



Bharat Heavy Electricals Limited

(A Govt. of India Undertaking)

Piping Centre , 80, G. N. Chetty Road, CHENNAI – 600 017

Phone : 91 (044) 28161243, Fax : 91 (044) 28161341

e-mail: varada@bhelmpc.co.in

OPEN TENDER REF : ENQUIRY 4101300059 DT 23.10.2013

1. This Tender is an Open Tender for manufacturing & supply of “ **Fabricated Tees , Y-Pieces and Pipe with attachments**” as per BHEL’s requirements .
2. The quoted price shall be “FIRM” till the complete execution of the scope.
3. All the bids and supporting documents submitted shall be in English only.
4. Last date for submission of Bid **15.11.2013 - Time - 14.30 Hours.**
5. Part I and Part II will be opened on **15.11.2013 - Time - 14.30 Hours.**
6. Tender shall be processed through Price bid opening. However BHEL reserves the right to go for "Reverse Auction" instead of sealed tender bid which will be decided after technical cum commercial bid evaluation.
7. Ordering will be made on competitiveness of prices quoted against each item and not as total package.
8. **Bids shall be submitted in THREE PARTS. Bidders shall submit the Bid (Part I & II in one envelope and Part III in separate envelope) in English language as indicated below:**

Envelope 1 : This sealed envelope should contain

PART I – “ELIGIBILITY BID”:

- Point by point confirmation for Annexure A ie Eligibility criteria
- All supporting documents required for the Eligibility criteria.

Only the bids meeting eligibility criteria will be considered for further evaluation of technocommercial and price bids. Other bids are liable for rejection.

PART II – “TECHNO COMMERCIAL BID”:

- Point by point confirmation for Annexure B ie Technical Requirements
- Point by point confirmation for Annexure C ie Commercial terms



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Envelope 2 : This sealed envelope should contain

PART III – “PRICE BID”:

This sealed envelope should contain price details as per Annexure – D (List of items).

9. The Bid (consisting of three inner envelopes mentioned above) , sealed and superscribed as "Parts I , II & III inside" indicating Enquiry No., Due Date, Address & Reference of the Bidder should reach the below mentioned address on or before the due date by 14:30 Hrs (IST). BIDS RECEIVED AFTER 14:30 Hrs (IST) WILL NOT BE CONSIDERED.

The above bid (a single envelope containing three inner envelopes) shall be sent in a sealed cover duly indicating

Enquiry No. & date, Tender Opening date and Item Description: “Fabricated Tees , Y-Pieces and Pipe with attachments”.

To

SM / Purchase / Fittings

BHEL - Piping Centre

Old No 93, (New No:80) G N Chetty Road

T Nagar / Chennai 600 017 . PHONE : 28161243

Senior Manager / Purchase
BHEL / Piping Centre
Ph: 044-28161243
E-mail: varada@bhelmpc.co.in

SL NO	ELIGIBILITY CRITERIA ##	VENDOR'S RESPONSE [YES / NO] To attach supporting documents where ever called for
1	Firm shall be a regular manufacturer. Traders /Distributors/Dealers are not acceptable.	
2*	Firm should have made a turnover of at least Rs. 5 crores during last year. <u>Indigenous vendors</u> shall provide Company Financial statement - Balance Sheet and P&L statement for the past two years . <u>Foreign vendors</u> shall provide report from third party agency like D&B (or) Copy of Financial statement - Balance Sheet and P&L statement on Financial soundness.	
3	<u>For Indigenous vendors only</u> Whether firm is referred to BIFR or Firms having strictures/hold by any other Government agencies ? If so, such firm will not be considered.	
4*	Vendor shall have prior experience in fabrication of items similar to tendered items viz Fabricated Tees / Y Pieces / Pipe with attachments. Experience list indicating the details like customer,project, size, spec, qty and year of supply shall be enclosed.	
5*	Firm shall have valid ISO 9001 - 2008 certification. Copy of certificate shall be submitted	
6	Acceptance to BHEL TDC's Ref.: TDG:108 Rev:07 and TDG 109 Rev 00.	
7	To confirm availability of in-house facility for welding of P1, P5A & P15E-Gr1 material and their combinations and approved WPS / PQR by third party viz..Lloyds,BV,SGS, DNV,etc. for the same.	
8	To confirm availability of in -house facility for heat-treatment using a furnace calibrated upto 900 deg.C to carry out Post Weld Heat- treatment (PWHT). Vendor shall also have knowledge of HT cycles.	
9	For Indigenous vendor :- a) Firm shall have IBR qualification. b) Vendor shall have IBR qualified welders for CS, AS (P22, P91 & Combination).	
<p>NOTE:</p> <ol style="list-style-type: none"> Supporting documents shall be provided for all the sl nos marked with “ * “ without fail. Bids fulfilling the above criterias specified vide Sl no 1 to 9 will be considered for further evaluation. Bids not meeting the above criteria are liable for rejection. <p>## Vendors already registered with BHEL/PC for this category of material need not fill and send this Annexure A</p>		

TECHNICAL REQUIREMENTS

Fabricated Tees, Y-Pieces and Pipe with attachments pertaining to SA105, SA182F22,SA182F91 specification.

SL. NO	DESCRIPTION	VENDOR'S RESPONSE [YES / NO] To attach supporting documents where ever called for
01	<p>Point to point acceptance to BHEL TDC (i) TDG:108 Rev:07 (ii) TDG 109 Rev 00 and (iii) Reference TDC 101 rev 05</p> <p>Any deviation to the TDC requirements shall be clearly spelt out in bid under the heading "DEVIATIONS". Any undisclosed clarifications / deviations shall not be accepted at later stage.</p>	
02	<p>Confirmation to drawings sent by BHEL</p> <p>Any deviation to the drawings shall be clearly spelt out in bid under the heading "DEVIATIONS". Any undisclosed clarifications / deviations shall not be accepted at later stage.</p>	
03	<p>Vendor shall source the Pipe as raw materials from the following BHEL approved sources.</p> <ol style="list-style-type: none"> 1. Vallorec & Mannesmann, Germany 2. Yangzhou Chengde Steel Pipe Co.LTD, China 3. Wayman Gordan, USA 4. NKK Tubes, Japan 5. IBF Spa, Italy 6. JFE (Kawasaki), Japan 7. Bentler, Germany 8. Sumitomo Metals, Japan 9. Tennaris (Dalmine), Italy 10. Products Tublares, Spain 11. Tubacex, Spain <p>Vendor shall get Pipes from any other source only after specific approval from BHEL. In such case, vendor shall furnish the details of alternate source and their credentials.</p>	
04	<p>Vendor shall source the forgings as raw materials from following BHEL approved sources.</p> <ol style="list-style-type: none"> 1. Forge Fedriga, Italy 2. Forgiatura Morandini, Italy 3. Forgiatura Marcora, Italy 4. La Forgia Di Bollate, Italy 5. Pilsen Steel, Italy 6. Abs-Italfond Morandini, Italy 7. Foc Ciscato, Italy 	

