



Bharat Heavy Electricals Limited

(Seamless steel Tube Plant)

Tiruchirappalli – 620014, TAMIL NADU, INDIA

TITLE: SUPPLY OF Bevel Gears & Housings	Phone: +91 431 257 8439 Email : pcsn@bheltry.co.in Web : www.bhel.com
--	---

Reference Number: 9250618 E	Date: 08.06.2015	Due date for submission of application: 29.06.2015
------------------------------------	-------------------------	---

A. BHEL/SSTP, Trichy is looking for vendors to supply Bevel Gears & Housings as per Tender documents attached.

B. Important Note to New Vendors (Thro' web Viewers and who have not received this tender directly)

The new vendors will be required to furnish the following documentary proof/ information along with their offers:

1. Certificate of registration (copy of certificate to be submitted).
2. Banker's information (copy of bank pass book first page to be submitted).
3. MSME vendor certificate (if applicable).
4. Address of your organization (complete postal address with PINCODE).
5. Contact person's Phone No. /Mobile No. / FAX No. /E-mail ID.
6. Statutory documents – VAT / TIN / EXCISE REGISTRATION / CST REGN / SERVICE TAX REGISTRATION etc. (copy to be furnished)
7. NSIC/SSI Certificate (if applicable)
8. ISO Certificate (if applicable)
9. Experience certificate as proof of supply of similar items to any Govt. agencies / PSU- Organisations (copy of PO's to be furnished).

"The vendor should have the required machining, grinding & heat treatment facility for the manufacture of the spiral bevel gears and the same shall be send with their offer. If they are outsourcing the heat treatment, then the details of the heat treater shall be submitted with the offer. The vendor shall submit the Drawing, P.O & customer details for similar gears supplied by them in the last 5 years. The vendor shall submit the copy original TC of raw material used for the manufacture of the gears. The vendor shall conform the TDC point by point. The vendor shall have the required inspection facility to inspect the gears at their end. "

10. Audit Report/ IT Return (if applicable)
11. Agency agreement with manufacturer (if applicable)
12. Partnership Deed (if applicable).

If the new vendors fail to submit the above documentary proof/information, their offers will not be considered for this enquiry.

Purchase Officer / Purchase /SSTP
Phone: 0431-257 8439.
Mail: pcsn@bheltry.co.in



BHARAT HEAVY ELECTRICALS LTD
 (A GOVERNMENT OF INDIA UNDERTAKING)
 SEAMLESS STEEL TUBE PLANT
 TIRUCHIRAPPALLI - 620 014
 TAMIL NADU

TIN : 33243560005

CST No. : 239383
 Dated : 11.06.1991

PURCHASE ENQUIRY

VENDOR CODE

ENOURY NUMBER

ENQUIRY DATE

ENQUIRY DUE DATE

No. OF ITEMS

9 250618 E

08-06-15

29-06-15

8

Office Copy

Kindly arrange to submit your **Competitive Offer** for the following item(s)
 If you are not in a position to submit your Offer, Kindly arrange to send **Regret Letter**.

THIS IS ONLY A REQUEST FOR OFFER AND NOT AN ORDER

Sl. No	Material Code and Description	Unit	Requirement	
			Quantity	Delivery
1	<p>BHEL Material Code : SP6912510124 ----- BEVEL GEAR RH - SRM 300</p> <p>DRAWING NO. : 20-ST-115-02-188/02 TDC NO. : TDC/TE/MFG-03 REVISION NO. : 03 DATE : 04.12.2009</p>	NUMBER	12.000	16/11/15
2	<p>BHEL Material Code : SP6912510698 ----- BEVEL GEAR LH - SRM 300</p> <p>DRAWING NO. : 20-ST-115-02-188/02 TDC NO. : TDC/TE/MFG-03 REVISION NO.: 03 DATE : 04.12.2009</p>	NUMBER	12.000	16/11/15
3	<p>BHEL Material Code : SP6912510116 ----- BEVEL GEAR HOUSING RH FOR SRM300</p> <p>DRAWING NO. : 10-ST-115-02-039/03 TDC NO. : TDC/TE/MFG-03 REVISION NO.: 03 DATE : 04.12.2009</p>	NUMBER	12.000	16/11/15
4	<p>BHEL Material Code : SP6912510681 ----- BEVEL GEAR HOUSING LH FOR SRM 300</p> <p>DRAWING NO. : 10-ST-115-02-039/03 TDC NO. : TDC/TE/MFG-03 REVISION NO. : 03 DATE : 04.12.2009</p>	NUMBER	12.000	16/11/15

IMPORTANT NOTE :

