



Bharat Heavy Electricals Limited

(A Govt. of India Undertaking)

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

Fax : 91 (044) 28161245, : Phone : 91 (044) 28161243

REF: ENQ NO: 4101400073

DT: 18.09.2014

Sub: Request for quotation – Forgings / Forged Fittings - reg.

Please find the following tender documents enclosed for you to submit offer. The offers should reach us before the time of opening tenders. The offer will be opened at **14:30 hrs** on the **due date 03.10.2014** in the presence of tenderers who may like to be present. Late tenders will be rejected.

List of Enclosures with the enquiry:

- 1) List of items
- 2) Drawings / EP Drawing
- 3) Terms and Conditions Format
- 4) TDC: TDG: 104 REV 08

Your offer shall contain only the following:

- 1) PART 1 - Techno commercial Bid: Duly filled & signed "Terms and Conditions format & List of items without price part (indicating the quoted / not quoted items)" provided by BHEL.
- 2) PART 2 - Duly filled in Price Bid: "List of items" provided by BHEL.

NOTE:

Any other terms or conditions mentioned in your offer other than the above mentioned formats will not be evaluated and will be considered null & void. Hence your offer shall contain ONLY the above mentioned formats.

Considering the urgent requirement of projects it is to inform you that **due date may not be extended**. The technical bids will be opened on **03.10.2014**. Pl submit your bids **well before the due date**.

Please indicate enquiry no. and date and due date in all correspondences. This is only a request for quotation and not an order.

(Ravi Singh)
Engineer / Purchase
For Senior Manager / Purchase
BHEL / Piping Centre

LIST OF ITEMS

FORGINGS

Sl. No.	Material code	Description	TOTAL QTY (Nos.)	SPECIFICATION	D1 VALUE	DRAWING	CURRENCY	UNIT RATE
1	921178420000	MAT PIECE OD660X40/ID650X49 SA182F22	6	SA182F22	586.7/650	4-80-320-77058/00		
2	925166200000	HOL.FORG OD323/ID183 L=700SA182F22CL3	1	SA182F22CL3	NA	NA		
3	925166790000	Safety valve stub OD223 SA105	16	SA105	NA	4-80-999-93229/01		
4	925167600000	FORGING ID708X42 L=1000 SA105	8	SA105	NA	NA		
5	925167710000	FORG OD410MIN/ID364MAX L=490 SA182F11C2	4	SA182F11CL2	NA	NA		
6	925167720000	FORGING OD875MIN/ID762MAX SA182F11CL2	4	SA182F11CL2	NA	NA		
7	925167730000	FORGING ID 851X100 L=1200 SA182F11CL2	4	SA182F11CL2	NA	NA		
8	925167740000	FORGING ID 448X50 L=350 SA182F11CL2	4	SA182F11CL2	NA	NA		
9	925179150000	MAT PIECE OD864X35/OD864X27 L=500 SA105	1	SA105	As per Drawing	4-80-320-60917/01		
10	925179410000	BW RED OD 508X64/OD368X48-SA105	3	SA105	392/281	4-80-423-62609/01		
11	925271320004	MPCE645X31.5/355.6X32L=600 SA182F22CL3	3	SA182F22CL3	As per Drawing	4-80-321-60835/00		
12*	925275310000	BWCONREDOD645X31.5/508X28 SA182F22CL3	2	SA182F22CL3	As per Drawing	4-80-321-74800/01		
13	925279290000	MPCEOD645X31.5/OD508X25L=500 SA182F22CL3	2	SA182F22CL3	As per Drawing	4-80-321-60836/00		

No raw material / component /other services for (*) marked Sl. Nos. shall be sourced from China either directly or indirectly for manufacturing or supply.

For Sl . Nos 2, 4, 5, 6, 7 & 8 tolerances of (OD +2 -0, ID +0 -2, L +2 -2) shall be followed.

VENDOR'S SIGNATURE AND SEAL



TERMS & CONDITIONS FOR PROCUREMENT OF FORGED FITTINGS -- FOREIGN & INDIGENOUS

SL NO	BHEL REQUIREMENT	AGREE	DISAGREE
1	<p>TYPE OF BID – Offers are invited to submit in single/Two parts</p> <p>A. In case of Single Part Bid no deviation shall be taken and bids will be rejected if any deviation is taken. The order will be finalized based on price /negotiation/RA with all other conditions being accepted by the bidder.</p>	NA	NA
	<p>B. In case of Two part bid, the following procedure shall be followed.</p> <p>Part-I TECHNICAL - CUM – COMMERCIAL PART (Un priced) :- This part of the Bid shall contain following Technical and Commercial Points only (Except Price Portion)</p> <ul style="list-style-type: none"> • Acceptance to our TDC104 rev 08 (Technical delivery condition) as given in the tender. Deviation if any shall be clearly indicated. UNDISCLOSED DEVIATIONS ARE NOT ACCEPTABLE. • Copy of price bid without price part to know the items for which you are quoting against this tender. • Confirmation to supply as per drawings if any sent along with enquiry. <p>(Money values shall not be indicated i.e. unpriced bid).</p> <p>PART II PRICE PART :</p>		
	<p>Foreign vendors- The unit price shall be quoted on FOB basis. (Please name the port)</p>		
	<p>Indigenous vendors-The unit price on FOR Trichy/Site basis. (Including freight and insurance)</p>		
	<p>The price shall include all testing, inspection, packing & Forwarding charges. PLEASE DO NOT QUOTE ON EX-WORKS BASIS. This part of the Bid shall contain item-wise Price details against each Enquiry Sl.No. and the same shall be put in a sealed cover duly indicating Tender No, Tender Opening date, and “Price Bid” on the Sealed cover. Price quoted by the Supplier, itemwise including Taxes & Duties shall be furnished. Preconditions for price will not be accepted. Both the above referred parts(part I , part II) of the Bid each sealed in a separate cover shall be put in a sealed outer cover duly indicating Tender No.& Date, Tender Opening date and to be sent to</p> <p align="center">SR. MANAGER / PURCHASE (FITTINGS) BHEL: PIPING CENTRE 80, G.N CHETTY STREET T.NAGAR, CHENNAI 600 017</p>		
	<p>TENDER SHALL BE PROCESSED BY OPENING THE SUBMITTED SEALED PRICE BID.</p> <p>HOWEVER BHEL RESERVES THE RIGHT TO FINALIZE THE PRICES THROUGH REVERSE AUCTION WHICH WILL BE INFORMED AFTER TECHNICAL EVALUATION.</p>		
	<p>Price Comparison shall be made by considering the Exchange rates as on Technical bid opening date.</p>		
2	If you are not interested / not in a position to participate in the tender, please send regret letter for not participating, before due date of the tender.		
3	You are requested to quote only for the sizes / spec for which are within your manufacturing range and approved by BHEL, Piping Centre.		
4	Vendors should accept ordering based on competitive price at item level, ordering will not be made on package basis. Minimum order qty. / Minimum order value condition is not applicable for this tender. If any such conditions made by the vendor, their bid is liable for rejection.		