	<p>8. Veronal Steel, Italy 9. Forge Morandini, Italy 10. Sider Plating Scaiigera, Italy 11. Afar spa, Italy 12. Forge Monchieri spa, Italy 13. Metalcam spa, Italy 14. Coprosider ISF spa, Italy 15. Olifer ACP spa, Italy, 16. Breitenfeld Edelstahl AG Austria</p> <p>Vendor shall get forgings from any other source only after specific approval from BHEL. In such case, vendor shall furnish the details of alternate source and their credentials.</p>	
05	Machinery list with calibration <u>details shall be submitted</u>	
06	Vendor shall submit the credentials of having supplied the tendered items to power plants of higher MW rating and same shall be working continuously and satisfactorily for a minimum period of 3 years.	
07	NDE procedures viz. PT, MT, UT & RT approved by Level-III personnel <u>shall be submitted.</u>	
08	Availability of in-house facility for heat-treatment using a furnace calibrated upto 900 deg.C to carry out Post Weld Heat-treatment (PWHT). Vendor shall also have knowledge of HT cycles. <u>Details to be furnished</u>	
09	Availability of in-house facility for welding of P1, P5A & P15E-Gr1 material and their combinations and approved WPS / PQR by third party viz..Lloyds,BV,SGS, DNV,etc..for the same. <u>Details to be furnished</u>	
10	For Indigenous vendor :- a) Firm shall have IBR qualification. b) Vendor shall have IBR qualified welders for CS, AS (P22, P91 & Combination). <u>Details to be furnished.</u>	
11	Indigenous Vendors: Inspection shall be done at Vendor's works by BHEL/ BHEL authorised inspection agency & Customer as applicable.	
12	Overseas / Foreign Vendor :- Item shall be inspected by IBR approved third party agencies viz,..BV, Lloyds, SGS, DNV, etc..on behalf of BHEL.	
13	Unpriced bid (copy of Annexure D without the price details) clearly indicating the items quoted and not quoted shall be submitted.	

14	<p>Vendors shall comply with all the above requirements. If any deviations to the requirements shall be clearly spelt out in bid under the heading “DEVIATIONS”. Any undisclosed clarifications / deviations shall not be accepted at later stage.</p>	
15	<p>Quantity indicated in the Annexure - D –List of items is classified as follows:-</p> <p>Column A – (General requirement) - Ordering of quantity mentioned in this column of Annexure D is subject to approval of the vendor by BHEL.</p> <p>Column B – (Customer specific requirement) Ordering of quantity mentioned in this column of Annexure D is subject to approval of the vendor by BHEL and BHEL’s Customer.</p>	
15A	<p>For certain Projects which calls for customer approval , Vendors shall duly fill & submit the 7 pages questionnaire for approval. Offer acceptance for this quantity (column B mentioned above) is subject to customer approval only.</p> <p>7 Page questionnaire shall be provided by BHEL after technocommercial acceptance of the vendor.</p>	
16	<p><u>New Vendors:</u></p> <p>Fulfillment and assessment of vendors will be based on filled-in- Supplier Registration Forms (SRF). Vendors who have not registered with BHEL Piping Centre shall send the duly filled “Supplier Registration” forms available in website http://www.bhel.com/vender_registration/vender.php .BIDDERS.</p> <p>This shall be sent us in a separate cover addressed to-</p> <p>Sr Manager Supplier Development Cell BHEL:PIPING CENTRE G N Road T.Nagar Chennai – 600 017</p> <p>In case the firm is already registered with any of the BHEL units , the proof for the same shall be furnished</p>	

SL NO	COMMERCIAL TERMS	VENDOR CONFIRMATION (To attach supporting documents where ever called for)
1	Address : Full address of the Manufacturing unit and the corporate office along with the contact details to be provided .	
2	<p>Delivery period – Supplies to be completed within 4 months from the date of LOI / Purchase Order.</p> <p>Delivery is the essence of the Contract/ PO. BHEL may accept or reject the bid if delivery is not as specified, or if offered delivery is not suiting Project Plan/ Production plan as per BHEL.</p> <p>BHEL has the right to order partly or fully considering the various requirements.</p> <p>BHEL may short close/cancel an order or divert to another vendor at any time during the currency of the Contract/PO irrespective of the PO Delivery date</p> <p>a) if the performance of the vendor is poor, b) if the delivery requirement of the item is very critical and not being met, c) if there is no response for improvement in delivery as per BHEL requirement.</p>	
3	<p>Delivery Terms:</p> <p><u>Foreign Bidders</u> shall submit their bid on CFR, Chennai (preferred) or FOB (port name to be mentioned) basis. Prices shall include Testing , Inspection , Packing & Forwarding charges. Do not quote on Ex-Works basis. Vendors quoting on CFR basis shall arrange for FREE container retention period of 21 days for clearance of cargo.</p> <p><u>Indian Bidders</u> shall submit their bid for FOR Destination - BHEL Trichy Stores / Any site in India (inclusive of Packing , Forwarding , Freight & Transit Insurance). Rates quoted shall be inclusive of all charges. Taxes & Duties to be indicated separately. Do not quote on Ex-Works basis .</p>	
4	<p>Bids shall be free from CORRECTION AND ERASURES. Corrections if any, must be attested. Note: Bidders are requested to submit their bids only through sealed bids. As the part II (priced bid) will not be opened before the technical evaluation is completed, bidders are requested not to submit their bids through email/fax etc.</p>	
5	Validity: Bidder shall give a minimum validity of 90 days from the date of Technical bid opening.	
6	Fixed price: All items should be quoted on "Per unit basis". Prices quoted by the bidder shall be fixed and not subject to any escalation whatsoever during the period of bid validity and execution of the Purchase Order. A bid submitted with an adjustable price will be liable for rejection.	
7	Bid currency: Indian bidders should submit the prices only in Indian Rupees. Foreign bidders may submit their bid in EURO / USD / GBP. For the evaluation purpose the exchange rate (TT – Selling Rate of State Bank of India) on technical bid opening date will be considered.	
8	Taxes and Duties: (for Indian Bidders only) All Taxes and Duties payable as extra to the quoted price should be specifically stated in their bids along with CST & TNGST No / Tariff No. etc., failing which the purchaser will not be liable for payment of such Taxes and Duties.	ED – CST / VAT – Any other taxes -
9	<p>Payment Terms: NO ADVANCE PAYMENT SHALL BE MADE BY BHEL.</p> <p>Indian Bidders - The payment term is 100% payment after 45 days against receipt of site acknowledged LR . Despatch documents shall be directly sent to BHEL and not to be routed through Bank. As per policy, LC will not be opened. Bids with LC requests/advance payments are liable for rejection.</p>	

