



BHEL / PIPING CENTRE / CHENNAI

**TECHNO COMMERCIAL MEMORANDUM OF UNDERSTANDING (EXCEPT PRICE) FOR SUPPLYING
BUTT WELDED FITTINGS (CS, SS & AS (except P91))**

BETWEEN

M/s. BHEL, PIPING CENTRE, 600 017

&

BHEL REGISTERED VENDORS

**DOC REF : BHEL : PC : IMP : MOU : BWF : REV 00
PRODUCT : BW FITTINGS (CS,AS & SS(except P91))**

VENDOR'S SIGNATURE WITH SEAL

BHEL PIPING CENTRE

GENERAL:

- This Techno commercial MOU is signed to finalize the technical and commercial terms (except price) for the supply of Butt Welded Fittings.
- By signing this MOU, Vendor agrees to the following terms and conditions.
- This MOU will be used for both Spot tenders and Rate Contracts.
- The MOU will stand valid till **31.03.2015**. The MOU validity may be extended even after the initial period if required by M/s BHEL, with the consent of vendor. However, if any change is required within the validity of the MOU, the same may be amended with mutual consent.

MOU TERMS:

SL NO	MOU TERMS	Vendor's Confirmation
1.0	<p><u>Type of Bid:</u> AN ENQUIRY CAN BE EITHER A 'SINGLE PART' BID TYPE OR 'TWO PART' BID TYPE. The bid type to which an enquiry will be resorted to, will be indicated in the enquiry itself. Vendors have to submit their bids suitably.</p>	AGREED
1.1	<p><u>Single Part Bid:</u> In case of Single Part, only one bid has to be submitted. The bid must consist of the following: a) Vendor has to confirm to supply as per MOU, in the format which will be sent along with the enquiry b) Price has to be submitted in the format which will be sent along with the enquiry.</p>	AGREED
1.2	<p><u>Two Part Bid:</u> In case of two part bid, two bids (Part I & Part II) have to be submitted:</p> <ul style="list-style-type: none"> • PART I: a) Vendor has to confirm to supply as per MOU, in the format which will be sent along with enquiry b) Unpriced bid to be submitted to know the items for which the vendor has quoted. C) Taxes and duties applicable • PART II: Price bid has to be submitted in the format which will be sent along with the enquiry. <p>Both PART I bid and PART II bid, each sealed in a separate cover, shall be put in a sealed offer cover indicating 'TENDER NO WITH DATE ', 'TENDER OPENING DATE '& 'ITEM DESCRIPTION: FITTINGS and shall be sent to</p> <p align="center">Sr. MANAGER / PURCHASE (FITTINGS) BHEL PIPING CENTRE PURCHASE DEAPRTMENT NO 80, GN CHETTY ROAD (II FLOOR) T.NAGAR, CHENNAI 600 017</p>	AGREED