SL NO	BHEL REQUIREMENT	AGREE	DISAGREE
5	<p>Test certificates as called for in the TDC shall be sent to Purchase / Piping centre BHEL Chennai immediately after the shipment / dispatch of items and not through Bank.</p> <p>Inspection documents 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 sent along with the first consignment and the attested Xerox copy of IBR shall be sent for subsequent consignments.</p> <p>Soft copy of the all the test certificates shall also be submitted through email.</p>		
6	Year of Code for Viz. the standards ASME B16.9, ASME B 28 & ASME B.16.11 etc. as mentioned in TDC shall be latest and the specific year is to be mentioned in the Manufacturer's test certificates, as well as in IBR Form III-C. Also the relevant Year Code for material standard and the NDT standard (ie U.T/LPI/MPI) has to be mentioned.		
7	VALIDITY OF THE OFFER: - The quotation shall be valid at least for a period of 90 days from the date of technical bid opening / 60 days from the date of final reverse auction. Offer with lesser validity may not be considered		
8	DELIVERY SCHEDULE :- 4 MONTHS from LOI / PO date DELIVERY IS THE ESSENCE OF THE CONTRACT. As delivery will affect our project requirements, kindly quote for the above delivery period only.		
9	TERMS OF DELIVERY :- 1) Indigenous vendors FOR Trichy/Site basis		
	2) Foreign vendors FOB basis (Please name the port)		
10	TAXES & DUTIES: - Please indicate clearly the percentages of applicable taxes, duties like CST, Excise Duty or any other taxes / duties.	Indicate taxes and duties in % , if any	
11	TRANSPORT : For Indigenous suppliers: Wherever DTS advice is given, fittings shall be directly sent to respective project sites. The remaining items shall be sent to Trichy Stores.		
12	PRESERVATION & IDENTIFICATION:- As per Technical Delivery Condition		
13	INSPECTION :- Indigenous suppliers. a) IBR & BHEL/ BHEL approved third Party inspection agency for CS & AS materials. b) Only BHEL/ BHEL approved third Party inspection agency for SS Materials. No IBR inspection for SS materials.		
	Foreign suppliers SGS / BV /LLOYDS/TUV or IBR approved inspection agency.		
14	Inspection Charges:- For Indigenous vendors: Inspection shall be by BHEL / BHEL approved third party inspection agency. BHEL approved TPI 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 quoted price.		
15	GUARANTEE: 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 whichever is earlier.		

SL NO	BHEL REQUIREMENT	AGREE	DISAGREE
16	<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 10% of the price of delayed/undelivered portion.</p> <p>For the purpose of LD , the delivery date will be reckoned as follows:</p> <p>a) For foreign/Imported vendors: Date of Bill of Lading will be taken as delivery date. b) For Indigenous sources: LR date will be taken as the delivery date.</p>		
17	<p>TERMS OF PAYMENT: No advance payment shall be made by BHEL.</p> <p>For indigenous vendors: 100% payment within 45 days after receipt of materials: Payment shall be made against presentation of following documents to our Finance Department . However a copy of Invoice and LR shall be sent to Purchase department immediately after the dispatch is effected.</p> <p>A. Invoice in Triplicate B. Delivery Challan in duplicate. C. Guarantee certificate in duplicate. D. Lorry Way Bill Copy 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.</p>		
	<p>For Foreign Vendors: 100% through CAD (OR) 100 % LC at sight. It may be noted that loading for LC charges will be made @ 1.5% of quoted rates.</p>	Choose one of the given two options	
18	<p>No raw material / component /other services for (*) marked Sl. Nos. shall be sourced from China either directly or indirectly for manufacturing or supply.</p>	AGREED	
19	<p>GENERAL :-</p> <ul style="list-style-type: none"> The PO copy with all details will be given to successful bidders in soft mode also. Order will be placed on item level L1 status only and not as a total package. 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 BHEL reserves the right to cancel this tender without assigning any reasons what so ever. Deviation taken after placement of order will not be accepted (Both technical & on delivery) Suppliers to analyze in detail, at the time of submission of offer with reference to our “delivery” requirement of fittings and confirm Compliance or otherwise. 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 Risk purchase clause: In case vendor fails to meet delivery date as per Purchase order, BHEL has the right to cancel the order and order the same item on other vendor and recover the additional cost that may incur. Unsolicited offers will not be considered for this enquiry .New Vendors may download Vendor registration forms from BHEL Web site www.bhel.com, and submit all relevant data for registration purpose. 		

Note : Please confirm your acceptance/other wise to all the points indicated above positively and submit this format duly filled, signed & stamped along with the technical bid.

VENDORS SIGNATURE & SEAL



1.0 GENERAL

Materials shall meet Indian Boiler Regulations, (IBR) in addition to the latest version of SA105, SA 182 & Code Case 2179 (for SA182 F92) as on date specified in the Purchase Order (PO).

2.0 RAW MATERIAL

- (a) The raw material used shall meet the respective specification and the test certificate shall be furnished.
- (b) For SA182 F91 & F92 (code case 2179) : The raw material shall be procured from the Mills listed in document ref.QCP:18(latest revision). For raw material sources not listed in QCP:18, credentials shall be submitted by the vendor along with offer for BHEL review and approval. Indigenous vendors shall procure the raw material for other than SA182 F91 & F92 (code case 2179) from IBR approved sources.
- (c) For SA 105 : Carbon : 0.25% max.
For SA182 F92 : Si: 0.10-0.50%; Ni: 0.30 max and Cu: 0.25 max.

3.0 PROCESS

- (a) Process of manufacture shall conform to applicable standards.
- (b) Unless otherwise specified in the P.O, SA182 F11/12 items shall be supplied as per class 2 and SA182 F22 shall be of Class 3 only.
- (c) Dimensions shall be as per Purchase Order.
- (d) For SA182 F91 & F92 (code case 2179) : Steel for forging shall be check tested for product analysis at vendor's works and shall be witnessed by IBR / IBR authorised agency. The check test report along with Mill TC shall be certified by IBR / IBR authorised agency.
- (e) **Forging:** to ensure uniformity of structure & strength with reduction ratio in area 4: 1 min from ingot to final forging, close to final size & shape. Flow lines to be parallel to axis of openings.
- (f) **Blooms / Billets** used for forgings (Side Length, Dia \geq 50mm) shall be UT tested & for acceptance norm refer sl.5(i). For finished bars this can be done at Final stage.

4.0 HEAT TREATMENT

4.1 All items shall be heat treated as below:

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

4.2 SA182 F91 & F92 :-

Normalising Temp. : 1050°C - 1080°C (for wall thickness larger than 75 mm, accelerated cooling may be done to obtain a fully martensitic structure).

Tempering Temp. : 750°C - 780°C Soaking time: 2.5min/mm of thickness (1 hr min.), still air cooling.

5.0 TESTING

- (a) **Product analysis:-** Product analysis shall be carried out on One piece / Heat / HT lot / Size.
- (b) **Corrosion test:-** Corrosion test (IGC) shall be carried out on one piece / Heat / HT lot / Size for SS items.

Prepared by : Vivekananda Yellu	Reviewed by : M.S.Muralidharan
Approved by: A.P.Madhavan Kutty Quality	K. Ganeshan OP&C and MPL
	G.Venkataramani Engg&Quality



- (c) **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.
- (d) **LPI (After Heat Treatment)** :100% for SS as per ASTM E165, No linear indications acceptable.
- (e) **Tension test**:-Tension test shall be carried out on one Test piece for each specification, heat, heat treatment lot and size.
- (f) **Bend test**:- (a) Bend test for CS (SA 105) : One sample of 19 mm thick and 25mm width to be bent 180 deg around mandrel of radius 6.35mm.
(b) Bend test for AS (SA182): One Sample of 25.4 mm width and thickness = t to be bent 180 deg around mandrel of radius =1.5 t. Test on representative sample is also acceptable.
- (g) **Photomicrograph test for F91 & F92** :- Photomicrograph test shall be carried out from a specimen of forging in the as finished condition for each individual size (OD and wall thickness) from each heat per heat treatment batch. 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.
- (h) **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.

- (i) **Ultrasonic Test**:- All items shall be ultrasonically tested as per SA388 and acceptance norms shall be as per ASME Sec VIII Div .2 Cl. 3.3.4.

6.0 POSITIVE MATERIAL IDENTIFICATION (PMI) FOR ALLOY STEEL FITTINGS.

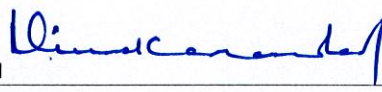
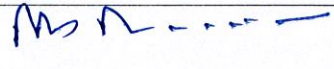


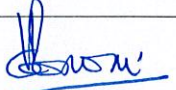
Each alloy steel item shall be checked for the correctness of the material during manufacturing and final inspection using X-ray fluorescence principle or spark emission spectrography.