For and on behalf of
BHARAT HEAVY ELECTRICALS LTD

[Signature]
PURCHASE EXECUTIVE

BHARAT HEAVY ELECTRICALS LTD
 (A GOVERNMENT OF INDIA UNDERTAKING)
 SEAMLESS STEEL TUBE PLANT
 TIRUCHIRAPPALLI - 620 014
 TAMIL NADU

TIN : 33243560005

CST No. : 239383
 Dated : 11.06.1991

PURCHASE ENQUIRY

VENDOR CODE

ENOURY NUMBER

ENQUIRY DATE

ENQUIRY DUE DATE

No. OF ITEMS

9 250618 E

08-06-15

29-06-15

8

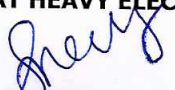
Office Copy

Kindly arrange to submit your **Competitive Offer** for the following item(s)
 If you are not in a position to submit your Offer, Kindly arrange to send **Regret Letter**.

THIS IS ONLY A REQUEST FOR OFFER AND NOT AN ORDER

Sl. No	Material Code and Description	Unit	Requirement	
			Quantity	Delivery
5	<p>BHEL Material Code : SP6911110582</p> <p>-----</p> <p>BEVEL GEAR RH - SRM380</p> <p>DRAWING NO. : 10-ST-115-01-045/01 TDC NO. : TDC/TE/MFG-03 REVISION NO. : 03 DATE : 04.12.2009 BHEL Material Code : SP6911110831</p> <p>-----</p>	NUMBER	6.000	16/11/15
6	<p>BEVEL GEAR LH - SRM380</p> <p>DRAWING NO. : 10-ST-115-01-045/01 TDC NO. : TDC/TE/MFG-03 REVISION NO. : 03 DATE : 04.12.2009 BHEL Material Code : SP6911110092</p> <p>-----</p>	NUMBER	6.000	16/11/15
7	<p>BEVEL GEAR HOUSING RH FOR SRM380</p> <p>DRAWING NO. : 10-ST-115-01-044/02 TDC NO. : TDC/TE/MFG-03 REVISION NO. : 03 DATE : 04.12.2009 BHEL Material Code : SP6911110823</p> <p>-----</p>	NUMBER	6.000	16/11/15
8	<p>BEVEL GEAR HOUSING LH FOR SRM380</p> <p>DRAWING NO. : 10-ST-115-01-044/02 TRC NO. : TDC/TE/MFG-03 REVISION NO. : 03 DATE : 04.12.2009</p>	NUMBER	6.000	16/11/15
<p>=====</p> <p>Foot Note :</p>				

IMPORTANT NOTE :

For and on behalf of
BHARAT HEAVY ELECTRICALS LTD

PURCHASE EXECUTIVE

BHARAT HEAVY ELECTRICALS LTD
 (A GOVERNMENT OF INDIA UNDERTAKING)
 SEAMLESS STEEL TUBE PLANT
 TIRUCHIRAPPALLI - 620 014
 TAMIL NADU

TIN : 33243560005

CST No. : 239383
 Dated : 11.06.1991

PURCHASE ENQUIRY

VENDOR CODE

ENOURY NUMBER

ENQUIRY DATE

ENQUIRY DUE DATE

No. OF ITEMS

9 250618 E

08-06-15

29-06-15

8

Office Copy

Kindly arrange to submit your **Competitive Offer** for the following item(s)
 If you are not in a position to submit your Offer, Kindly arrange to send **Regret Letter**.

THIS IS ONLY A REQUEST FOR OFFER AND NOT AN ORDER

Sl. No	Material Code and Description	Unit	Requirement	
			Quantity	Delivery
	<p>-----This Tender is floated on TWO-BID basis-----</p> <p>2. Following details are enclosed. a. Annexure-A - Important note to tenderers for two-bid. b. Annexure-B - Technical Conditions c. Annexure-C - Commercial Conditions</p> <p>3. Tenderers are required to fill in above Annexure-B and C and enclose them along with their UN-PRICED BID.</p> <p>4.a. Delivery date furnished in the Enquiry is only indicative. 4.b. For Delivery Schedule - Pl. refer Clause No. C.4 of Annexure- C.</p> <p>5. Price Bid of Vendors, who accept the Clause No. B.1 to B.5 of Annexure-B & C.1 to C.4 & C.6 of Annexure- C. shall only be considered for further processing. Fill the Annexure-B & C and enclose it with Technical and Un-Priced Commercial Bid. For Payment term - Refer Annexure - C Point No. C- 5. Any deviation in the above payment term will attract loading as mentioned below. For payment term deviation - "Base rate of SBI (as applicable on the date of bid opening. Techno-commercial bid opening in case of two part bids) + 6% shall be considered for loading for the period of relaxation sought by bidders. Payment through Bank is not preferred. In case of Payment through Bank is opted by Supplier, BHEL prefers documents submission through bank with copy of LR and door delivery of Goods to Stores with Consignee copy attached. In this case Loading will be 3% on the offered value. Offers of indigenous Suppliers with payment terms as LC/Advance Payment are liable for rejection.</p> <p>6. Order will be Placed on Overall L-1 vendor as the gears and housings are to be matched and supplied in matched sets. The Bevel gear Left & right to be matched with the respective gear housing.i.e Indlt Sl.No.1 & 3, 2 & 4, 5 & 7 and 6 & 8 are to matched with each other. The matched gears and housings are to be marked with L1L1 & R1R1.... L12L12 & R12R12 (L1L1 means LH Gear & LH Housing; R1R1 means RH Gear & RH Housing).</p>			