2.0	<p><u>Technical Requirements:</u></p> <ul style="list-style-type: none"> a) BHEL TDC No. TDG:102:Rev07 has been agreed in to and shall be followed for manufacturing and supply of Butt Welded fittings.In case of any revision in the TDC , vendors acceptance will be obtained. b) Agreed to supply as per BHEL drawings sent along with enquiry. If there is any clarification in BHEL's drawings, vendor shall get it clarified. Vendors should not submit any separate drawing for approval. c) Edge preparation shall be done as per BHEL drg no: 3-80-300-19825 rev 03 and style & D1 value shall be as mentioned against each item in the enquiry . d) Tolerance shall be as per BHEL drawing 48030126192 rev 01 e) Offers shall be for Seamless construction unless otherwise specified as welded construction as per enquiry (as mentioned against each item) f) Seamless construction is acceptable in place of welded construction. However Welded construction is not acceptable in place of seamless construction. g) All the reducers are concentric unless otherwise specified. h) Vendors shall not alter the description and size details given in the enquiry. i) All fittings shall be painted, marked and packed as per TDC requirement. j) Vendor shall quote only for the sizes which are within their manufacturing range approved by BHEL, Piping Centre. 	AGREED
3.0	<p><u>DELIVERY TERMS:</u> CFR CHENNAI PORT. Insurance will be borne by BHEL. Vendors shall arrange for FREE container retention period of 21 days for clearance of cargo.</p>	AGREED
4.0	<p><u>Price:</u> Quoted price shall be FIRM till the completion of supply. Prices shall include Testing, Inspection,Packing & Forwarding Charges. For Rate Contracts the terms and conditions shall be as indicated in the tender.</p>	AGREED
5.0	<p><u>Tender Process:</u> Tender shall be processed by opening the submitted sealed Price Bid or through Reverse Auction. The mode of tender process will be informed by BHEL after evaluation of Techno-commercial bids.</p> <p>Price Comparison shall be made by considering the Exchange rates as on Technical bid opening date.(State Bank of India – TT Selling Rates)</p> <p>Ranking will be based on Net Cash Outflow to BHEL. For foreign vendors inland transport from the port of discharge up to Trichy stores will be loaded for comparison with Indigenous bids to obtain net cash outflow to BHEL.</p>	AGREED
6.0	<p>If the vendor is not interested / not in a position to participate in the tender, vendor shall send regret letter for not participating, before due date of the tender.</p>	AGREED

7.0	<p>Test certificates (TC) along with Inspection Reports (IR) as called for in the TDC shall be sent to Manager Purchase (Fittings)/ Piping centre BHEL Chennai immediately after the shipment / dispatch of items.</p> <p>TC & IR shall be furnished for each batch of dispatch / consignment. If entire P O quantity is manufactured in one lot but dispatched in phased manner, original IBR should be submitted with the first consignment .For subsequent consignments, attested Xerox copy of IBR along with Xerox copies of TC & IR indicating Invoice detail against which original TC & IR was handed over to BHEL shall be submitted.</p> <p>Soft copies of the all the test certificates shall also be submitted through email.</p> <p>Year of Code for the standards SA 234, ASME B16.9, ASME B.16.11 etc. Shall be latest and the specific year has to be mentioned in the Manufacturer’s test certificates, as well as in IBR Form III-C.</p>	AGREED
8.0	<p>Offer Validity: - 90 days from the date of technical bid opening / 60 days from the date of last reverse auction.</p>	AGREED
9.0	<p>Delivery: - To be quoted against each tender.</p>	AGREED
10.0	<p>Generally ordering will be done on item level L1 vendor only and not as a total package. However in exceptional circumstances Order will be placed as a total package if indicated in the enquiry.</p>	AGREED
11.0	<p>Shipment: - All Items are to be shipped to Chennai Port India.</p>	AGREED
12.0	<p>INSPECTION: - Inspection shall be by reputed agencies like Lloyds, BV, SGS, TUV or by Inspection agency approved by IBR for that country of origin. Vendor shall indicate the name of the agency in the technical bid.</p>	AGREED
13.0	<p>INSPECTION CHARGES: Inspection charges and testing charges shall be included in the quoted price.</p>	AGREED
14.0	<p>BHEL Standard Guarantee Clause: The Bidder should guarantee for satisfactory performance of the materials for a period of 24 months from the date of dispatch or 18 months from the date of commissioning / putting into use whichever is earlier and if any defect is noticed during the above period, the same shall be rectified/replaced free of cost on FOR / Destination basis within a reasonable time, maximum limited to the agreed delivery period . To this effect a Guarantee certificate should be sent along with the dispatch documents in the event of an order</p>	AGREED