7.0 WORKMANSHIP, FINISH AND REPAIR

All items shall have smooth, workman like finish, and to be free from scale & defects like laps, seams, folds, cracks, etc. Surface defects can be removed by mechanical means and defective areas smoothly dressed up with the adjacent surface. Minimum dimension after repair shall meet drawing / Specification. Repairs by fusion welding are prohibited.

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

- 8.1 **PAINTING**: All items except SS to be applied with resin type rust preventive coating with visibility to punched and stenciled details on outside and either with rust preventive coating or rust inhibitor inside. SS items to be surface treated as per ASTM A380 both inside and outside.

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Approved by: A.P.Madhavan Kutty Quality 	K. Ganeshan OP&C and MPL 	G.Venkataramani Engg&Quality 



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

SA105	=	Blue
SA182 F11	=	Green & White
SA182 F12	=	Black & Red
SA182 F22	=	Blue & Red
SA182 F91	=	Brown & Red
SA182 F92	=	Brown & Blue
SA182 F316	=	Black & Blue
SA182 F316L	=	Blue, Brown & Yellow

8.3 **MARKING** (In English only) :-

8.3.1 The items 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 items dispatched directly to project site as **DTS** shall be hard punched and paint stencilled with DU code (14 digit work order du detail) as given by purchase in addition to marking done as per para 8.3.1.

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

9.0 **INSPECTION & CERTIFICATION** (In English only) :-

All items are to be Inspected at the manufacturer's works by the Inspection agencies / authorities as per IBR and as indicated in the P.O. Inspection certificate in IBR Form IIIC (Form IIIF for well known forger under IBR) shall be submitted along with the Work Test Certificate countersigned by any of the above authorities and shall include the following.

1. Test Certificate Number & date.
2. BHEL P.O Number & Amendment Number(if any)
3. BHEL P.O. Serial Number
4. BHEL TDC Number
5. Size-wise Quantity
6. Specification, Grade & Year of code.
7. Heat/Melt Number
8. Steel making / forming process
9. Ladle and product Analysis of Raw Material.
10. IBR approved certificate for manufacturing creep resistance steel in case of indigenous steel makers.
- *11. Product analysis report.
- *12. Heat Treatment Chart.
13. NDE report. (VISUAL.MPI, LPI, UT)
- *14. Tensile Test report

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- *15. Bend Test report.
- *16. Hardness Test report
- *17. Intergranular corrosion test report for SS
- 18. Photomicrograph test report along with photomicrograph with 500x (min) magnification.
- *19. Dimensional conformance.
- *20. Repair details if any, Certified copy of TC for starting material.
- *21. Guarantee of HTP shall be given in the test certificate as follows if hydro test is not carried out :- "Forgings are capable of with standing without failure, breakage or impairment of their serviceability a hydrostatic test pressure equal to that prescribed for the specified matching pipe of equivalent material".

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

10.0 AUDIT CHECKS AT BHEL

BHEL reserves the right to carry out audit checks for chemistry, HT condition, mechanical test and NDT on representative test bars or job.

Supplies found defective during check or subsequent processing at BHEL are liable for rejection.

11.0 Records of Revisions:-

- Revision 02 : Material specification SA 182 F316 added.
- Revision 03 : (i) Para 4.0, 6.0 included.
(ii) Para 5.0 (b),(c),(h),(j), 8.0 and 9.0 (17) are revised.
- Revision 04 : (i) New material specification SA 182 F92 added.
(ii) Para 1.0, 3.0, 4.2, 5 (f), (g) & 8.2 are revised.
(iii) Para 5 (a) to (h) are modified for better clarity.
- Revision 05 : (i) Para 10.0 added.
(ii) Para 2 (c), 3.0, 8.2, 8.3.2 & 9.0 are revised.
(iii) Para 5 (c), 5 (d) & 5 (i) are modified for better clarity.
- Revision 06 : (i) Para 2 (b), 3 (e),(g) & 9.0 are revised.
(ii) Para 4.1, 4.2, 5(h), 6.0, 8.1, 8.2, 8.3 & 8.4 are modified for better clarity.
- Revision 07 : (i) Para 3 (e) deleted-(Creep Test (Type Test) requirement), further clauses renumbered..
(ii) Para 9.0 revised.
- Revision 08 : (i) Para 2.0(b), 3.0(d) & 5.0(g) are revised.
(ii) Para 4.2 modified for better clarity.

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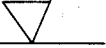
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REV	DATE	ALTERED
01	05-05-06	<i>[Signature]</i>
		APPROVED
		<i>[Signature]</i>

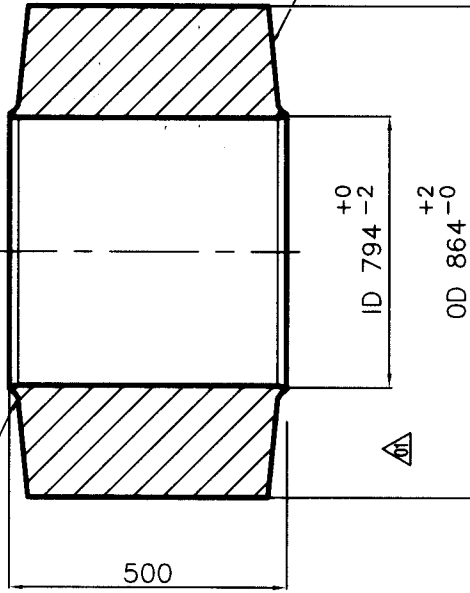
ALL DIMENSIONS ARE IN MILLIMETRES

THICKNESS DIMENSION 100mm REMOVED.
REVISIONS ARE INDICATED AS ∇

12.5



EDGE PREPARATION
AS PER DRG No.
3-80-300-19825
STYLE-P, d1=794



EDGE PREPARATION
AS PER DRG No.
3-80-300-19825
STYLE P, d1=813

	MATCHING PIECE L= 500 (OD864x35 / OD864x27)	92 517 915 0000	A	360	000
		SA 105			
VAR NO.	DESCRIPTION	MATL. CODE	A/C	UNIT	UNIT.WT.(Kg)
		MATL. SPECN.	DI		QTY.

STANDARD



BHARAT HEAVY ELECTRICALS LIMITED
PIPING CENTRE
CHENNAI 600 017

	NAME	SIGN	DATE	NO. OF VAR
DRN	A. PRIYA	<i>[Signature]</i>	10-11-05	
CHD	M.C.SEKARAN	<i>[Signature]</i>	10-11-05	
APPD	A. VELAYUTHAM	<i>[Signature]</i>	10-11-05	

DEPT	GRADE OF UNTOL DIM	SCALE	WEIGHT (KG).	BHEL PO REF NO:	ITEM NO.	NO. OF ITEMS
CODE	C / M / F	N.T.S	360.000			
TITLE			CARD CODE	DRAWING NO.	REV	
MATCHING PIECE (OD864x35 / OD864x27)			U 01	4-80-320-60917	01	

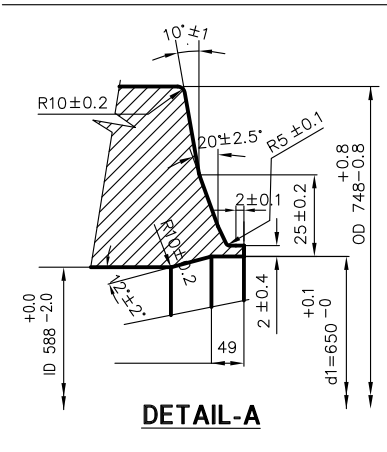
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REV	DATE	ALTERED
01		APPROVED