	<p>Payment shall be made against presentation of following documents to our Finance Department . However a copy of Invoice and site acknowledged LR shall be sent to Purchase department immediately after the dispatch is effected.</p> <ul style="list-style-type: none"> • Invoice in Triplicate • Delivery Challan in duplicate. • Guarantee certificate in duplicate. • Site acknowledged Lorry Way Bill Copy / Receipt of material at Trichy stores • Inspection report & Test Certificate copies • ED gate pass original or copy with a confirmation that the original is sent with the goods. <p>Foreign Bidders - Payment shall be made on 100% CAD basis (Cash against documents) with PBG for 10% of PO Value . If LC is requested , loading charges @ 1.5% of the basic rate will be applicable . Documents required for payment :</p> <ul style="list-style-type: none"> • Bill of Lading • Invoice • Packing list • Country of origin certificate • Inspection report • Test Certificate / Compliance certificate • Performance Bank Guarantee 	
10	<p>INDIAN AGENT FOR FOREIGN PRINCIPAL: BHEL prefers the manufacturers to quote directly. In case this is not possible and the bid is being submitted through an Indian agent, the following details are to be furnished along with the bid:</p> <ol style="list-style-type: none"> a. The letter from their Principal authorising the Indian agent to submit the bid on their Principal's behalf. In case the Indian agent submits bid on their own letter head then a covering letter (in original) from the Principal should be enclosed, clearly mentioning that they are bound by the bid submitted by the Indian agent on their behalf. b. Precise relationship between foreign suppliers and their Indian agents and their mutual interest in business, should be clearly spelt out. c. Any payment, which the agent receives in India or abroad, from the foreign supplier, whether as a commission or as a general retainer fee is to be mentioned in the bid. d. All services to be rendered by the agent, whether of general nature or in relation to the particular contract, must be clearly stated by the foreign supplier and the Indian agent. e. The amount of agency commission agreed to between the foreign principal and the Indian agent should be specifically disclosed and the agency commission will be paid in Indian Rupees only on satisfactory completion of the contract. f. For calculation of rupee equivalent of agency commission, exchange rate as prevailing on the date of order will be taken. g. Copy of current agency agreement is to be enclosed without which the bid is liable for rejection. 	
11	<p>Performance Bank Guarantee (PBG) – For FOREIGN VENDORS: The Bidder, in the event of an order, should furnish a Performance Bank Guarantee from any one of the attached list of consortium banks or counter-guaranteed by any one of this list of banks, at no extra cost in BHEL's Proforma which will be provided by BHEL along with the order, for an amount equivalent to 10% (Ten percent) of the value of the contract. The Bank Guarantee should remain in full force and effect during a period of 24 months from the date of dispatch of materials or 18 months from the date of their commissioning whichever is earlier with an additional claim period of two months.</p>	

12	Guarantee Clause : Vendors shall guarantee the supplies for a period of 24 months from the date of dispatch of materials or 18 months from the date of their commissioning which ever is earlier.	
13	Liquidated Damages: If the supplier fails to deliver the fittings within the period specified in the contract the purchaser shall deduct Liquidated Damages, a sum equivalent to 0.5% of the price for each week of delay up to a maximum of 10% of the price of delayed/undelivered portion. LD, if applicable, will be levied from the order delivery date to the date of Bill of lading/LR in case of CFR/FOR contracts and to the date of the inspection clearance in case of FOB contracts. Grace periods are not acceptable.	
14	Risk Purchase: Alternatively the purchaser at his option will be entitled to terminate the contract and to purchase elsewhere at the risk and cost of the seller either the whole of the goods or any part which the supplier has failed to deliver or despatch within the time stipulated as aforesaid or if the same were not available, the best and the nearest available substitute therefore. The supplier shall be liable for any loss which the Purchaser may sustain by reason of such risk purchases in addition to penalty at the rate mentioned under liquidated damages.	
15	The correspondence between the bidder and BHEL through email is considered to be valid document legally though not signed. It is treated as valid confirmations made on behalf of the respective company and comes under the legal ambit of the business transaction and hence binding on both the parties.	
16	Bidders participating in the tender should declare in their technical bid whether they have been black-listed / kept on hold / given Business holiday for a specified period by any Public Sector Undertaking or Government Departments. The reasons for such action with details and the current status of such hold shall be clearly furnished to BHEL. If no such details are mentioned in the bid, it will be construed that the bidder is not under any such hold. However, at a later date if it comes to the notice of BHEL about any such hold under enforcement, BHEL reserves the right to reject the bid at any point of time and also under any stage of the finalisation of the tender. Such bidders will not be permitted to participate in the further tender proceedings and will be communicated suitably	
17	Inspection : For Indigenous vendors : Inspection shall be by BHEL / BHEL approved third party inspection agency . No inspection charges are applicable to the vendor. Inspection charges shall be borne by BHEL . However testing charges shall be included in vendors scope. For Foreign vendors: Inspection shall be by reputed agencies like Lloyds , BV , SGS , TUV etc . (Vendor shall indicate the name of the agency in the technical bid). Inspection charges shall be included in the unit rate of quoted price for each item. Kindly do not quote inspection charges for total package since ordering will be done on itemwise L1 vendor only.	
18	Technocommercial evaluation will be made on item level basis . Item level acceptance / rejections shall be done . Quotation for acceptable items only will be considered .	
19	BHEL reserves the right to negotiate L1 rate or re float the tender opened if L1 price is not the lowest acceptable price to them inter-alia other reasons.	
20	Any other conditions which might have been quoted by the seller and are in contravention to the terms prescribed in the order and which have not been specifically accepted in by purchaser will not be applicable to the contract.	
21	BHEL/End customer reserves the right to inspect the item ordered at any stage at vendor's works.	
22	Date of price bid opening/Reverse Auction will be informed later after acceptance of bid on technocommercial ground.	

23	<p>Evaluation of bids:</p> <p>Lowest Bidder (L1 bidder) will be determined for each SI no based on the net cash out flow to BHEL FOR/Trichy basis. Ordering will be made on competitiveness of prices quoted against each item and not as total package.</p> <p>Customs Duty as applicable to BHEL & Inland transport from the port of discharge upto Trichy stores will be loaded to foreign bids for comparison with Indigenous bids to obtain net cash outflow to BHEL. Ranking will be based on Net Cash Outflow to BHEL.</p>					
24	<p>Note :</p> <p>(i) Ordering of quantity mentioned in column A (General requirement) of Annexure D is subject to approval of the vendor by BHEL.</p> <p>(ii) Ordering of quantity mentioned in column B (Customer specific requirement) of Annexure D is subject to approval of the vendor by BHEL and BHEL's Customer.</p>					
25	<p>INTEGRITY PACT</p> <p>Integrity pact (To be filled and submitted with Technical bid without fail. Your offer will be considered only after signing and submitting the Integrity pact. Otherwise your offer is liable to be rejected).</p> <p>An Independent External Monitor shall monitor this tender whose contact details are as given below:</p> <p><i>Shri J. M. Lyngdoh , IAS (Retd.)</i> <i>Plot No. 144-145,</i> <i>Pragati Resort,</i> <i>Proddator Village & P.O.,</i> <i>Shankarpally Road,</i> <i>Rangareddy Distt. (AP)- 500 033</i></p> <p><i>All correspondence with Shri J M Lyngdoh, IAS(Retd) has to be with registered post only as courier service is not available there.</i></p>					
26	<p>LIST OF DOCUMENTS ENCLOSED :</p> <ul style="list-style-type: none"> • List of Consortium Banks • Performance Bank Guarantee Format • Integrity Pact 					
27	<p>Contact details of BHEL/Piping centre/Purchase</p> <table border="0"> <tr> <td>G.NIVEDHA Engineer / Purchase 044 -28161265 nivedha@bhelmipc.co.in</td> <td>S.VARADARAJAN Manager / Purchase 044-28161243 varada@bhelmipc.co.in</td> </tr> <tr> <td>K.RAJAN Senior Manager / Purchase 044-28161217 rajan@bhelmipc.co.in</td> <td>G.PANNEER SELVAM AGM / Materials 044-28161355 gps@bhelmipc.co.in</td> </tr> </table>	G.NIVEDHA Engineer / Purchase 044 -28161265 nivedha@bhelmipc.co.in	S.VARADARAJAN Manager / Purchase 044-28161243 varada@bhelmipc.co.in	K.RAJAN Senior Manager / Purchase 044-28161217 rajan@bhelmipc.co.in	G.PANNEER SELVAM AGM / Materials 044-28161355 gps@bhelmipc.co.in	
G.NIVEDHA Engineer / Purchase 044 -28161265 nivedha@bhelmipc.co.in	S.VARADARAJAN Manager / Purchase 044-28161243 varada@bhelmipc.co.in					
K.RAJAN Senior Manager / Purchase 044-28161217 rajan@bhelmipc.co.in	G.PANNEER SELVAM AGM / Materials 044-28161355 gps@bhelmipc.co.in					