IMPORTANT NOTE :

For and on behalf of
BHARAT HEAVY ELECTRICALS LTD

[Signature]
 PURCHASE EXECUTIVE

ANNEXURE-A

IMPORTANT NOTE TO TENDERERS (FOR INDIGENOUS & OVERSEAS SUPPLIERS)

This Tender is floated on TWO-BID System. Tenders are requested to submit their offers in TWO-BIDS (Part I: Un priced bid and Part II: Price Bid) separately in a sealed cover as follows.

1. **Part I: UN PRICED BID:** (Complete with technical & Commercial conditions as per enquiry including un priced copy of price schedule i.e. identical to part II with prices blanked and replaced by "Quoted").

The Tenderer should confirm their acceptance / comments to the Enquiry along with other commercial Terms & Conditions of the Tender. In case any deviation is taken by the Tenderer from the Tender requirements, it is to be clearly indicated in the offer with reference to the particular clause. If such deviations are not explicitly indicated in the offer, it will be construed by BHEL that the Tenderer is complying with Annexure Clause(s), Commercial terms & conditions and other conditions in full.

2. **Part II: PRICE BID:** Price (with break-up details wherever required) to be indicated.
3. **Both Un priced Bid and Price Bid is** to be submitted in a single envelop before 1400 hours (Indian Time) on tender Due Date.
4. The **Unpriced Bid** shall be put in a separate sealed cover superscribed with Tender number, Tender Date & Tender Due Date and also the cover should be clearly marked with "UNPRICED BID".
5. The **Price Bid** shall be put in a separate sealed cover superscribed with Tender number, Tender Date & Tender Due Date & the cover should be clearly marked with "PRICE BID".
6. Both the individually enveloped **UNPRICED BID** and **PRICE BID** covers as mentioned above, have to be put in another single bigger cover clearly indicating Tender number, Tender Date & Tender Due Date at the top of the cover. This cover is to be addressed to

Purchase Executive,
Purchase Department,
Seamless Steel Tube Plant (SSTP),
BHEL, Tiruchirapalli-620014, India.
Phone No: 91 431 2578502, 2578491

7. Un-priced Bid shall only be opened on the Tender Due Date mentioned in the Tender, in the presence of Tenderers / their Authorized Representative, who may like to be present for such opening. The price bid will NOT be opened on the date of tender opening.
8. After opening the Un-priced Bid, they shall be evaluated by BHEL for their suitability. BHEL shall hold discussions with the responded Tenderers on the Technical and Commercial terms and freeze the terms & conditions of the offer.. These frozen technical specifications will be communicated to responded tenderers.
9. BHEL shall offer opportunity to the responded and technically / commercially suitable Tenderers, to submit their latest Price Bid/ Impact of prices, if any in line with the frozen technical , Commercial , delivery conditions.
10. This latest Price Bid & the Impact of prices for the frozen technical specifications submitted by the Tenderers will be opened in the presence of Tenderers. Based on the above, the ranking of the Tenderers shall be made and accordingly the Tender shall be finalized.
11. "BHEL reserves the right to go for Reverse Auction (RA) instead of opening the sealed envelope price bid, submitted by the bidder. **This will be decided after techno-commercial evaluation.** All bidders to give their acceptance for participation in RA. Non-acceptance to participate in RA may result in non-consideration of their bids, in case BHEL decides to go for RA.

In case BHEL decides to go for Reverse Auction, only those bidders who have given their acceptance to participate in RA will be allowed to participate in the Reverse Auction. Those bidders who have given their acceptance to participate in Reverse Auction will have to necessarily submit "online sealed bid" in the Reverse Auction. Non-submission of "online sealed bid" by the bidder will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.

Terms & Conditions of REVERSE AUCTION

Against this enquiry for the subject item/ system with detailed scope of supply as per enquiry specifications, BHEL may resort to "REVERSE AUCTION PROCEDURE" i.e., ON LINE BIDDING (THROUGH A SERVICE PROVIDER). The philosophy followed for reverse auction shall be English Reverse (No ties).