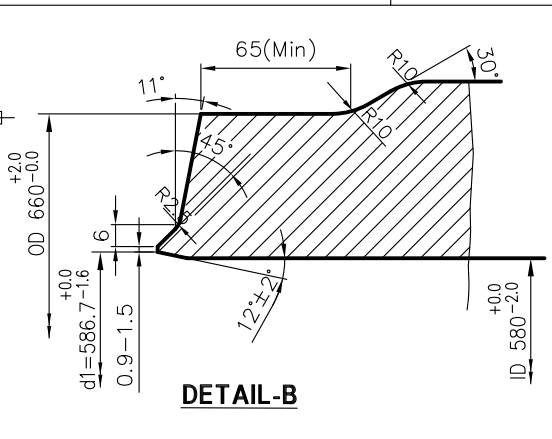
NOTES

ALL DIMENSIONS ARE IN MILLIMETRES

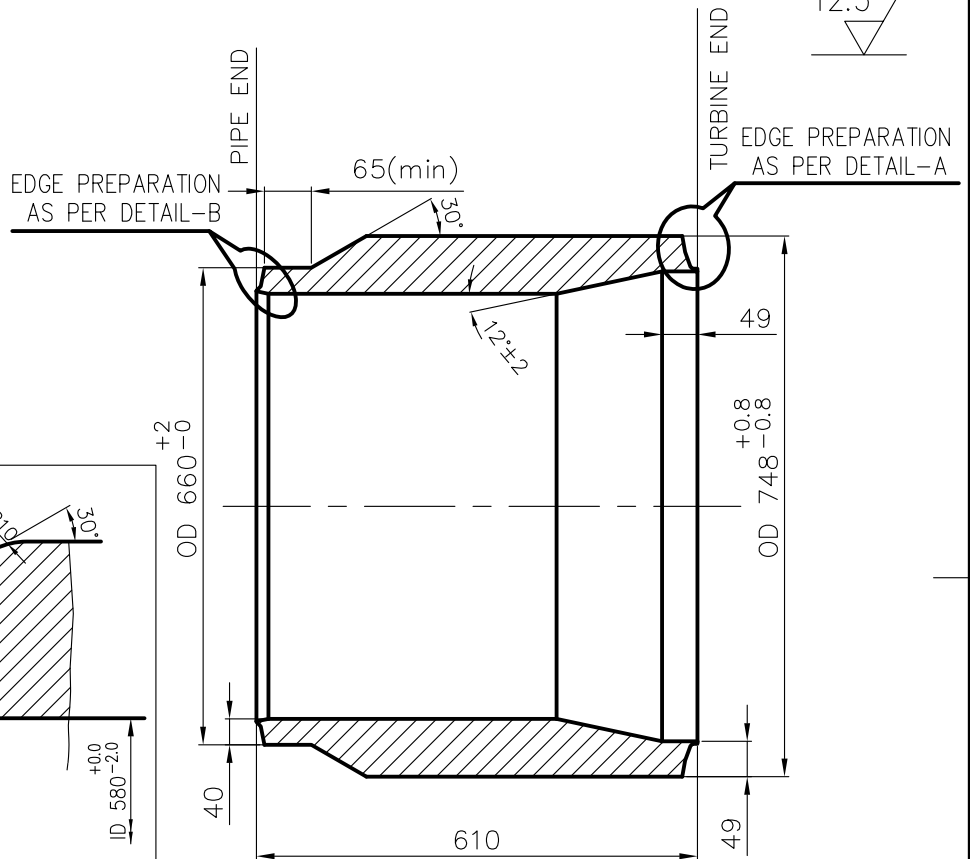
- 1) DESIGN PRESSURE : 73.1 Kg/Cm²(g)
- 2) DESIGN TEMPERATURE : 500 °C
- 3) FOLLOW TDC No. : TDG-104 (LATEST REVISION)
- 4) THE FINISHED MATERIAL CODE IS '92 117 842 0000'



DETAIL-A



DETAIL-B



-	FORGING OD660/ID650 L=610	-	A	645	000
VAR NO.	DESCRIPTION	STD	A/C	UNIT	QTY.
				UNIT.WT.(Kg)	



BHARAT HEAVY ELECTRICALS LIMITED
PIPING CENTRE
CHENNAI 600 017

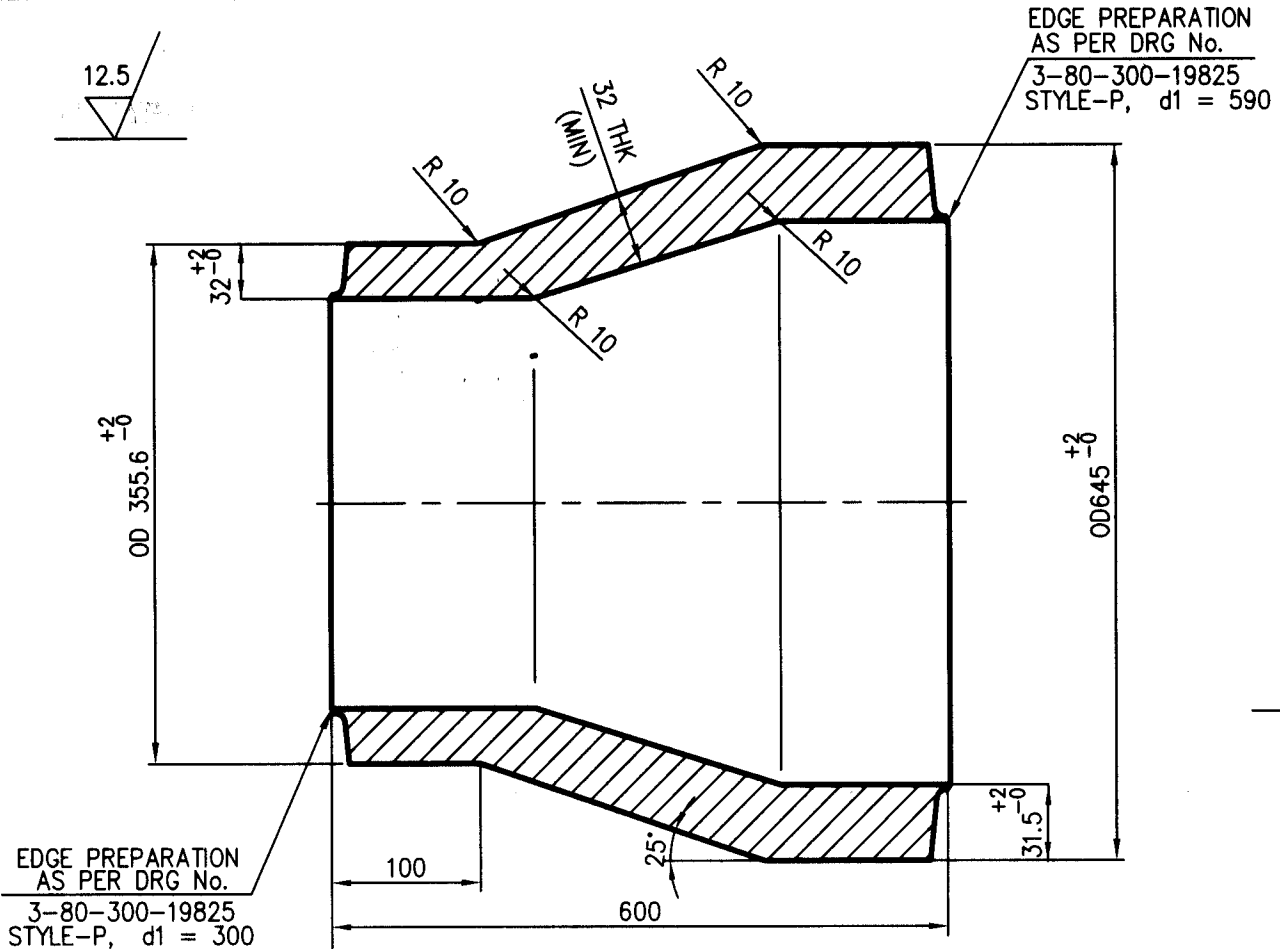
NAME	SIGN	DATE	NO. OF VAR
DRN POONGKODI.V	-sd-	15/06/2013	
CHD SUKUMAR.B	-sd-	15/06/2013	
APPD C.V.NATHAN	-sd-	15/06/2013	

DEPT	GRADE OF UNTOL DIM	SCALE	WEIGHT (KG).	BHEL PO REF.NO:	ITEM NO.	NO. OF ITEMS
CODE	C / M / P	N.T.S	645.000	-	-	-
TITLE			CARD CODE	DRAWING NO.	REV	
MATCHING PIECE (OD660x40/ID650x49)			U 01	4-80-320-77058	00	

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REV	DATE	ALTERED
01		APPROVED

ALL DIMENSIONS ARE IN MILLIMETRES



EDGE PREPARATION
AS PER DRG No.
3-80-300-19825
STYLE-P, d1 = 300

EDGE PREPARATION
AS PER DRG No.
3-80-300-19825
STYLE-P, d1 = 590

VAR NO.	DESCRIPTION	STD	MATL. CODE	A	UNIT	UNIT.WT.(Kg)
	MATCHING PIECE L=600 OD645 x 31.5/OD 355.6 x 32		92 527 132 0004 SA 182 F22 CL3			241 000
			MATL. SPECN.	C	DI	QTY.