SL NO	MATERIAL CODE	DESCRIPTION	GENERAL REQUIREMENT	CUSTOMER SPECIFIC REQUIREMENT	TOTAL REQUIREMENT	DRG	CURRENCY	UNIT RATE
			COLUMN A	COLUMN B	COLUMN C			
1	925055940000	FAB UNEQ TEE OD323.9X58/OD219.1X40/SA105	NIL	8	8	3-80-423-30241/00		
2	925055950000	FAB UNEQL TEE OD457X82/OD323.9X58/SA105	NIL	4	4	3-80-423-30240/00		
3	925055960000	FAB UNEQT OD508X52/OD355.6X38 SA105	24	NIL	24	3-80-424-30262/00		
4	925056100000	FAB UNEQ. TEE ID850X48/ID675X38 SA182F91	4	NIL	4	3-80-310-30688/00		
5	925056110000	FAB UNEQ. TEE ID850X48/OD711X42 SA182F91	2	NIL	2	3-80-310-30689/00		
6	925056120000	FAB Y-PIECE ID850X48/ID675X38 SA182F91	2	NIL	2	2-80-310-12439/00		
7	925056170000	FAB UNEQTEE ID500X92/ID350X60 SA182F91	NIL	3	3	3-80-301-30888/00		
8	925056180000	FAB UNEQTEE ID500X92/OD219.1X34 SA182F91	NIL	3	3	3-80-301-30889/00		
9	925056190000	FAB UNEQTEE ID500X92/OD323.9X48 SA182F91	NIL	6	6	3-80-301-30890/00		
10	925056200000	FAB Y-PIECE OD864X32/OD660X27 SA105	NIL	3	3	2-80-320-12515/00		
11	925056210000	FAB Y-PIECE ID500X92/ID350X60 SA182F91	NIL	3	3	2-80-301-12514/00		
12	925057820000	FAB UET 559X54/ 323.9X31 SA182F91	2	NIL	2	3-80-999-97699/01		
13	925057970000	FAB UET 508 X 64 / 368 X 48 SA105	1	NIL	1	3-80-999-97703/00		
14	925058080000	FAB EQT 323.9 X 31SA182 F91	3	NIL	3	3-80-999-97711/01		
15	925058120000	FAB Y PIECE 864X 27/660 X 20 SA105	3	NIL	3	2-80-999-99496/01		
16	925058130000	FAB Y PIECE 559X54/406.4X38 SA182F91	2	NIL	2	2-80-999-99492/01		
17	925058150000	FAB YPCE 559 X 54 / 457 X 43 SA182F91	2	NIL	2	2-80-301-09376/02		
18	925058160000	FAB UNEQTEE 559 X 54 /457 X 43 SA182F91	2	NIL	2	3-80-301-26022/03		
19	925058170000	FAB UNEQTEE 762 X 25/ 711 X25 SA182F91	4	NIL	4	3-80-310-26024/02		
20	925058180000	FAB UNEQTEE 965 X 32 /762 X 25 SA182F91	2	NIL	2	3-80-310-26026/01		
21	925058190000	FAB Y PIECE 965 X32 /762 X25 SA182F91	1	NIL	1	2-80-310-09377/01		
22	925058230000	FABUNEQTEE 965X25/323.9X10.31SA105	4	NIL	4	3-80-320-26031/01		
23	925058240000	FAB Y PIECE 965 X 25 / 762X 20 SA105	2	NIL	2	2-80-320-09378/01		
24	925058250000	FAB UNEQ TEE 559X72 /406.4X54 SA105	3	NIL	3	3-80-423-26098/01		
25	925058260000	FAB UNEQ TEE 559X72/273X36 SA105	1	NIL	1	3-80-423-26099/01		
26	925058510000	FABUNEQTEEO355.6X29/OD273X25SA182F91	8	NIL	8	3-80-999-97760/01		
27	925058540000	FABUNEQTEEO355.6X 29/168.3X27.5SA182F91	2	NIL	2	3-80-999-97778/00		
28	925058670000	FABUNEQUALTEEO457X82/273X52 SA105	NIL	8	8	3-80-423-27269/01		
29	925058680000	FAB EQUAL TEE OD 660 X 116 SA105	NIL	4	4	3-80-423-27270/02		
30	925058690000	FAB UNEQUALTEE OD 660X116/457 X 82 SA105	NIL	4	4	3-80-423-27271/03		
31	925058700000	FAB UNEQUALTEE OD 660X116/355.6X64 SA105	NIL	3	3	3-80-423-27272/02		

SL NO	MATERIAL CODE	DESCRIPTION	GENERAL REQUIREMENT	CUSTOMER SPECIFIC REQUIREMENT	TOTAL REQUIREMENT	DRG	CURRENCY	UNIT RATE
			COLUMN A	COLUMN B	COLUMN C			
32	925058710000	FAB EQUAL TEE OD 559 X 75 SA105	NIL	8	8	3-80-423-27273/01		
33	925058720000	FAB UNEQUALTEE OD 559X75/406.4X56 SA105	NIL	10	10	3-80-423-27274/02		
34	925058730000	FAB UNEQUALTEE OD 559X75/219.1X32 SA105	2	2	4	3-80-423-27275/01		
35	925058760000	FABUNEQTEEOD864X50/508X30SA182F22CL3	NIL	10	10	3-80-320-27188/05		
36	925058770000	FABUNEQTEEOD864X50/711X42 SA182F91	NIL	9	9	3-80-310-27187/04		
37	925058790000	FAB Y PIECE ID460X85/ID350X60 SA182 F91	2	2	4	2-80-301-10066/04		
38	925058800000	FAB UN EQTEE ID460X85/OD323.9X48SA182F91	4	4	8	3-80-301-27186/03		
39	925058810000	FAB UN EQTEE ID460X85/ID350X60 SA182F91	2 + 1*	2	5	3-80-301-27185/01		
40	925058820000	FABUNEQTEE ID460X85/OD219.1X34 SA182F91	2	2	4	3-80-301-27192/02		
41	925058830000	FAB Y PIECE OD 864X50 / 711X42 SA182F91	NIL	5	5	2-80-310-10067/04		
42	925058840000	FAB Y PIECE OD 864X29/ OD660X23 SA105	NIL	2	2	2-80-320-10068/03		
43	925058850000	FABUNEQTEE OD864X50/323.9X20 SA182F22CL3	NIL	14	14	3-80-320-27198/02		
44	925058860000	FAB UNEQTEE OD864X29/355.6X15.09 SA105	2*	6	8	3-80-320-27303/01		
45	925059480000	FAB UNEQT 559X 54/ 219.1X25 SA182F91	1	NIL	1	3-80-999-97826/00		
46	925166960000	PIPEWITHSTUBS(HRH-SV)-NB 550 SA182F22CL3	2	NIL	2	3-80-999-97762/02		
47	925166990000	PIPEWITHSTUBS-SV&ERV(MAINSTEAMLINE-I)	1	NIL	1	3-80-999-97763/00		
48	925167020000	PIPE WITH STUBS-SV (COLD REHEAT LINE)	2	NIL	2	3-80-999-97766/01		
49	925167440000	PIPEWITHSVSTUB-HRH- ID719X62 SA182F91	12	NIL	12	3 80 310 28601/03		
50	925167450000	PIPEWITHSVSTUB-CRH- ID751X45 SA105	8	NIL	8	3 80 320 28600/01		
51	925167460000	PIPEWITHSTUB-(CRH- SV) NB 550 SA105	2	NIL	2	3 80 320 28692/00		
	Grand Total				242			