1. For the proposed reverse auction, technically and commercially acceptable bidders only shall be eligible to participate.

Those bidders who have given their acceptance for Reverse Auction (quoted against this tender enquiry) will have to necessarily submit "online sealed bid" in the Reverse Auction. Non-submission of "online sealed bid" by the bidder for any of the eligible items for which techno-commercially qualified, will be considered as tampering of the tender process and will invite action by BHEL as per extant guidelines in vogue.

2. BHEL will engage the services of a service provider who will provide all necessary training and assistance before commencement of on line bidding on internet.
3. In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained.
4. Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.
5. Bidders have to fax the Compliance form (annexure IV) before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.

In line with the NIT terms, BHEL will provide the calculation sheet (e.g., EXCEL sheet) which will help to arrive at "Total Cost to BHEL" like Packing & forwarding charges, Taxes and Duties, Freight charges, Insurance, Service Tax for Services and loading factors (for non-compliance to BHEL standard Commercial terms & conditions) for each of the bidder to enable them to fill-in the price and keep it ready for keying in during the Auction.

6. Reverse auction will be conducted on scheduled date & time.
7. At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.
8. The lowest bidder has to fax/e-mail the duly signed and filled-in prescribed format for price breakup including that of line items, if required, (Annexure VII) as provided on case-to-case basis to Service provider within two working days of Auction without fail.
9. **In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the Price bids and price impacts, if any, already submitted and available with BHEL shall be opened as per BHEL's standard practice.**
10. Bidders shall be required to read the "Terms and Conditions" section of the auctions site of Service provider, using the Login IDs and passwords given to them by the service provider before reverse auction event. Bidders should acquaint themselves of the „Business Rules of Reverse Auction", which will be communicated before the Reverse Auction.
11. If the Bidder or any of his representatives are found to be involved in Price manipulation/ cartel formation of any kind, directly or indirectly by communicating with other bidders, action as *per extant BHEL guidelines*, shall be initiated by BHEL and the results of the RA scrapped/ aborted.
12. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.
13. In case BHEL decides to go for reverse auction, the H1 bidder(s) (whose quote is highest in online sealed bid) may not be allowed to participate in further RA process.

Annexure – B.
Technical Conditions

Vendor Code:	Vendor Name:	
Tender No.:	Tender Date:	Tender Due Date:

:

Sl.No.	Technical Requirement	Accepted
B. 1.	To supply of Materials as per Tender Specifications & Drawings without any deviation.	
B.2.	Point by point TDC confirmation given.	
B. 3.	T.C for material to be given with supplies.	
B.4.	Gauges shall be used to check the splines of the gears. The gauges shall be collected from SSTP/BHEL after receipt of our order.	
B.5.	To supply of materials with suitable preservation and packing.	

Signature with Date	Seal

Annexure – C.
Commercial Conditions
(Page No. 1 of 2)

Vendor Code:	Vendor Name:	
Tender No.:	Tender Date:	Tender Due Date:

Sl.No.	Commercial Terms	Accepted				
C1.	<u>Delivery Terms</u> : Free delivery at BHEL/SSSTP Stores.					
C2.	Validity of Offer - 60 Days from the Date of Tender Opening.					
C3.	<p><u>LIQUIDATED DAMAGES:</u> It is clearly understood among the parties to the Contract that TIME IS THE ESSENCE OF THE CONTRACT. Therefore, the delivery of the goods specified in the Purchase Order shall be made within the time prescribed. Where the Seller supplies or despatches the goods, beyond the delivery period specified, and the Purchaser will have no obligation to accept the goods. If accepted, Liquidated Damages at the rate of 0.5% (Zero point five Percent) of the value of goods delayed, per week of delay, subject to a maximum of 10% (Ten Percent) or part thereof, will be levied without prejudice to any other relief or compensation due to the Purchaser under any other conditions of the Contract.</p> <p><u>RISK PURCHASE:</u> Alternatively, the Purchaser, at his option, will be entitled to terminate the Contract and to purchase elsewhere at the risk and cost of Seller, either the whole of the goods or any part, which the Seller has failed to deliver or dispatch within the time stipulated as aforesaid or if the same were not available the best and nearest available substitute thereof. The Seller shall be liable for any loss, which the Purchaser may sustain by reason of such Risk Purchase(s), in addition to penalty at the rate mentioned above.</p>					
C4.	<p><u>Delivery period required</u> :</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="text-align: center;">Delivery</td> <td style="text-align: center;">Enq.Sl. Nos. 1 to 8</td> </tr> <tr> <td style="text-align: center;">4 Months from PO</td> <td style="text-align: center;">All Quantity</td> </tr> </table>	Delivery	Enq.Sl. Nos. 1 to 8	4 Months from PO	All Quantity	
Delivery	Enq.Sl. Nos. 1 to 8					
4 Months from PO	All Quantity					
C5.	<u>Payment</u> : 100% after 45 days after receipt and acceptance of materials by BHEL					
C6.	Acceptance for Reverse auction					