15.0	<p>LD Clause: - 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 5% of the price of delayed/undelivered portion.</p> <p>For the purpose of LD, date of Bill of Lading will be taken as the delivery date.</p> <p>LD will be calculated for the number of days delayed from the PO delivery date. %LD per day and LD value calculations are elucidated below: The same shall be used for Net Shipment value mentioned in para 19.C.3 below.</p> <p>No of days delayed = BL date – PO delivery date %LD per day = (No of days delayed) * (0.5 / 7) subject to a maximum of 5%. [% LD to be rounded to nearest two decimals]</p> <p>LD Value = %LD calculated above * Value of the delayed supply</p>	AGREED
16.0	<p>Risk Purchase Clause: 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.</p>	AGREED
17.0	<p>Performance Bank Guarantee (PBG):- Not applicable</p>	AGREED
18.0	<p>Payment Term: No advance payment shall be made by BHEL.</p> <p>100% CAD basis (Cash against documents). If LC is requested, loading charges @ 1.5% of the basic charge will be applicable.</p> <p>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 • Guarantee Certificate 	100% CAD
19	<p>Packing and Marking: Packing and Marking shall be as per TDC</p> <p>Machined end of the fittings shall be well protected using END CAPS. Fittings shall be suitably packed in box / crate to avoid transit and other damages. Packing shall be sea worthy / air worthy depending on the mode of shipment.</p>	AGREED

<p>20.0</p>	<p><u>MSE INDIAN VENDORS (MICRO & SMALL SCALE INDIAN INDUSTRIES)</u></p> <p>As per Indian Government Guidelines the following benefits have to be passed on to Indian Micro & Small scale industries.</p> <p>The following is the benefit for the MSEs.</p> <p>In tender, participating MSEs quoting price within price band of L1+15% shall also be allowed to supply a portion of requirement by bringing down their price to L1 price in a situation where L1 price is from someone other than a MSE and such MSE shall be allowed to supply up to 20% of quantity (Item level). This condition shall be applicable only for items with qty more than 10nos.</p>	<p align="center">AGREED</p>
<p>21.0</p>	<p><u>Forwarding of Dispatch documents and Test Certificates:</u></p> <ul style="list-style-type: none"> • Vendor shall indicate the Item description as “BOILER COMPONENTS – FITTINGS” in all the dispatch documents like Invoice, Bill of Lading, Packing List, Country of Origin. • Vendor shall negotiate the documents with Bank only for the net shipment value (i.e. Invoice value – LD value calculated as per PO terms) <p>Forwarding of dispatch documents and Test Certificates shall be done as indicated in the Annexure</p>	<p align="center">AGREED</p>
<p>22.0</p>	<p><u>NOTE :-</u></p> <ul style="list-style-type: none"> • Vendor shall follow BHEL drawings for manufacturing. No separate drawings shall be submitted by vendor for BHEL approval. If there is any clarification in BHEL drawing, vendor shall get it clarified. • PI note the reservation for MSE Indian vendors as per clause 20.0 • Ordering will be done on item level L1 vendor only and not as a total package unless indicated in the enquiry. • The PO copy with all details will be given to successful bidders in soft mode also. • Acknowledgement for receipt of PO shall be sent within one week from the date of receipt. • During the Contract period, any of our sister units of BHEL Piping Centre will be entitled to place order for this item on the same terms and conditions with the consent of the vendor. • BHEL reserves the right to cancel the tender without assigning any reasons what so ever. • Deviation taken after placement of order will not be accepted. • Lowest prices received against BHEL tenders does not mean order will be placed on that Supplier. BHEL reserves the right not to consider the same. • BHEL reserves the right to negotiate or re-float the tender opened if L1 price /or other details are not acceptable to them. • BHEL reserves the right to order on more than one vendor at the lowest acceptable price to BHEL. • Document shall be negotiated with bank only for the net shipment value as per PO & as per para 15 above. 	<p align="center">AGREED</p>