Note :

- (i) Ordering of quantity mentioned in column A (General requirement) of Annexure D is subject to approval of the vendor by BHEL.
- (ii) Ordering of quantity mentioned in column B (Customer specific requirement) of Annexure D is subject to approval of the vendor by BHEL and BHEL's Customer.
- (iii) No raw material / component / other services for items marked with " * " shall be sourced from China either directly or indirectly for manufacturing or supply.



1.0 GENERAL

Fabricated Tees and Y-piece shall meet Indian Boiler Regulations (IBR) and the following requirements in addition to the latest version of relevant material specifications namely ASME SA 105, SA 106, SA 182, SA 335.

2.0 FORGINGS.

2.1 Material : SA 105, SA 182 F11, F12, F22, F91 & F92 (Code Case 2179).

2.2 Raw forge vendor details shall be furnished in the technical part of the bid for BHEL's approval. Raw forge sources shall be approved by BHEL.

2.3 Carbon content of SA105 items shall be restricted to 0.25% maximum.

2.4 Unless otherwise specified in the P.O, items of SA182 F11/12 shall be supplied as per class 2 and SA182 F22 shall be supplied as per class 3 only.

2.4 Heat Treatment:-

2.4.1 All fittings shall be heat treated as below:

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

2.4.2 SA 182 F91 & F92 forgings 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 1 hour minimum, still air cooling.

2.5 **Product analysis** shall be carried out on One piece / Heat / HT lot / Size.

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

2.7 **Bend test:-** (a) 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) For AS (SA182): One Sample of 25.4 mm width and thickness = t to be bent 180deg around mandrel of radius = 1.5 t. Test on representative sample is also acceptable.

2.8 **Hardness test:-** (i) For SA 182 F91 :- 100% of items; Value: 191-250 BHN
(ii) For SA 182 F92 :- 100% of items; Value: 196-250 BHN
(iii) For other specn :- 10% of items; Value - As per specn.

The hardness test values shall be indicated in the Test certificate.

2.9 **MPI (After Heat Treatment) : 100%:** As per ASTM E 709. Linear Indications like cracks, folds & other injurious defects are unacceptable.

Dry MPI : CS, AS (other than F91, F92) : all sizes.

Wet MPI : SA182 F91, F92 : all sizes.

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2.10 **Ultrasonic Test:-** Forgings of all thickness shall be ultrasonically tested as per SA 388 and acceptance norms shall be as per 3.3.4 of ASME Section VIII Division 2.

2.11 **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.

3.0 PIPES.

3.1 Material : SA 106 Gr.C, SA 335 P11, P12, P22 , P91 & P92 (Code case : 2179).

3.2 Pipe vendor details shall be furnished in the technical part of the bid for BHEL's approval. Pipe source's shall be approved by BHEL.

3.2 The pipes used shall meet the requirements indicated in Technical delivery condition ref. TDG: 101. The applicable / latest revision number of this document is indicated in the Tender / Purchase order.

4.0 FABRICATION OF Y Piece and Tees

4.1 Fit up, fabrication, dimension and tolerance shall be as per BHEL drawing.

4.2 Welding: WPS and PQR shall be approved by well known independent inspecting agencies like Lloyds, BV, SGS, Copy of approved WPS & PQR shall be furnished along with the Technical part of the bid for approval by BHEL.

4.2.1 Welding of F91 / P91 & F92 / P92 materials :

MATERIAL SPECIFICATION	ELECTRODES TO BE USED	
	GTAW PROCESS	SMAW PROCESS
SA F91 / P91	ER 90S – B9	E9015 – B9
SA F92 / P92	9Cr WV TIG	Thermanit MTS-616

GTAW rods and SMAW electrodes used shall be of following makes.

- Bohler Schweisstechnik Austria, Austria
- Bohler Thyssen Schweisstechnik, Germany
- Kobe Steels Ltd., Japan
- Oerlikon Welding Ltd, Switzerland
- Metrode Products, U.K

The core wire chemistry shall be equivalent to F91/ P91 & F92 / P92. Synthetic electrodes are not permitted.

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4.3 PWHT for F91 / P91 & F92 / P92 materials shall be 760 ± 10 deg C. Holding time shall be minimum 2 hours for thickness up to 50mm; minimum 4 hours for thickness 51 to 100 mm. PWHT for other material shall be as per ASME B31.1.

5.0 NON DESTRUCTIVE EXAMINATION

5.1 All NDE shall be done after PWHT only – and witnessed by Inspection authorities.

5.2 NDE procedures (MT-Wet, PT, RT, UT and Hardness) shall be approved by BHEL.

5.3 All welds shall be subjected to RT, Wet MT and PT as per ASME Sec V. Evaluation and acceptance norms shall be as per ASME B31.1 Clause 136.4.5 for RT, Clause 136.4.3 for MT, Clause 136.4.4 for PT. Hardness shall be as per SA 234.

5.4 All welds shall also be subjected to UT and its methodology and acceptance shall be as per AD 2000 Merkblatt HP 5/3-2002 Edition, with additional requirements as in 5.4.1 through 5.4.3 below.

5.4.1 The examination shall be conducted by Pulse Echo contact testing.

The following digital equipments or its equivalent models with A-scan presentation that generates and receives frequencies in the range of 1 MHz to 5 MHz. shall be used for examination: GE Inspection Technology (Krautkramer make), Olympus (EPOCH IV, XT), Sonatest (Master scan series-350M/380M) U.K.

The calibration blocks used shall be of same material specification, diameter & thickness.

The UT equipment shall be calibrated at the beginning of each period of extended use or every 3 months whichever is less.

5.4.2 All recordable indications will be stored in memory of either the digital flaw detector or a PC for review at a later period.

5.4.3 The equipment calibration data for specific weld as well as the hard copy of 'Static echo-trace pattern'– showing the flaw-echo amplitude with respect to DAC, flaw depth, projection surface distance (probe position) and beam-path shall be attached to UT test report. This hard-copy of echo-trace with equipment calibration data will form part of test documentation.

5.5 Qualified Level II personnel shall perform the examination as well as evaluation, and a test report shall be issued.

5.6 Hardness test shall be carried out and report to be furnished. The maximum hardness (HV 10) shall be 300 for F91 & F92 material; and 225 for F11, F12 & F22.

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.

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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

8.1 **PAINTING:** All fittings shall be **Painted** on the external surface as given below

- a) Surface preparation: Blast cleaning
- b) Primer coat: One coat of 60 microns of In-Organic Ethyl Zinc Silicate primer.
- c) Finish coat : Two coats of 20 microns each of Heat Resistance Aluminium paint to IS13183 Gr-1.
- d) Total DFT : 100 microns minimum.
- d) Shade : Aluminium -- for all fittings.