Sl.No.	Commercial Terms	
C6.	a. Excise Duty Tariff Heading	
	b. Excise Duty (%)	
	c. CESS on ED (%)	
	d. Total of ED and CESS (%)	
C7	a. TVNAT (%)	
	b. CST (%)	
C8.	Other Cost (if any) - % (or) Rs.	
C9	Are you Micro/Small/Medium Industry? (If YES, please furnish MSM Regn.No., along with a copy of MSM Certificate)	YES / NO MSM No. MSM Certificate enclosed(Yes/NO)

Signature with Date & Seal ::

Important Note to MSE Vendors

1. 20% of the tendered quantity is earmarked for MSE suppliers in this tender.
2. Out of the 20% tendered quantity reserved for MSE suppliers, 4% shall be earmarked for procurement from MSE owned by SC / ST entrepreneurs.
3. In case MSE vendor participating in the tender quotes within the price band of L1 + 15%, they will be allowed to supply the portion of the requirement subject to acceptance of L1 price by MSE vendor. In case of more than one such MSE, the supply shall be shared proportionately.
4. MSE suppliers can avail the intended benefits only if they submit along with offer, attested copies of either EM II certificate having deemed validity (five years from the date of issue of acknowledgement in EM II) or valid NSIC certificate or EM II certificate along with CA certificate (Format enclosed) applicable for the year, certifying quantum of investment in plant and machinery within the permissible limit as per the act for relevant status (Micro or small) where the deemed validity of EM II is over. Date to be reckoned for determining the deemed validity will be the last date of technical bid submission. Non submission of such documents will lead to consideration of their bids at par with other bidders and MSE status of such suppliers shall be shifted to Non MSE supplier till the supplier submits these documents.

Certificate by Chartered Accountant

This is to Certify that M/S
 (hereinafter referred to as 'company') having its registered office at
 is registered under MSMED Act 2006, (Entrepreneur
 Memorandum No (Part-II).....dtd:.....,
 Category: (Micro/Small)). (Copy enclosed).

Further verified from the Books of Accounts that the investment of the company as on
 date as per MSMED Act 2006 is as follows:

1. **For Manufacturing Enterprises: Investment in plant and machinery** (i.e. original cost excluding land and building and the items specified by the Ministry of Small Scale Industries vide its notification No.5.0.1722(E) dated October 5, 2006:

Rs. Lacs

2. **For Service Enterprises: Investment in equipment** (original cost excluding land and building and furniture, fittings and other items not directly related to the service rendered or as may be notified under the MSMED Act, 2006:

Rs. Lacs

The above investment of Rs Lacs is within permissible limit of
 Rs Lacs for Micro / Small (Strike off which is not applicable)
 Category under MSMED Act 2006.

