical Composition	One Sample / Heat / Size	ASME SA 234 & BHEL TDG:102		Test Report	X	P	V	
2.6		YS, UTS, % Elongation	Major	Tensile test,	One Sample / Heat / Size/ HT Batch	ASME SA 234 & BHEL TDG:102		Test Report	X	P	W	
2.7	NDE	UT	Major	UT	100%	SA388 ASME SecVIII Div-2, Cl.3.3.4		Test Report	X	P	W	UT-Ultrasonic test.
2.8		MT	Major	MT	100%	ASTM E709 ASME B31.1 Cl. 13.6.4.3		Test Report	X	P	W	MT-Magnetic Particle Test
3.0	STUB WELDING											
3.1	Welding of stub	Welder qualification	Major	Review	100%	ASME Sec.IX, & IBR		WPS and PQR	X	P	V	
LEGEND: M - Manufacturer; B - BHEL/ BHEL Nominated Agency; P - Perform; V - Verification/Review; W - Witness; H - Hold. D - Documents required if marked "X"												
 PREPARED & REVIEWED BY: G.PANNEER SELVAM, SM / QA  APPROVED BY: P.ELANGOVAN, SDGM / QA												
PAGE : 1 of 2												

 BHARAT HEAVY ELECTRICALS LIMITED PIPING CENTRE, MADRAS - 17 QUALITY ASSURANCE & CONTROL DEPT.				STANDARD QUALITY PLAN FOR PIPE CAP WITH SW STUB AS PER BHEL DRAWING UNDER PVM CATEGORY Specification : SA105, SA182F11, F12, F22				QP NO : QPG: 44 REV.NO : 00 DATE : 02-06-2009				
REF: BHEL TDC No. : TDG:102 (latest revision)												
SL. NO.	COMPONENT OR OPERATION	CHARACTERISTICS	CLASS	TYPE OF CHECK	QUANTUM OF CHECK	REFERENCE DOCUMENT	ACCEPTANCE STANDARD	TYPE OF RECORD		AGENCY		REMARKS
1	2	3	4	5	6	7	8	9	D	M	B	15
3.2	Welding of stub	Stub Welding fit up	Major	Review	100%	As per BHEL Drawing		Report	---	P	V	
3.3	Heat Treatment after Stub welding	Rate of Heating, Rate of Cooling & Soaking time	Critical	Temp & Time graph	100%	ASME 3.1 Cl. 132		HT Chart	X	P	V	
3.4	NDT for weldment	MT	Major	MT	100%	ASME B31.1 Cl. 13.6.4.3		Test Report	X	P	W	
4.0	FINAL INSPECTION											
4.1		Finish, Dimensions, & Edge preparation	Major	Visual & Measurement	100%	ASME B16.9, BHEL Drg.. & P.O.		Report	X	P	W	
4.2		PMI-Chemical	Major	PMI	100%	ASME SA 234 & BHEL TDG:102		Test Report	X	P	W	For Alloy steel only
4.3		IBR Certification	Major	all tests as per IBR	100%	IBR		FORM-IIIIC	X	P	IBR	
4.4		Marking / Color coding	Critical	Visual	100%	BHEL TDG:102 & P.O.		Report	X	P	W	
4.5		Surface Protection, Preservation & Packing	Critical	Visual	100%	BHEL TDG:102 & P.O.		Report	X	P	W	
5.0		Inspection clearance	Critical	Verification	100%	All reports as required in this QP & BHEL TDG:102.		Report	X	P	W/V	CHP

LEGEND: M - Manufacturer; B - BHEL/ BHEL Nominated Agency; P - Perform; V - Verification/Review; W - Witness; H - Hold. D - Documents required if marked "X"

NOTES:

1) IN CASE OF NO CORRELATION WITH RAW MATERIAL ORIGINAL TEST CERTIFICATES, ALL TESTS AS PER SPECIFICATION SHALL BE WITNESSED BY BHEL / BHEL NOMINATED INSPECTION AGENCY. IN CASE, ON REVIEW OF MTC/TEST REPORT, IF NOT FOUND ACCEPTABLE BY BHEL AS PER SPECIFIED REQUIREMENT, ENTIRE LOT WILL BE REJECTED.

2) CALIBRATED INSTRUMENTS SHALL BE USED DURING TESTING

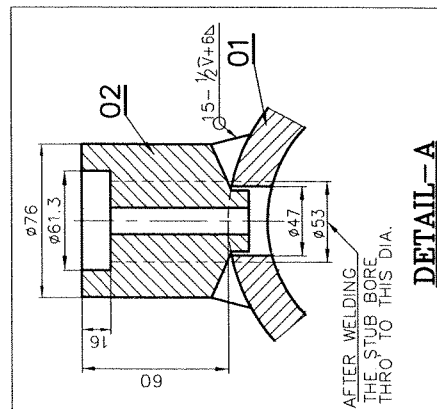
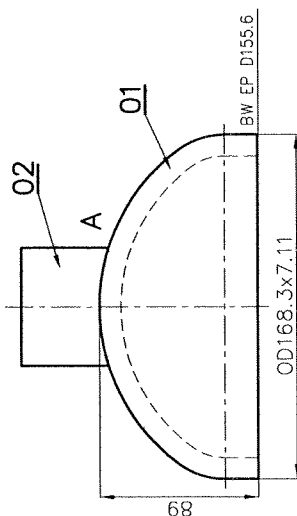
3) CHEMICAL & MECHANICAL TESTS SHALL BE PERFORMED AT IN-HOUSE OR NABL-APPROVED LABORATORIES.

PREPARED & REVIEWED BY:  G. PANNEER SELVAM, SM / QA

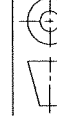
APPROVED BY:  P. ELANGO VAN, SDGM / QA

PAGE : 2 of 2

01. DESIGN PRESSURE: 85 kg/sq.cm. (g)
02. DESIGN TEMPERATURE: 370°C
03. PIPE CAP AS PER ASME B16.9 & SA234.
04. TOLERANCES OF PIPE CAP AS PER DRG 4-80-301-26192.
05. MANUFACTURING, INSPECTION, TESTING AS PER IBR.
06. FINISHED ASSEMBLY CODE No. 96 175 385 0000.
07. LOCATION OF IDENTIFICATION MARKING ON THE PIPE CAP SHOULD BE SUCH THAT IT IS RETAINED AFTER WELDING THE STUB.



ITEM NO.	DESCRIPTION	DRAWING NUMBER	ITEM NO	MATERIAL CODE	UNIT WEIGHT
VAR NO.			VAR NO	MATERIAL SPECN	QUANTITY
02	ASME B16.11 SW STUB NB50 CL3000	4-80-999-97625A 201		15 339 144 0000 SA105	1.330 1
01	BW PIPE CAP ASME B16.9 168.3x7.11	3-80-999-97738		SA234WPC	3.000 1

		BHARAT HEAVY ELECTRICALS LTD., PIPING CENTRE, CHENNAI, 600 017				NAME R. ANANTH R. ANANTH M.N.VASUDEVAN	SIGN 	DATE 17.11.2008 17.11.2008 17.11.2008
DEPT. CODE	GRADE OF UN TOL. DIM C/M/F		SCALE N.T.S.	WEIGHT (Kg) 4,330	REF. TO ASSY / OLD DRG.			
TITLE PIPE CAP 168.3x7.11 WITH NB50 SW STUB CS		CARD CODE U 01		DRAWING No. 3-80-999-97738		REV 01		

BY 3216