STANDARD



BHARAT HEAVY ELECTRICALS LIMITED
PIPING CENTRE
CHENNAI 600 017

NAME	SIGN	DATE	NO. OF VAR
DRN A. PRIYA	<i>A. Priya</i>	05-11-05	
CHD M.C.SEKARAN	<i>M.C. Sekaran</i>	05-11-05	
APPD A.VELAYUTHAM	<i>A. Velayutham</i>	05-11-05	

DEPT	GRADE OF UNTOL.DIM	SCALE	WEIGHT (KG).	BHEL PO REF.NO:	ITEM NO.	NO. OF ITEMS
CODE	C / M / F	N.T.S	241.000			

TITLE	CARD CODE	DRAWING NO.	REV
MATCHING PIECE (OD645x31.5/OD355.6x32)	U 01	4-80-321-60835	00

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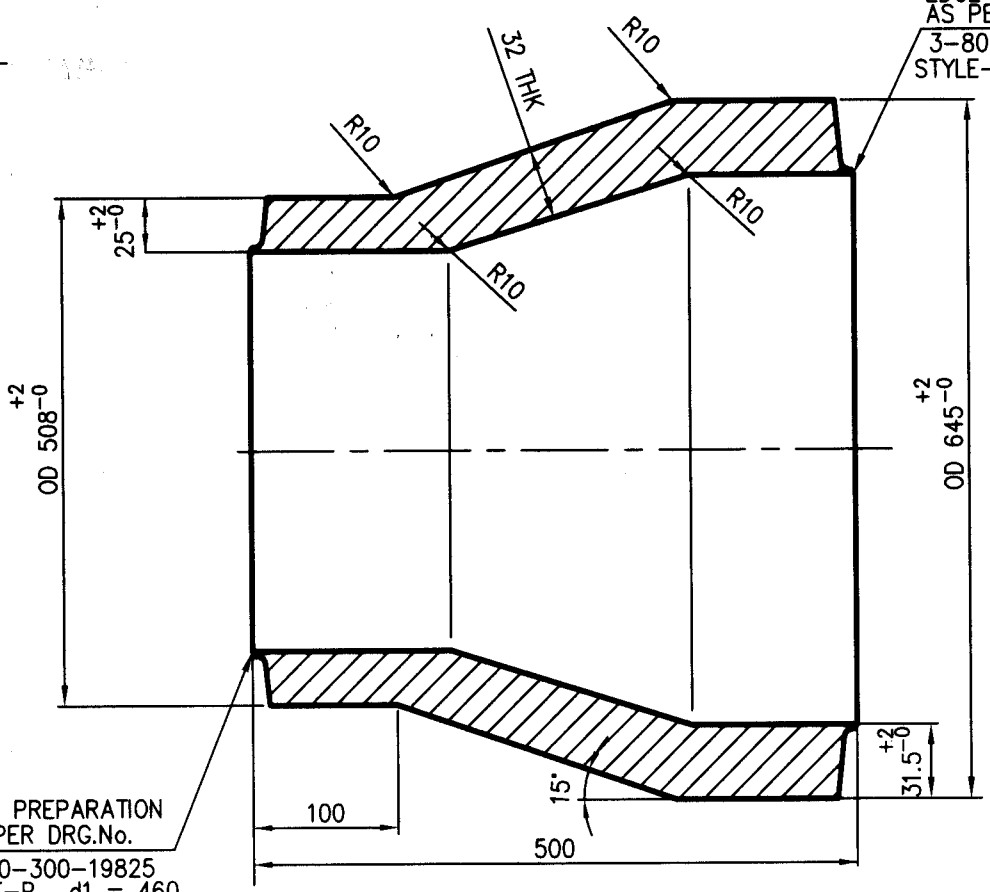
ALL DIMENSIONS ARE IN MILLIMETRES

REV	DATE	ALTERED
01		APPROVED

12.5

EDGE PREPARATION AS PER DRG.No. 3-80-300-19825 STYLE-P, d1 = 590

EDGE PREPARATION AS PER DRG.No. 3-80-300-19825 STYLE-P, d1 = 460



VAR NO.	MATCHING PIECE L=500 OD645 x 31.5/OD 508 x 25	92 527 929 0000 SA 182 F22 CL3	A	211 000
			A	
			C	
			DI	
			UNIT	UNIT.WT.(Kg)
				QTY.

STANDARD



BHARAT HEAVY ELECTRICALS LIMITED
PIPING CENTRE
CHENNAI 600 017

NAME	SIGN	DATE	NO. OF VAR
DRN A. PRIYA	<i>A. Priya</i>	05-11-05	
CHD M.C.SEKARAN	<i>M.C. Sekaran</i>	05-11-05	
APPD A.VELAYUTHAM	<i>A. Velayutham</i>	05-11-05	

DEPT CODE	GRADE OF UNTOL.DIM C / M / F	SCALE N.T.S	WEIGHT (KG). 211.000	BHEL PO REF.NO:	ITEM NO.	NO. OF ITEMS
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TITLE MATCHING PIECE (OD645x31.5/OD508x25)	CARD CODE U 01	DRAWING NO. 4-80-321-60836	REV 00
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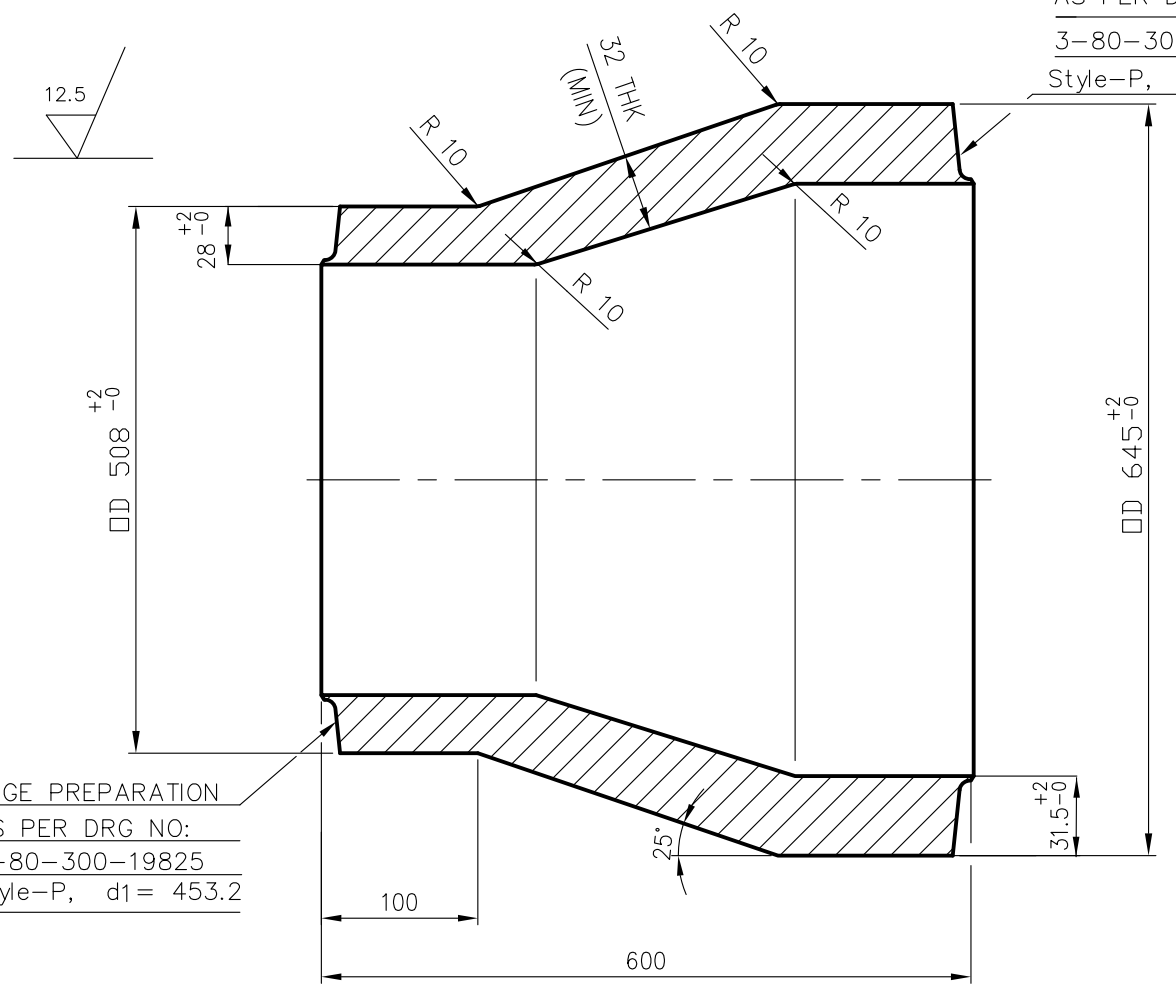
REV	DATE	ALTERED	P SURESH
01	10.12.12	APPROVED	S PANDA
MATERIAL CODE CHANGED			