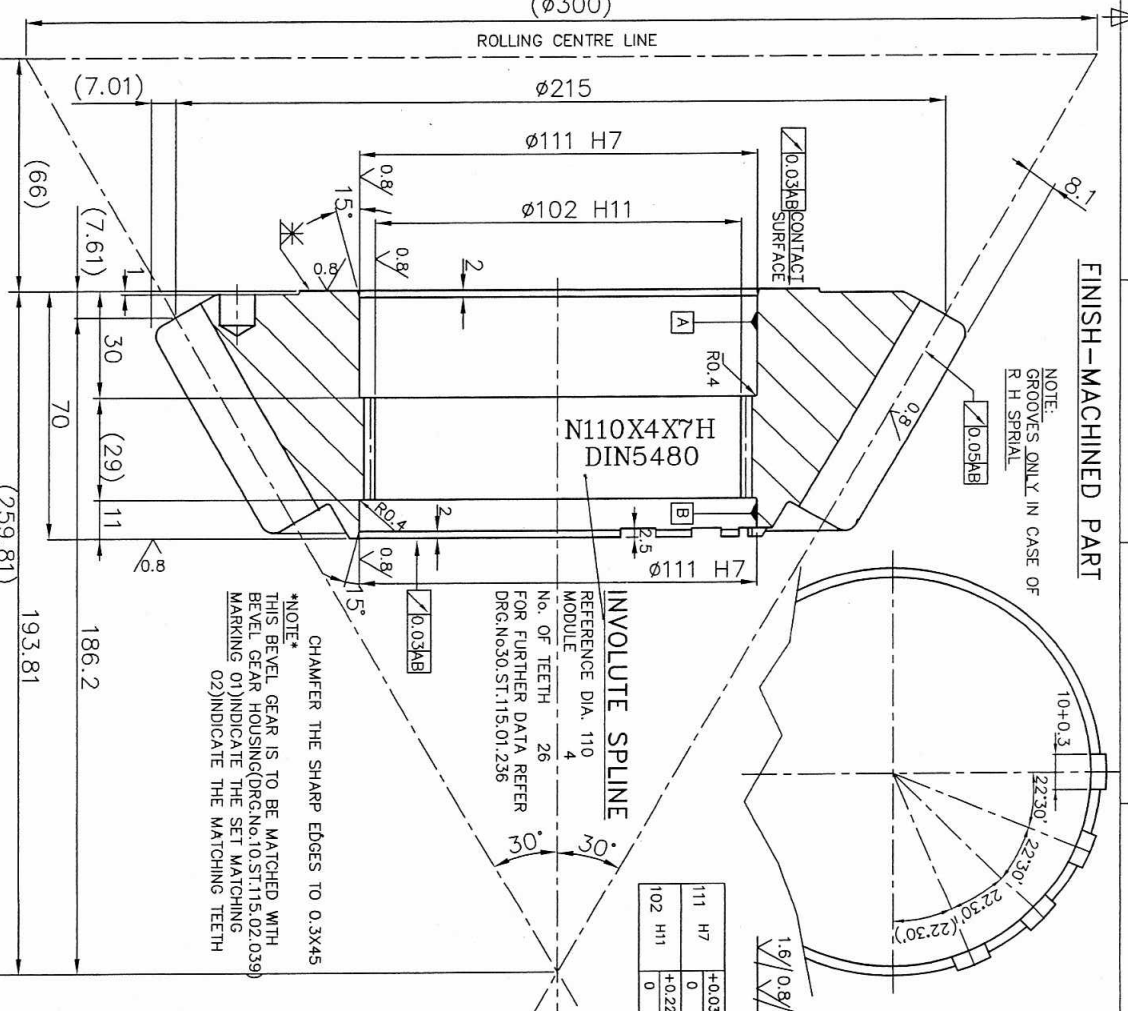
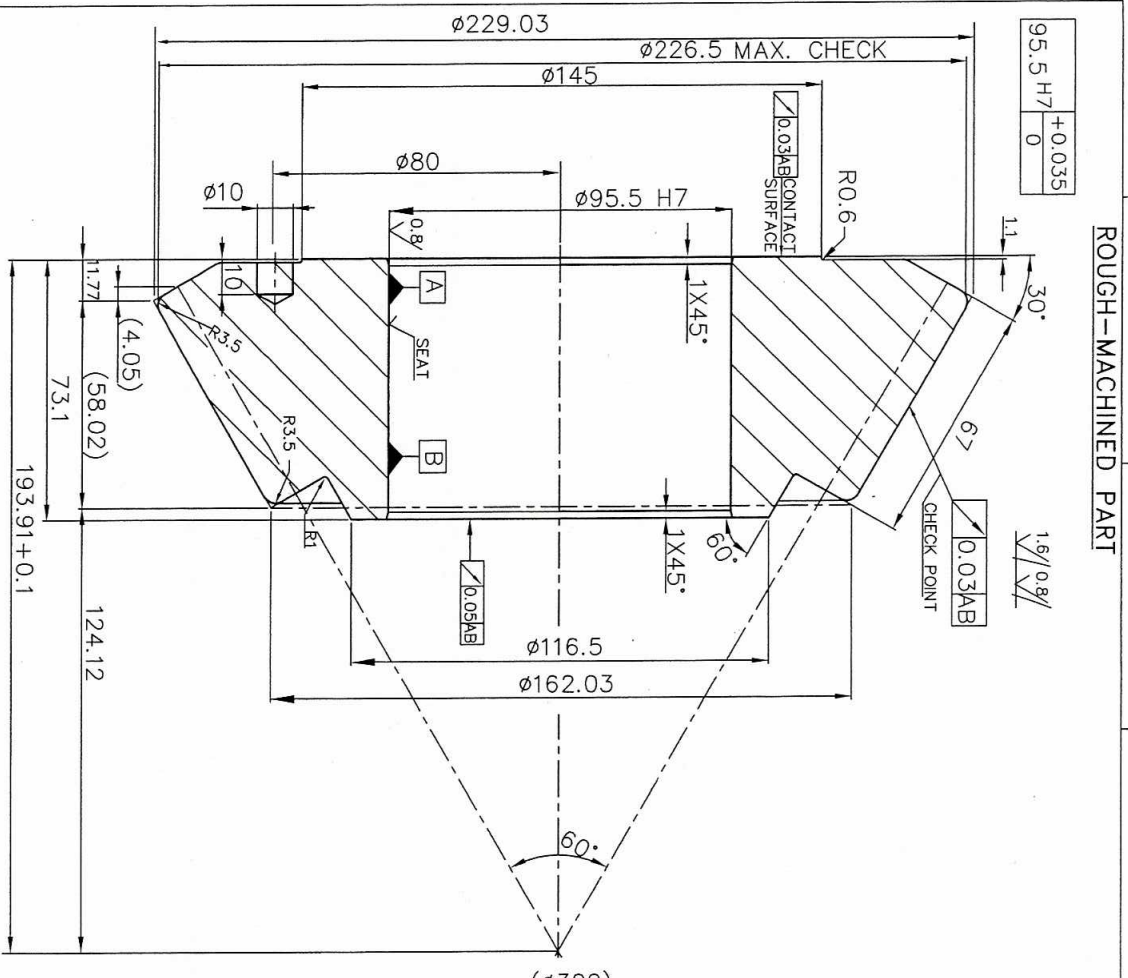
Date:

(Signature)

Name -

Membership number -

Seal of Chartered Accountant



AFTER ROUGH TURNING HEAT TREAT TO 8=70-75kg/mm²

MATERIAL : 17CrNiMo6 DIN-1.6587
CHEMICAL COMPOSITION
C 0.14 0.15 0.40 max.0.035 max.0.035 1.30 0.25 1.40
Si 0.19 0.40 0.60
Mn 0.19 0.40 0.60
S 0.0035 max.0.035 1.30 0.25 1.40
P 0.0035 max.0.035 1.30 0.25 1.40
Ni 0.19 0.40 0.60

SUPPLY TO BE AS PER TDC/TE/MFG-03
* MARK: MATERIAL CODE No., FIRM'S NAME, P O No. & S.L.No.

R H SPIRAL 69 12 51 012 4
L H SPIRAL 69 12 51 069 8

REV	DATE	ALTERED
01	26.11.04	MATERIAL CHANGE(DIN1.6587)WMS
02	01.08.05	NOTE ADDED

		Bharat Heavy Electricals Ltd SEAMLESS STEEL TUBE PLANT THIRUCHIRAPPALLI - 620014	
DWT T E GRADE OF TUBES C/M/F	SCALE 1:1	WEIGHT (Kg) 7	DATE 21.05.15
TITLE BEVEL GEAR (S R M 300)		DRAWING NO : 20-ST-115-02-188	REV 02

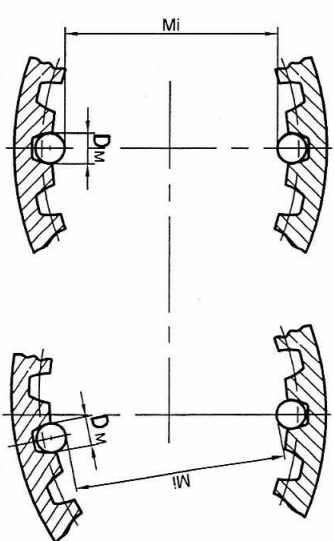
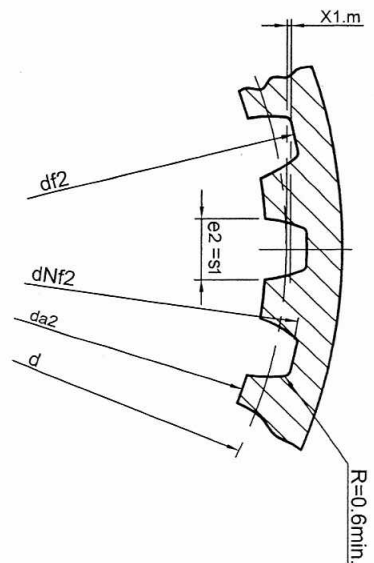
GEAR HARDENED TO 58-62 HRC DEPTH 1.0-1.4mm
CORE STRENGTH IN DEPENDUM P30.2=85-95kg/mm²
TEETH LAPPED
FOR GEARING DATA REFER DRG.20.ST.115.02.112