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1.0	<p><u>Type of Bid:</u> AN ENQUIRY CAN BE EITHER A 'SINGLE PART' BID TYPE OR 'TWO PART' BID TYPE. The bid type to which an enquiry will be resorted to will be indicated in the enquiry itself. Vendors have to submit their bids suitably.</p>	AGREED
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1.2	<p><u>Two Part Bid :</u> In case of two part bid , two bids (Part I & Part II) have to be submitted :</p> <ul style="list-style-type: none"> • PART I: a) Vendor has to confirm to supply as per MOU, in the format which will be sent along with enquiry b) Unpriced bid to be submitted to know the items for which the vendor has quoted. C) Taxes and duties applicable • PART II: Price bid has to be submitted in the format which will be sent along with the enquiry. <p>Both PART I bid and PART II bid, each sealed in a separate cover, shall be put in a sealed offer cover indicating 'TENDER NO WITH DATE ', 'TENDER OPENING DATE '& 'ITEM DESCRIPTION: FITTINGS' and shall be sent to</p> <p align="center">Sr. MANAGER / PURCHASE (FITTINGS) BHEL PIPING CENTRE PURCHASE DEAPRTMENT NO 80, GN CHETTY ROAD (II FLOOR) ,T.NAGAR, CHENNAI 600 017</p>	AGREED

<p>2.0</p>	<p>Technical Requirements:</p> <ul style="list-style-type: none"> a) BHEL TDC No TDG:102:Rev07 has been agreed in to and shall be followed for manufacturing and supply of Butt Welded fittings. In case of any revision in the TDC, vendors acceptance will be obtained. b) Agreed to supply as per BHEL drawings sent along with enquiry. If there is any clarification in BHEL’s drawings, vendor shall get it clarified. Vendors should not submit any separate drawing for approval. c) Edge preparation shall be done as per BHEL drg no: 3-80-300-19825 rev 03 and style & D1 value shall be as mentioned against each item in the enquiry . d) Tolerance shall be as per BHEL drawing 48030126192 rev 01 e) Offers shall be for Seamless construction unless otherwise specified as welded construction as per enquiry (as mentioned against each item) f) Seamless construction is acceptable in place of welded construction. However Welded construction is not acceptable in place of seamless construction. g) All the reducers are concentric unless otherwise specified. h) Vendors shall not alter the description and size details given in the enquiry. i) All fittings shall be painted, marked and packed as per TDC requirement. j) Vendor shall quote only for the sizes which are within their manufacturing range approved by BHEL, Piping Centre. 	<p align="center">AGREED</p>
<p>3.0</p>	<p>Delivery Terms: FOR - BHEL TRICHY STORES / ANY SITE IN INDIA as per BHEL dispatch instruction.</p> <p>Wherever DTS advice is given, fittings shall be directly sent to respective project sites. The remaining items shall be sent to BHEL/Trichy Stores after obtaining dispatch clearance from BHEL.</p>	<p align="center">AGREED</p>
<p>4.0</p>	<p>Price: Quoted price shall be FIRM till the completion of supply. Bidders shall submit their bid for FOR - BHEL Trichy Stores / Any site in India. Rates quoted shall be inclusive of all charges (Testing, IBR Inspection, Packing, Forwarding, Freight & Insurance). Taxes & Duties to be indicated separately. However for Rate Contracts the terms and conditions shall be as indicated in the tender.</p>	<p align="center">AGREED</p>
<p>5.0</p>	<p>Tender Process: Tender shall be processed by opening the submitted sealed Price Bid or through Reverse Auction. The mode of tender process will be informed by BHEL after evaluation of Techno-commercial bids.</p> <p>Price Comparison shall be made by considering the Exchange rates as on Technical bid opening date. (State Bank of India – TT Selling Rates)</p> <p>Ranking will be based on Net Cash Outflow to BHEL. For foreign vendors inland transport from the port of discharge upto Trichy stores will be loaded for comparison with Indigenous bids to obtain net cash outflow to BHEL.</p> <p>Generally ordering will be done on item level L1 vendor only. However in exceptional circumstances order will be placed as a total package if indicated in the enquiry.</p>	<p align="center">AGREED</p>
<p>6.0</p>	<p>If the vendor is not interested / not in a position to participate in the tender, vendor shall send regret letter for not participating, before due date of the tender.</p>	<p align="center">AGREED</p>