ALL DIMENSIONS ARE IN MILLIMETRES

NOTES :-

- DESIGN PRESSURE : 66.3 Kg/Cm² (g)
- DESIGN TEMPERATURE : 510° C
- FOLLOW APPLICABLE QP.

EDGE PREPARATION
AS PER DRG NO:
3-80-300-19825
Style-P, d1 = 590




EDGE PREPARATION
AS PER DRG NO:
3-80-300-19825
Style-P, d1 = 453.2

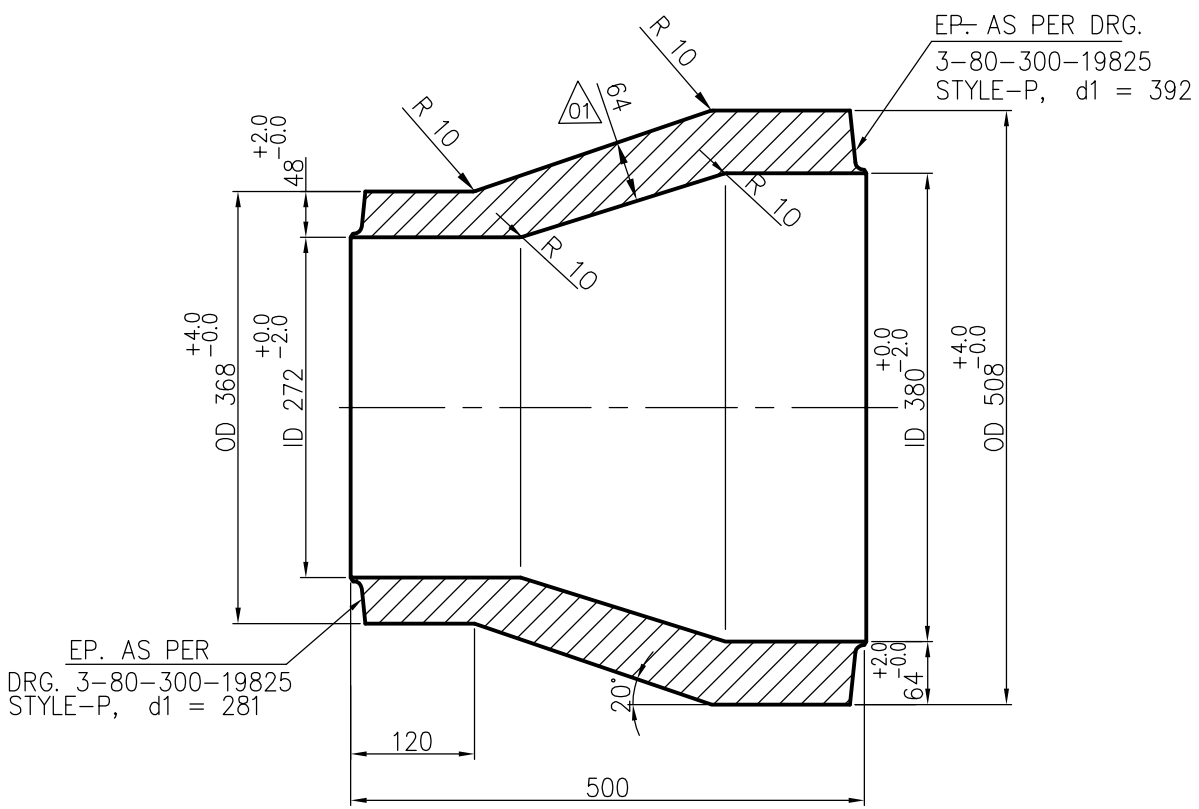
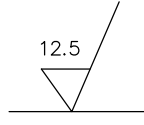
	MATCHING PIECE L=600 OD 645x31.5/OD 508X28	95 527 531 0000 SA 182 F22 CL3	A	390	000
VAR NO.	DESCRIPTION	MATL. CODE	A	UNIT	UNIT.WT.(Kg)
		MATL. SPECN.	C	DI	QTY.

		BHARAT HEAVY ELECTRICALS LIMITED PIPING CENTRE CHENNAI 600 017		DRN	NAME	SIGN	DATE	NO.OF VAR
				CHD	S.PANDA		14.02.12	
				APPD	S.PANDA		14.02.12	
DEPT	GRADE OF UNTO.L.DIM	SCALE	WEIGHT (KG).	BHEL PO REF.NO:		ITEM NO.	NO. OF ITEMS	
CODE	C / M / F	N.T.S						
TITLE			CARD CODE	DRAWING NO.			REV	
MATCHING PIECE (OD645x31.5/OD508X28)			U 01	4-80-321-74800			01	

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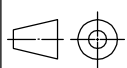
REV	DATE	ALTERED	R.SANTHOSH
01	09.11.09	APPROVED	M.MANO
DIM 71THK CORRECTED TO 64 THK.			
REV ARE INDICATED AS 			

ALL DIMENSIONS ARE IN MILLIMETRES



MACHINED REDUCER L=500 OD 508x64/OD 368x48	92 517 941 0000	A	290	000
	SA 105			
DESCRIPTION	MATL. CODE	A	UNIT.WT.(Kg)	
	MATL. SPECN.	C	QTY.	