The internal surface shall be protected with rust preventive coating or rust inhibitor.

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

SA 105 / SA 106 Gr.C	=	Blue
SA 182 F11 / SA 335 P11	=	Green & White
SA 182 F12 / SA 335 P12	=	Black & Red
SA 182 F22 / SA 335 P22	=	Blue & Red
SA 182 F91 / SA 335 P91	=	Brown & Red
SA 182 F92 / SA 335 P92	=	Brown & 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.

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.

9.0 **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.

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10.0 MANUFACTURING QUALITY PLAN.

Vendor shall submit manufacturing Quality plan along with technical part of the bid for BHEL approval.

11.0 INSPECTION & CERTIFICATION (In English only):-

11.1 All items are to be inspected at the manufacturer's works by the Inspection agencies / authorities as per IBR. Inspection certificate for finished product in IBR Form IIIC shall be submitted along with the Work Test Certificate (EN 10204 Type 3.2) countersigned by authorities as per IBR and shall include the following details. (Three ink signed originals required)

- i. Test Certificate Number & date.
- ii. BHEL P.O Number & Amendment Number(if any)
- iii. BHEL P.O. Serial Number
- iv. BHEL TDC Number, Drawing number
- v. Size-wise Quantity
- vi. Specification, Grade & Year of code.
- vii. Heat / Melt Number
- viii. Steel making process.
- ix. Material details
- x. Ladle and product Analysis of Raw Material.
- xi. Tensile Test
- xii. Bend Test
- xiii. Guarantee of HTP shall be given in the test certificate as follows, if hydro test is not carried out: - "Fabricated Y piece / welded Tees are capable of withstanding without failure, breakage or impairment of their serviceability a hydrostatic test pressure equal to that prescribed for the specified matching pipe of equivalent material".
- xiv. References to the NDT & other test reports covered in 11.2 below.

11.2 The following reports shall be furnished separately along with the Form III C & MTC indicated in para 11.1 above.

- i. NDE reports for VT, MT, RT, UT (UT Reports in soft copy + hard copy).
- ii. Positive Material identification (PMI) report for Alloy steel.
- iii. Heat Treatment Chart.
- iv. Hardness Test report.
- v. Photomicrograph test report along with photomicrograph with minimum 500 x magnifications.
- vi. Dimensional report (as built drawing with dimensions)

12.0 RECORDS OF REVISION.

Revision 01 : a) Para 3.0, 4.2.1 ,6.0 , 10.0 are included.
b) Para 1.0,4.2,4.3,8.2,11.0 are revised.

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Revision 02 : a) Para 2.10,4.2.1,8.1, 8.2, 9.0 are revised.

Revision 03 : a) Para 2.12, 8.0 and 11.0 (18) are revised.

Revision 04 : a) Para 8.1 modified as sea worthy painting.

b) Para 11 modified. Works TC 'EN 10204 Type 3.2' specified. Individual reports are required.

Revision 05 : a) Para 5.6 (Hardness test) included.

b) Para 8.1 modified indicating colour shades.

c) Para 11 modified for better clarity with respect to documentation.

Revision 06 : a) New material specn. SA 182 F92 & SA 335 P92 are included.

b) Para 2.1, 2.3, 2.4.1, 2.4.2, 2.8, 2.11, 3.1, 4.2.1, 4.3, 5.6, 8.2, 11.2(vi) are revised.

c) Para 2.5, 2.6, 2.7, 2.9 & 2.10 are modified for better clarity.

Revision 07 : a) Para 2.2 & 3.2 are added.

b) Para 2.9, 8.1 & 8.3.2 are revised.

c) Para 2.8 modified for better clarity.

*** ** *

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1.0 GENERAL

Pipe with stubs, branches and attachments shall be manufactured as per BHEL drawing and shall meet Indian Boiler Regulations (IBR). The following requirements shall be taken care in addition to the latest version of relevant material specifications.

2.0 PIPES.

2.1 Material : SA 106, SA 335 P11, P12, P22, P91.

2.2 The pipes used shall meet the requirements indicated in Technical delivery condition ref. TDG : 101. The applicable / latest revision number of this document is indicated in the Tender / Purchase order. Test certificate in IBR Form IIIA format meeting IBR requirement shall be furnished. The Pipes used shall be of renowned make and the same shall be indicated in the Technical part of the bid. Vendors shall procure the pipes only from Pipe manufacturers approved by BHEL.

2.3 All pipes used shall be of single length without joints. In case of any joints to make up the required length, specific approval shall be taken from BHEL during Technical bid discussions.

3.0 FORGINGS.

3.1 Material: SA 105, SA 182 F11, F12, F22, F91.

3.2 Carbon content of SA105 items shall be restricted to 0.25% maximum.

3.3 SA 182 F91 forgings 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

3.4 Unless otherwise specified in the P.O, items of SA182 F11/12 shall be supplied as per class 2 and SA182 F22 shall be supplied as per class 3 only

3.5 Product analysis shall be carried out on One piece / Heat / HT lot / Size.

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

3.7 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.

3.8 Bend test for AS (SA182): One Sample of 25.4 mm width and thickness = t to be bent 180deg around mandrel of radius = 1.5 t. Test on representative sample is also acceptable.

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- 3.9 Hardness test shall be carried out on all items of F91, and minimum 10% for other material Grades; acceptance norm shall be as per relevant material specification (SA 105 / SA 182).
- 3.10 All forgings shall be tested by MT as per ASTM E-709 and acceptance norm shall be as per ASME B 31.1 Clause 136.4.3
- 3.11 Forgings of all thickness shall be ultrasonically tested as per SA 388 and acceptance norms shall be as per 3.3.4 of ASME Section VIII Division 2.
- 3.12 Metallography:- Metallography shall be carried out on one per heat, per size, per heat treatment lot of F91 forgings. 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.
- 3.13 Test certificate in IBR Form IIIC format meeting IBR requirement shall be furnished.

4.0 PLATES FOR BOTTOM SUPPORT AND STRUCTURAL ATTACHMENTS:

- 4.1 The Plates used for bottom support and structural attachments (non pressure retaining part) shall meet the respective material specification indicated in the drawing and necessary test certificate shall be furnished.

5.0 FABRICATION

- 5.1 Fit up, fabrication, dimension and tolerance shall be as per BHEL drawing
- 5.2 Welding : WPS and PQR shall be approved by well known independent inspecting agencies like Lloyds, BV, SGS, Copy of approved WPS & PQR shall be furnished along with the Technical part of the bid for approval by BHEL. The welders shall be qualified as per ASME Sec IX and IBR.
- 5.2.1 Welding of F91 / P91 material :
GTAW rods (ER 90S – B9) and SMAW electrodes (E9015 – B9) used shall be of following makes.
a) Bohler Schweisstechnik Austria, Austria
b) Bohler Thyssen Schweisstechnik, Germany
c) Kobe Steels Ltd., Japan
d) Oerlikon Welding Ltd, Switzerland
e) Metrode Products, U.K
The core wire chemistry shall be equivalent to F91/ P91 . Synthetic electrodes are not permitted.
- 5.2.2 For F91 / P91, PWHT shall be done immediately after welding.
- 5.3 PWHT shall be done in a calibrated furnace.