7.0	<p>Test certificates (TC) along with Inspection Reports(IR) as called for in the TDC shall be sent to Manager Purchase (Fittings)/ Piping centre BHEL Chennai immediately after the shipment / dispatch of items .</p> <p>TC & IR shall be furnished for each batch of dispatch / consignment. If entire P O quantity is manufactured in one lot but dispatched in phased manner, original IBR should be submitted with the first consignment .For subsequent consignments, attested Xerox copy of IBR along with Xerox copies of TC & IR indicating Invoice detail against which original TC & IR was handed over to BHEL shall be submitted.</p> <p>Soft copies of the all the test certificates shall also be submitted through email.</p> <p>Year of Code for the standards SA 234, ASME B16.9, ASME B.16.11 etc. Shall be latest and the specific year has to be mentioned in the Manufacturer’s test certificates, as well as in IBR Form III-C.</p>	AGREED
8.0	<p>Offer Validity: - 90 days from the date of technical bid opening / 60 days from the date of last reverse auction.</p>	AGREED
9.0	<p>Delivery: - Shall be quoted against each tender.</p>	AGREED
10.0	<p>Taxes & Duties: - To be indicated clearly in the offer. Octroi if any, to supplier’s account only.</p>	AGREED
11.0	<p>Transport: - Wherever DTS advice is given, fittings shall be directly sent to respective project sites. The remaining items shall be sent to BHEL/Trichy Stores after obtaining dispatch clearance from BHEL.</p>	AGREED
12.0	<p>Inspection: - a) IBR & BHEL/Third Party inspection agency for CS & AS materials. b) BHEL/Third Party inspection agency for SS Materials. No IBR inspection for SS materials.</p>	AGREED
13.0	<p>Inspection Charges: Inspection charges of BHEL/ Their representative are to BHEL A/c. However any other testing charges and IBR inspection charges should be included in the quoted prices.</p>	AGREED
14.0	<p>BHEL Standard Guarantee Clause: The materials are to be guaranteed for satisfactory performance for a period of 24 months from the date of dispatch or 18 months from the date of commissioning / putting into use whichever is earlier and if any defect is noticed during the above period, the same shall be rectified/replaced free of cost on FOR / Destination basis within a reasonable time, maximum limited to the agreed delivery period . To this effect a Guarantee certificate should be sent along with the dispatch documents in the event of an order</p>	AGREED

15.0	<p>LD Clause: - 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 <u>5%</u> of the price of delayed/undelivered portion.</p> <p>For the purpose of LD, LR date will be taken as the delivery date.</p> <p>No LD will be charged if the shipment is effected within 7 days from the PO delivery date. After 7 days, LD will be calculated for the number of days delayed from the PO delivery date.</p> <p>%LD per day and LD value calculations are elucidated below:</p> <p>No of days delayed = LR date – PO delivery date %LD per day = (No of days delayed) * (0.5 / 7) subject to a maximum of 5%. [% LD to be rounded to nearest two decimals]</p> <p>LD Value = %LD calculated above * Value of the delayed supply</p>	AGREED
16.0	<p>Risk Purchase Clause: 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.</p>	AGREED
17.0	<p>Performance Bank Guarantee (PBG):- Not applicable</p>	AGREED
18.0	<p>Payment Term: No advance payment shall be made by BHEL.</p> <p>100% payment within 45 days after receipt of the following documents: Payment shall be made against presentation of following documents to BHEL's Finance Department. However a copy of Invoice and LR shall be sent to Purchase department immediately after the dispatch is effected.</p> <ul style="list-style-type: none"> A. Invoice in Triplicate B. Delivery Challan in duplicate. C. Guarantee certificate in duplicate. D. Lorry Way Bill Copy <ul style="list-style-type: none"> 1) Site acknowledged LR in case of DTS desptch 2) Proof of receipt of material at Trichy stores E. Inspection report copy F. IBR Form III-C copy G. ED gate pass original or copy with a confirmation that the original is sent with the goods. 	AGREED