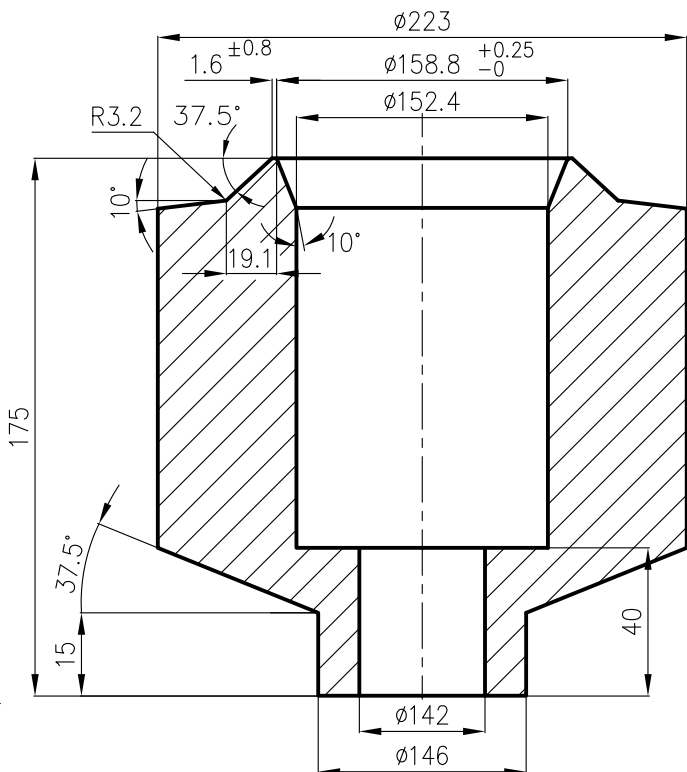
STANDARD

	BHARAT HEAVY ELECTRICALS LIMITED		DRN	NAME	SIGN	DATE	NO.OF VAR	
	PIPING CENTRE		CHD	R.USHA		21.07.06		
	CHENNAI- 600 017		APPD	T.N.ELANGOVAN		21.07.06		
DEPT	GRADE OF UNTOL.DIM		SCALE	WEIGHT (KG).	REF. TO ASSY./OLD DRG.		ITEM NO.	NO. OF ITEMS
CODE	C / M / F		N.T.S	290.000				
TITLE			CARD CODE	DRAWING NO.			REV	
MACHINED REDUCER (OD 508 x 64/OD 368 x 48)			U 01	4-80-423-62609			01	

ALL DIMENSIONS ARE IN MILLIMETRES


REV	DATE	ALTERED : M.R.K
01	15.06.13	APPROVED : M.MANO
DESIGN PRESSURE CHANGED FROM 55 KG/CM2 TO 74.6 KG/CM2		

DESIGN PRESSURE AT 370°C : 74.6 kg/sq.cm(g)



			92-516-679-0000	A		22	500
			SA105				
VAR NO.	DESCRIPTION	STD	MATL. CODE	A	UNIT	UNIT.WT.(Kg)	
			MATL. SPECN.	C	DI	QTY.	

STANDARD

	BHARAT HEAVY ELECTRICALS LIMITED PIPING CENTRE CHENNAI 600 017		DRN	NAME	SIGN	DATE	NO.OF VAR
			CHD	R.ANANTH		17.11.09	
			APPD	M.N.VASUDEVAN		17.11.09	
DEPT	GRADE OF UNTOL.DIM	SCALE	WEIGHT (KG).	REF. TO ASSY./OLD DRG.		ITEM NO.	NO. OF ITEMS
CODE	C / M / F	N.T.S	22.500				
TITLE			CARD CODE	DRAWING NO.			REV
SAFETY VALVE STUB SA105 OD223, d1=158.8, L175			U 01	4-80-999-93229			01

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3-80-300-19825

DRAWING No.

NOTES: -

- 01. APPLICABLE FOR P91/P92**
i) STRAIGHT WITH STRAIGHT/FITTING
ii) BEND WITH BEND/FITTING
 02. FOR OD MISMATCHING REF. FIGURE-Xa.
 03. $\alpha = 6^\circ$ FOR WALL THICKNESS ≤ 30 mm
 04. $\alpha = 10^\circ$ FOR WALL THICKNESS > 30 mm

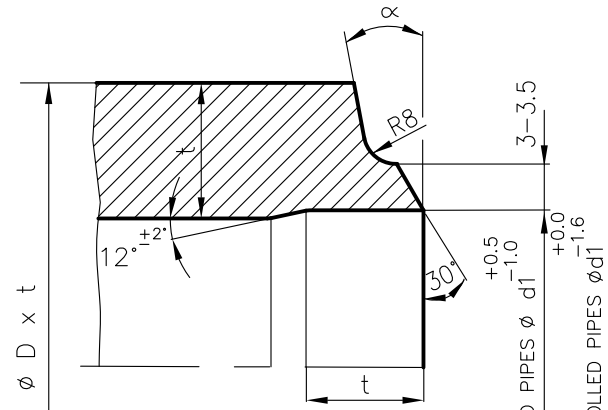


FIGURE - X

FOR OD PIPES ϕ d1
 FOR ID CONTROLLED PIPES ϕ d1

MATCHING EDGE PREPARATION FOR MISMATCH OD APPLICABLE FOR BENDS/FITTINGS OF P91/P92 MATERIALS

NOTES: -

01. OD OF STRAIGHT TO BE PHYSICALLY MEASURED/VERIFIED.
 02. $\alpha = 6^\circ$ FOR WALL THICKNESS ≤ 30 mm
 03. $\alpha = 10^\circ$ FOR WALL THICKNESS > 30 mm
 04. t = THK OF CONNECTING PIPE (STRAIGHT)

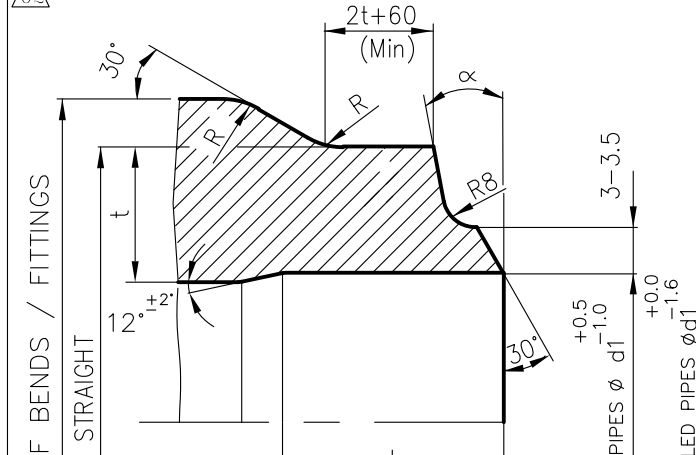


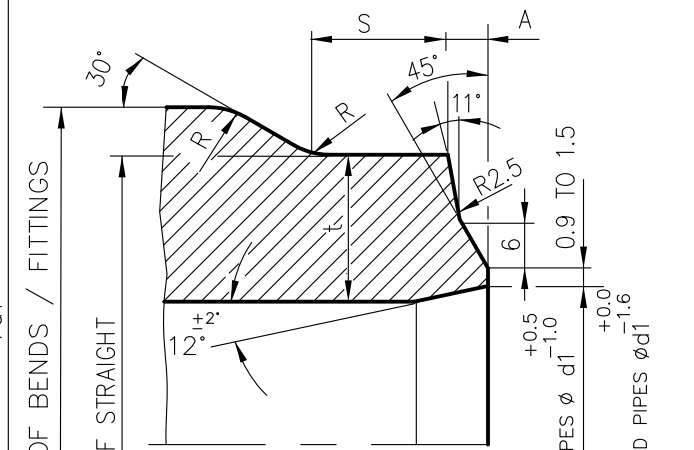
FIGURE - Xa

FOR OD PIPES ϕ d1
 FOR ID CONTROLLED PIPES ϕ d1

MATCHING EDGE PREPARATION FOR MISMATCH OD DIAMETRICALLY GREATER THAN 8 mm (ie OD1 - OD2 > 8mm) APPLICABLE FOR BENDS/FITTINGS OTHER THAN P91/P92 MATERIALS

NOTES: -

01. OD OF STRAIGHT TO BE PHYSICALLY MEASURED/VERIFIED.
 02. WHEN $t < 65$, $S+A = 65$ Min. & $t > 65$, $S=65$ Min. WHERE t=THK OF CONN.PIPE(STRAIGHT).