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- 5.4 PWHT for F91 / P91 material shall be 760 ± 10 deg C. Holding time shall be minimum 2 hours for thickness up to 50mm; minimum 4 hours for thickness 51 to 100 mm.
- 5.5 PWHT for other material shall be as per ASME B31.1. However, the holding time shall be 30 minutes minimum for SA 105, SA 106; 60 minutes minimum for P11,P12 & P22 materials.
- 6.0 NON DESTRUCTIVE EXAMINATION**
- 6.1 All NDE shall be done after PWHT only – and witnessed by Inspection authorities.
- 6.2 NDE procedures (PT, MT, UT, RT and Hardness) shall be approved by BHEL
- 6.3 **Pipe to Stub / Branch weld** - shall be subjected to UT, PT and MT as per ASME Section V - article 4, 6 and 7 respectively and acceptance as per ASME B31.1 CI 136.4.6 , 136.4.4 and 136.4.3 respectively.
- 6.3.1 **Pipe to Stub / Branch Welds for SA335P91 materials** - shall be subjected to wet MT, PT & UT. The wet MT and PT shall be as per ASME Section V–article 7, 6 respectively and acceptance norms shall be as per ASME B31.1 CI 136.4.3 , 136.4.4 respectively. The methodology and acceptance for UT shall be as per AD 2000 Merkblatt HP 5/3-2002 Edition, with additional requirements as in 6.6.1 through 6.6.3 below.
- 6.4 **Pipe to structural attachment (non pressure retaining part) weld** - shall be subjected to MT (for SA335P91 materials- wet MT) and PT as per ASME Sec V article 7, 6 respectively. The acceptance norms shall be as per ASME B 31.1 CI 136.4.3 and 136.4.4 respectively.
- 6.5 **Butt welds** - shall be subjected to MT and RT as per ASME Sec V . Evaluation and acceptance norms shall be as per ASME B31.1 Clause 136.4.3 and 136.4.5 respectively.
- 6.6 **Butt welds for SA335P91** shall be subjected to wet MT, RT and UT. The wet MT and RT shall be as per ASME Sec V. Evaluation and acceptance norms shall be as per ASME B31.1 Clause 136.4.3 and Clause 136.4.5 respectively. The methodology and acceptance for UT shall be as per AD 2000 Merkblatt HP 5/3-2002 Edition, with additional requirements as in 6.6.1 through 6.6.3 below.
- 6.6.1 The examination shall be conducted by Pulse Echo contact testing. The following digital equipments or its equivalent models with A-scan presentation that generates and receives frequencies in the range of 1 MHz to 5 MHz. shall be used for examination:
GE Inspection Technology (Krautkramer make), Olympus (EPOCH IV, XT), Sonatest (Master scan series-350M/380M)U.K

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The calibration blocks used shall be of same material specification, diameter & thickness.

The UT equipment shall be calibrated at the beginning of each period of extended use or every 3 months whichever is less.

6.6.2 All recordable indications will be stored in memory of either the digital flaw detector or a PC for review at a later period.

6.6.3 The equipment calibration data for specific weld as well as the hard copy of 'Static echo- trace pattern'– showing the flaw-echo amplitude with respect to DAC, flaw depth, projection surface distance (probe position) and beam-path shall be attached to UT test report. This hard-copy of echo-trace with equipment calibration data will form part of test documentation.

6.7 All pipe ends after edge-preparation as per BHEL drawing shall be subjected to PT as per ASME Sec V. The acceptance norms shall be as per ASME B 31.1 Cl 136.4.4.

6.8 Qualified Level II personnel (in accordance with SNT-TC-1A of ASNT) shall perform the examination as well as evaluation, and a test report shall be issued.

6.9 Hardness test shall be carried out and report to be furnished. The maximum hardness (HV10) for SA335P91 material shall be 300 and for others namely SA335P11,P12,P22 shall be 225.

7.0 POSITIVE MATERIAL IDENTIFICATION (PMI) FOR ALLOY STEEL MATERIAL

Each alloy steel component shall be checked for the correctness of the material during manufacturing and final inspection using X-ray fluorescence principle or spark emission spectrography.

8.0 WORK MAN SHIP, 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. Repair on parent material (Pipe, Forging, Plate) by fusion welding are prohibited.

9.0 PAINTING, COLOUR CODING, MARKING

9.1 **PAINTING:** All components shall be **painted** on the external surface as given below

a) Surface preparation : Blast cleaning

b) Painting : Seaworthy Epoxy painting of DFT – 100 microns with colour shades as given below.

c) Shade : (i) Smoke grey -- for all carbon steel components

(ii) Sea green -- for all Alloy steel components

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The internal surface shall be protected with rust preventive coating or rust inhibitor. Stainless steel components need not be painted.

9.2 **COLOUR CODING:** All components shall be colour coded circumferentially at ends as given below

SA 105 / SA 106 Gr.C	=	Blue
SA 182 F11 / SA 335 P11	=	Green & White
SA 182 F12 / SA 335 P12	=	Black & Red
SA 182 F22 / SA 335 P22	=	Blue & Red
SA 182 F91 / SA 335 P91	=	Brown & Red

9.3 **MARKING:**

9.3.1 The Pipe with stubs 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 stencilled on the finished component.

9.3.2 The Pipe with stubs dispatched directly to project site as **DTS** shall be 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 9.3.1.

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

11.0 **MANUFACTURING QUALITY PLAN:** Vendor shall submit manufacturing Quality Plan along with technical part of the bid for BHEL approval.

12.0 **INSPECTION & CERTIFICATION**

12.1 All items are to be inspected at the manufacturer's works by the Inspection agencies / authorities as per IBR. Inspection certificate for finished product in IBR Form IIIA shall be submitted along with the Work Test Certificate (EN 10204 Type 3.2) countersigned by authorities as per IBR and shall include the following details. (Three ink signed originals required)

- i. Test Certificate Number & date.
- ii. BHEL P.O Number & Amendment Number(if any)
- iii. BHEL P.O. Serial Number
- iv. BHEL TDC Number, Drawing number
- v. Size-wise Quantity
- vi. Specification, Grade & Year of code.
- vii. Heat / Melt Number
- viii. Steel making process.
- ix. Material details

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- x. Ladle and product Analysis of Raw Material.
- xi. Tensile Test
- xii. Bend Test
- xiii. Guarantee of HTP shall be given in the test certificate as follows, if hydro test is not carried out: - "Fabricated Pipe with stubs, branches and attachments are capable of withstanding without failure, breakage or impairment of their serviceability a hydrostatic test pressure equal to that prescribed for the specified matching pipe of equivalent material".
- xiv. References to the NDT & other test reports covered in 12.2 below.

12.2 The following reports shall be furnished separately along with the Form III A & MTC indicated in para 12.1 above.

- i. NDE reports for VT, PT, MT, RT, UT (UT Reports in soft copy + hard copy)
- ii. Positive Material identification (PMI) report for Alloy steel.
- iii. Heat Treatment Chart.
- iv. Hardness Test report
- v. Metallography Report along with photomicrograph with minimum 500x magnification.
- vi. Dimensional report.

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1.0 GENERAL

Materials: SA106GrB, GrC; SA 335 P11, P12, P22, P91 & P92(Code case : 2179).

This Technical Delivery Condition specify the requirements in addition to ASME SA 106, SA 335. If the blooms for SA 335 pipes are sourced from India, then the sources shall be, TISCO, MUSCO and ASP Durgapur - which are IBR approved.