19.0	<p><u>Packing and Marking:</u> Packing and Marking shall be as per TDC</p> <p>Machined end of the fittings shall be well protected using END CAPS. Fittings shall be suitably packed in box / crate to avoid transit and other damages.</p>	AGREED
20.0	<p><u>Micro Small Enterprises: (MSE)</u></p> <p>In case the supplier belongs to MSEs (Micro Small Enterprises) – Indian vendors, Registration copy in this respect shall be submitted along with the offer. The MSE certificate shall be certified by a Chartered Accountant for the current status.</p> <p>The following is the benefit for the MSEs.</p> <p>In tender, participating MSEs quoting price within price band of L1+15% shall also be allowed to supply a portion of requirement by bringing down their price to L1 price in a situation where L1 price is from someone other than a MSE and such MSE shall be allowed to supply up to 20% of quantity (Item level). This condition shall be applicable only for items with qty more than 10nos.</p>	AGREED
21.0	<p><u>Forwarding of Dispatch documents and Test Certificates:</u></p> <ul style="list-style-type: none"> • Despatch documents consisting of Invoice, LR and Annexure containing item wise DU details & Heat no details shall be sent through email to the following persons in BHEL Piping centre immediately after the dispatch is effected. Mr A BASHEER AHAMED, abasheer@bhelmpc.co.in Mr K.RAJAN – rajan@bhelmpc.co.in • Invoice and LR shall clearly indicate the consignee address as per the dispatch Instructions. • Test certificate consisting of the following original documents shall be sent through courier to Mr A BASHEER AHAMED, Manager/Purchase, Piping Centre. <ul style="list-style-type: none"> (i) Inspection report of BHEL/BHEL’s authorized Inspection agency (ii) IBR form III C (iii) Manufacturer TC (iv) Inspection records as per TDC (v) Copy of dispatch documents • TC & IR shall be furnished for each batch of dispatch / consignment. If entire P O quantity is manufactured in one lot but dispatched in phased manner, original IBR should be submitted with the first consignment .For subsequent consignments, attested Xerox copy of IBR alongwith Xerox copies of TC & IR indicating Invoice detail against which original TC & IR was handed over to BHEL shall be submitted. • Documents for payment purpose as per para 17 above shall be sent to Sr.Manager/Finance, Piping Centre, Chennai – 17 	AGREED

22.0	<p><u>NOTE :-</u></p> <ul style="list-style-type: none">• Vendor shall follow BHEL drawings for manufacturing. No separate drawings shall be submitted by vendor for BHEL approval. If there is any clarification in BHEL drawing, vendor shall get it clarified.• PI note the reservation for MSE Indian vendors as per clause 20.0• Ordering will be done on item level L1 vendor and not as a total package unless specified in the enquiry.• The PO copy with all details will be given to successful bidders in soft mode also.• Acknowledgement for receipt of PO shall be sent within one week from the date of receipt.• During the Contract period, any of our sister units of BHEL Piping Centre will be entitled to place order for this item on the same terms and conditions with the consent of the vendor.• BHEL reserves the right to cancel the tender without assigning any reasons what so ever.• Deviation taken after placement of order will not be accepted (Both technical & on delivery)• Lowest prices received against BHEL tenders does not mean order will be placed on that Supplier. BHEL reserves the right not to consider the same.• BHEL reserves the right to negotiate or re-float the tender opened if L1 price /or other details are not acceptable to them• BHEL reserves the right to order on more than one vendor at the lowest acceptable price to BHEL.	<p>AGREED</p>
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1.0 GENERAL:-

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
SA 815 (Duplex Stainless Steel)	- 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 ± 10 deg C. Soaking time: 1Hr. minimum. Still air cooling.