STYLE - Pa

FOR OD PIPES ϕ d1
 FOR ID CONTROLLED PIPES ϕ d1

MATCHING EDGE PREPARATION FOR MISMATCH OD DIAMETRICALLY GREATER THAN 8 mm (ie OD1 - OD2 > 8mm) APPLICABLE FOR ELBOWS OTHER THAN P91/P92 MATERIALS

NOTES: -

01. OD = OUTSIDE DIA OF CONN. PIPE (STRAIGHT) TO BE PHYSICALLY MEASURED/VERIFIED.
 02. t = THK OF CONN.PIPE (STRAIGHT)

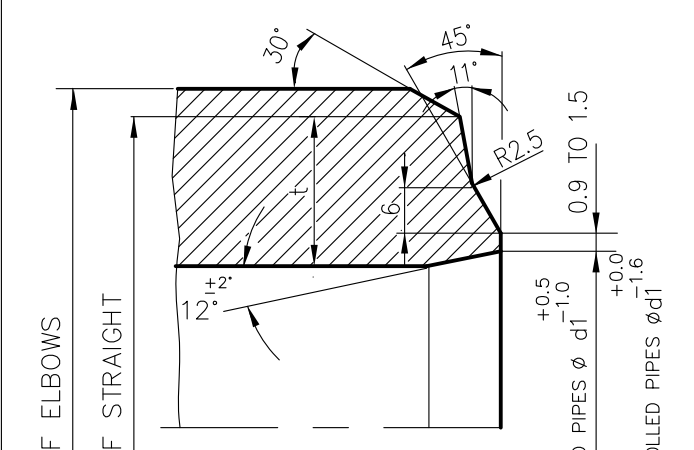


FIGURE - Z

FOR OD PIPES ϕ d1
 FOR ID CONTROLLED PIPES ϕ d1

NOTES: -

01. APPLICABLE FOR P91 PIPE BEND WELDED WITH P91 STRAIGHT PIPE FOR THICKNESS ≤ 30 mm AND OD ≥ 558 mm.

02. $\alpha = 6^\circ$ FOR WALL THICKNESS ≤ 30 mm
 03. FOR OD MISMATCH, REFER THE OD MACHINING ONLY SHOWN IN FIGURE-Xa
 04. FIGURE-Xb AND FIGURE-Xc ARE NOT APPLICABLE FOR P92 MATERIALS.

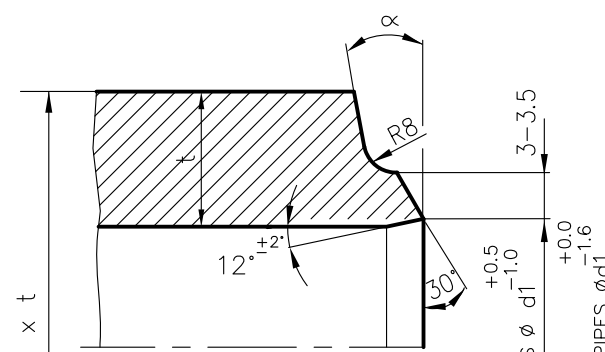


FIGURE - Xb
(BEND END)

FOR OD PIPES ϕ d1
 FOR ID CONTROLLED PIPES ϕ d1

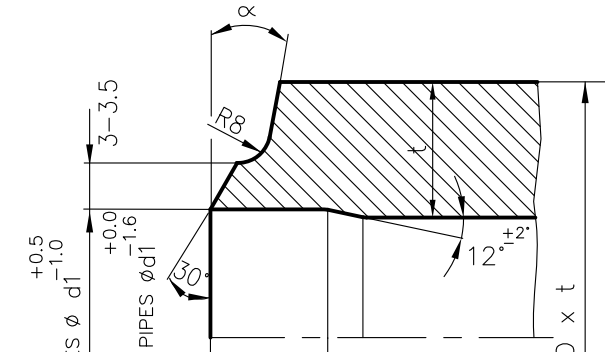
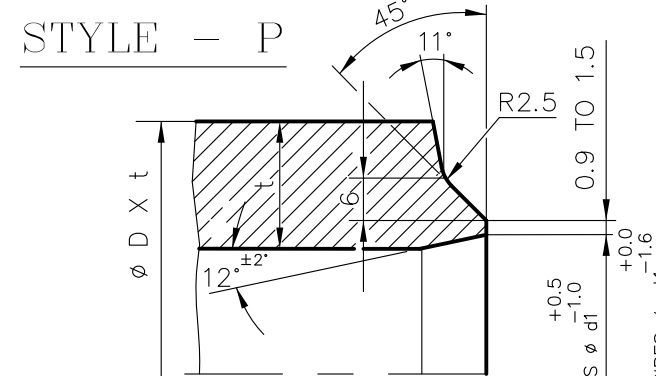


FIGURE - Xc
(STRAIGHT END)

FOR OD PIPES ϕ d1
 FOR ID CONTROLLED PIPES ϕ d1

STYLE - P



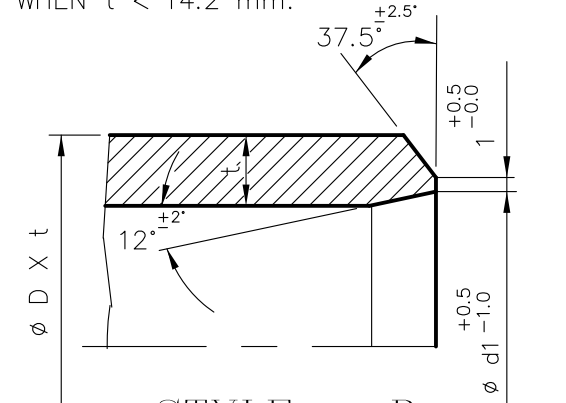
NOTES: -

01. USE WHEN $t \geq 14.2$ mm.
 02. FOR OD MISMATCHING REF. FIGURE-PA

FOR OD PIPES ϕ d1
 FOR ID CONTROLLED PIPES ϕ d1

NOTES: -

01. USE WHEN $t < 14.2$ mm.



STYLE - D

FOR OD PIPES ϕ d1
 FOR ID CONTROLLED PIPES ϕ d1

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT

STANDARD

	BHARAT HEAVY ELECTRICALS LTD.		DRN	NAME	SIGN	DATE	NO OF ITEMS
	PIPING CENTRE, MADRAS		CHD	K.B.RAGUNATH		11.10.01	
			APPD	M.C.SEKARAN		11.10.01	
				APPD	A.VELAYUTHAM	11.10.01	

DEPT.	GRADE OF UN TOL DIM	SCALE	WEIGHT (Kg)	NAME OF ORIGINAL ORGANISATION	ITEM No.
CODE	C/M/F				

TITLE	CARD CODE	DRAWING No.	REV
EDGE PREPARATION DETAILS	U 01	3-80-300-19825	03

GENERAL NOTES :

01. THE MINIMUM THICKNESS AT WELD END SHALL NOT BE LESS THAN
 a) 0.875 TIMES t NOM. FOR OD PIPES.
 b) t MIN. FOR ID CONTROLLED PIPES.
 02. t NOM & t MIN SHALL BE AS PER SPECIFIED PIPE SIZE.
 03. SHARP CORNERS SHALL BE ROUNDED OFF WHEREEVER 'R' IS INDICATED.

NOTES FOR WELDING:

01. WELD REINFORCEMENT TO BE FLUSH GROUND AND MERGED WITH PARENT METAL WITHOUT ANY UNEVENNESS.

REV 03	DATE 10.04.13	ALTERED: M.R.K	APPROVED: C.K.N
ZONE	FIG.Xb AND FIG.Xc ADDED. IN FIG.X. NOTE 01 MODIFIED. IN FIG.Xa, STY-PA, FIG.Z. P92 MATERIAL ADDED		
REV 02	DATE 10.01.13	ALTERED: M.R.K	APPROVED: C.K.N
ZONE	IN FIG.Xa, NOTE 04 ADDED. GENERAL NOTES 03 ADDED. IN FIG.Xa, 8MM OD MISMATCH IS REMOVED		
REV 01	DATE 11.05.04	ALTERED: R.SENDHIL	APPROVED: A.VELAYUTHAM
ZONE	PROJECT NAME REMOVED AND STANDARD INCORPORATED IN TITLE BLOCK		