2.0 CHEMICAL COMPOSITION

For SA106 Gr B and Gr C :- Carbon content shall be limited to 0.25% max. for pipe thickness up to and including 20 mm; and 0.30% max. for pipe thickness above 20 mm.

For SA335 P92 : Si: 0.10-0.50%; Ni: 0.30max and Cu: 0.25max.

3.0 TOLERANCES

3.1 OD specified pipes:- Unless otherwise specified in the PO, tolerances shall be as below.

- Outside diameter : $\pm 1\%$ (Max. 4 mm)
- Wall thickness and weight tolerance as per ASTM A530 for Carbon steel and ASTM A999 for Alloy steel pipes

3.2 ID specified pipes are specified by the maximum Internal Diameter and Minimum wall thickness. The tolerance if not specified otherwise in the PO shall be:

- ID: + 0.0mm, -3.2mm
- Thickness: +6.4mm, -0.0mm
- Weight per metre : +10% , -5% on nominal weight **

** Nominal weight of ID Pipe per metre shall be calculated as follows,
 $W_{tnom} = (ID_{nom} + t_{nom}) * t_{nom} * 0.02466$ kg/metre , where
ID nom = IDmax-1.6 mm ; tnom = tmin+3.2 mm

4.0 HEAT TREATMENT & MECHANICAL TESTS

4.1 HEAT TREATMENT

Heat treatment for SA106 GrB, GrC , SA335 P11,P12, P22 shall be as per specification.

SA 335 P91 & P92 pipes shall be normalised at 1050 to 1080deg C (for wall thickness larger than 75 mm, accelerated cooling may be done to obtain a fully martensitic structure) and tempered at 750 to 780 deg C. Soaking time 1 hour minimum, still air cooling.

4.2 MECHANICAL TESTS

- a) Number of Test (as per IBR): 2 numbers up to first 100 pipes and additional 1 number per subsequent 100 pipes or part thereof.
 - b) For P91 Pipes, Ys(0.2% offset) - 450 MPa min ; Ts – Min 630 MPa, Max 850 MPa.
 - c) For P92 pipes Ts- Min 655 Mpa, Max 850 Mpa
- For other grades, Ys and Ts shall be as per specifications.

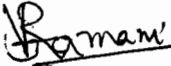
5.0 SUPPLEMENTARY TESTS

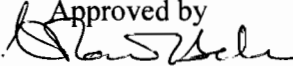
These are applicable to SA 106 Cr C, SA335 P11, P12, P22, P91 & P92. The supplementary test results shall be indicated in the Test Certificate along with the mandatory test results.

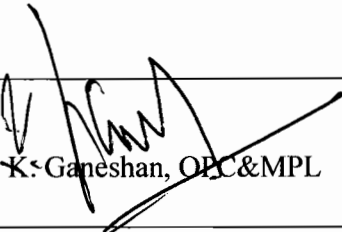
- 5.1 **Product Analysis (S1)** :- Product Analysis shall be carried out on 5% of pipes per lot per heat (minimum 2 Nos)
- 5.2 **Transverse tension test (S2)** :- Transverse tension test shall be carried out (for size NB 200 mm and above) on one end of 5% of pipes per lot (minimum 1 No).
- 5.3 **Photomicrograph test for P91 & P92 (S5)** :- 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.

6.0 HARDNESS FOR SA 335 P91 & P92 PIPES

Hardness test shall be carried out on each SA 335 P91 & P92 pipes. The hardness value for P91 shall be 191-250 BHN and that for P92 shall be 196-250 BHN. The hardness test values shall be indicated in the Test certificate.


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Approved by

G.Panneer Selvam, QA


K: Ganeshan, OEC&MPL



7.0 NON DESTRUCTIVE TEST

Each pipe shall be ultrasonically tested as per ASTM E 213 in both clockwise & anticlockwise directions; calibration to be done on two axial notches of 50 mm length (inside & outside) and a depth of 5% of wall thickness (minimum 0.3 mm; maximum 1.5mm). The results shall be indicated in the Test Certificate.

8.0 REPAIR

Repair by welding is prohibited. The pipe shall meet the dimensional tolerance (clause 3.0 above) after any mechanical repair as permitted in the standard.

9.0 WORKMANSHIP

All pipes shall have smooth surfaces, free from loose scales and defects like laps, seams, folds, cracks, pitting etc. The surface imperfection beyond the permissible limit of ASME SA106 / SA335 shall be removed mechanically without affecting the minimum thickness and workmanlike finish.

10.0 MARKING

The following details are to be marked on the consignment for identification

- 1) PO Number 2) Supplier's emblem/code 3) Specification & grade 4) Heat number
5) Size 6) No. of pipes 7) Inspector's seal

OD up to 31.8 mm (excluding)	Details 1 to 7 shall be stamped on metal / plastic tag attached to bundle
OD 31.8 mm to OD 76.1 mm (including)	<ul style="list-style-type: none">• Details 1 to 5 shall be paint stencilled on each pipe.• Details 1 to 7 to be stamped on Metal / Plastic tag attached to bundle.
OD above 76.1 mm	<ul style="list-style-type: none">• Details 2,3,4,5 & 7 shall be hard stamped with round edged stamp at 100mm from an end of each pipe.• Details 1 to 5 shall be paint stencilled on each pipe.

11.0 COLOUR CODING

Longitudinal colour bands shall be made throughout the length of the pipe. The colours shall be as per BHEL procedure SIP: PP: 21(Latest).

12.0 PRESERVATION

- Outside:- Resin type rust preventive coating with visibility to stencilled details.
- Inside:- Rust inhibitor or resin type rust preventive coating.
- Ends of the pipes shall be secured with caps.

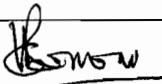
13.0 INSPECTION AND CERTIFICATION

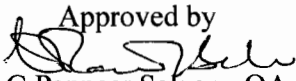
- 13.1** Pipes shall be inspected at the manufacturer's works by the IBR approved Inspecting Authority. Inspection certificate in IBR Form III A (Well-known pipe maker recognised in IBR to submit IBR FORM III D) along with Mill Test certificate and NDT reports certified by IBR approved Inspecting Authority shall be submitted.
- 13.2** Test Certificate shall include PO no.(BHEL) , TDC no., Pipe size and quantity- melt wise, specification and grade with year of code, Heat no., Steel & Pipe making process, chemistry including incidental elements on Ladle and Product analysis, Heat treatment details with actual temperature and soaking time, Mechanical results.
- 13.3** Detailed NDT reports with reference norms, acceptance standards and test results shall be furnished along with Test certificates.
- 13.4** For P91 & P92 pipes the Photomicrograph test report along with photomicrograph with 500x (min) magnification shall be furnished

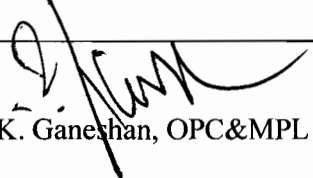
14.0 RECORDS OF REVISIONS

- (i) Rev 03 – Para 4.1, 4.2.b are included; Para 6.0, 13.0 are modified
(ii) Rev 04 – Para 3.1, 3.2 modified
(iii) Rev 05 – SA335 P92 included. Para 1.0, 2.0, 4.1, 4.2, 5.0, 6.0 are modified & Para 5.3, 13.4 included.

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