G.Venkataramani, Engg & Qlty

A.P.Madhavan Kutty, Quality

Approved by

K. Vedaprasad, QC

K. Ganeshan, OPC & MPL



5.0 TESTING: -

- (a) **MPI / LPI:-** 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.
- (b) **Tensile Test:-** One fitting of each specification, heat, heat treatment lot and size shall be subjected to Tension Test as per applicable standard.
- (c) **Ultrasonic Test:-** 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:-**
(i) For SA234 WP91/SA 182 F91:-100% of items; Value:191-250 BHN max.
(ii) For SA 815 (Duplex SS):- 100% of items; Value: 290 BHW max.
(iii) For other specn :- 10% of items; Value - As per specn.
The hardness test values shall be indicated in the Test certificate.
- (e) **Radiography Test (for 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, SA182 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) **Photomicrograph test for WP91 & F91 :-** 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 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: 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. Stainless steel and Galvanised fittings need not be painted.

G.Venkataramani, Engg & Qlty

Approved by

K. Vedaprasad, QC

A.P.Madhavan Kutty, Quality

K. Ganeshan, OPC & MPL



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

SA 234 WPB / WPBW	=	Red
WPC / SA105	=	Blue
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
SA 815 (Duplex Stainless Steel)	=	Red, White & Green

7.3 **MARKING** (In English only):

7.3.1 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. If the thickness of the fitting is less than 6 mm, punching is not permitted and the above details shall be paint stencilled 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 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 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** (In English only): -

8.1 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 (Three ink signed originals required)

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.

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9. Steel making process
10. Ladle Analysis of Raw Material and product analysis of fitting.
- *11. Supplementary Test (Product analysis, Tension test.) results.
- *12. Tensile Test Report

- *13. 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".

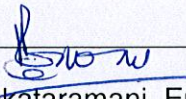
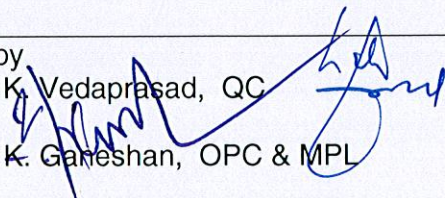

*Details furnished in the Tests certificate in lieu of chart/report is acceptable.

8.2 The following reports shall be **furnished separately** along with the Form III C & MTC indicated in para 8.1 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)
- vii. Thickness Measurement Report for Elbows as per Doc No : TDG102:001

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.
- Rev 05 :** a) New material specification SA 815 Duplex Stainless Steel included.
b) Para 4.1, 4.2, 5.0 (d), 7.1 & 7.2 are revised.
c) 5.0 (a), (b), (c), (e), (f), (g), 7.3.1 & 7.3.2 are modified for better clarity.
- Rev 06 :** a) Para 8.2 added.
b) Para 5.0(d), 5.0(g), 7.1, & 8.1 are revised.
c) Para 1.0 & 7.2 are modified.
- Rev 07 :** Para 8.2 - vii added.

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A.P.Madhavan Kutty, Quality 		K. Ganeshan, OPC & MPL

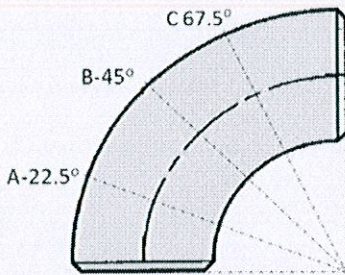


Thickness Measurement Report for Elbow

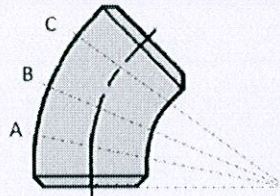
Doc No : TDG102:001 Rev:00

Date : 03-02-2014

A	Vendor Name & Code	
B	PO reference & Date	



90° Elbow



Less than 90°

Measurement (Extrados) points

Angle	A	B	C
90	22.50°	45.00°	67.50°
60	15.00°	30.00°	45.00°
45	11.25°	22.50°	33.75°
30	NA	15.00°	NA

Description of item :
 Material Spec :
 Material Code :

No	Wall thickness at ends		Wall Thickness at angle			Remarks
	End 1	End 2	A	B	C	
1.						
2.						
3.						
4.						
5.						
6.						
7.						
8.						
9.						
10.						
11.						
12.						
13.						
14.						
15.						

Manufacturer

BHEL

M. S. S.
3/2/14