INVOLUTE SPLINE
REFERENCE DIA. 110
MODULE 4
No. OF TEETH 26
FOR FURTHER DATA REFER
DRG.No.30.ST.115.01.235

111	H7	+0.035
102	H11	+0.220
		0

SL. NO.	DATA	SRM - 300		SRM - 380	
		COUPLING HUB, N100X4X7H	BEVEL GEAR, N110X4X7H	COUPLING HUB, N120X4X7H	BEVEL GEAR, N130X4X7H
01	REFERENCE DIAMETER	100	110	120	130
02	NO. OF SPLINES	24	26	28	31
03	PITCH CIRCLE DIAMETER d	96	104	112	124
04	BASE DIAMETER db	83.138	90.067	96.995	107.387
05	MAJOR DIAMETER $df2$	100	110	120	130
06	MINOR DIAMETER d_{a2}	92	102	112	122
07	FORM DIAMETER d_{nf2}	99.28min.	109.29min.	119.29	129.29min.
08	EXTERNAL ADDENDUM MODIFICATION x_m	-0.2	+0.8	+1.8	+0.8
09	SPLINE WIDTH $e_2 = s_1$	6.052	7.207	8.362	7.207
10	PIN DIAMETER D_M	7	7	7	7
11	DIMENSION OVER PINS	MI	NORMAL		
12	DIMENSION OVER PINS	MI min.			
13	DIMENSION OVER PINS	MI max.			
14	ALLOWANCE FACTOR	AMI			
15	CONCENTRICITY ERROR	0.020	0.022	0.022	0.022
16	DIRECTIONAL ERROR OF SPLINE FLANK	0.027	0.027	0.027	0.027/100

TOLERANCE FIELD: 7H
FOR FURTHER DATA REFER DIN: 5480 PART 9



COUPLING HUB: 30-ST-115-02-050
30-ST-115-01-073
BEVEL GEAR: 10-ST-115-01-045
20-ST-115-02-188

REV	DATE	ALTERED BY	APPROVED BY	DATE
01	23.05.15	M. Bhargava	N. Arunuganathan	

ZONE DATA FOR COUPLING HUB N100X4X7H & N120X4X7H ADDED.

DEPT	GRADE OR UNTO. DIM	SCALE	WEIGHT(Kg)	DRAWING NO.	REV
	C/M/F			30.ST.115.01.236	01

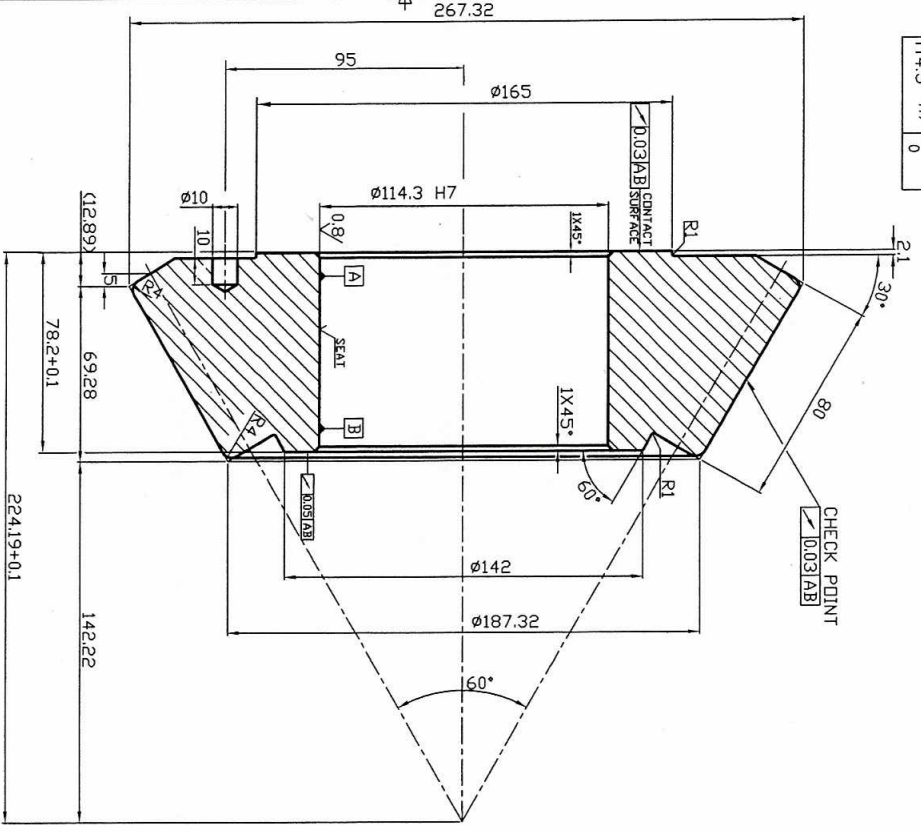
TITLE: INVOLUTE SPLINES DATA (COUPLING HUB & BEVEL GEAR) FOR SRM 300 & 380

DRN	NAME	SIGNATURE	DATE
CHD	M. Bhargava		22.05.15
APPD	N. Arunuganathan		
	M. Manjunathan		

Bharat Heavy Electricals Ltd
SEAMLESS STEEL TUBE PLANT
TRUCHIRAPALLI - 620014

ROUGH-MACHINED PART

1.6/0.8/

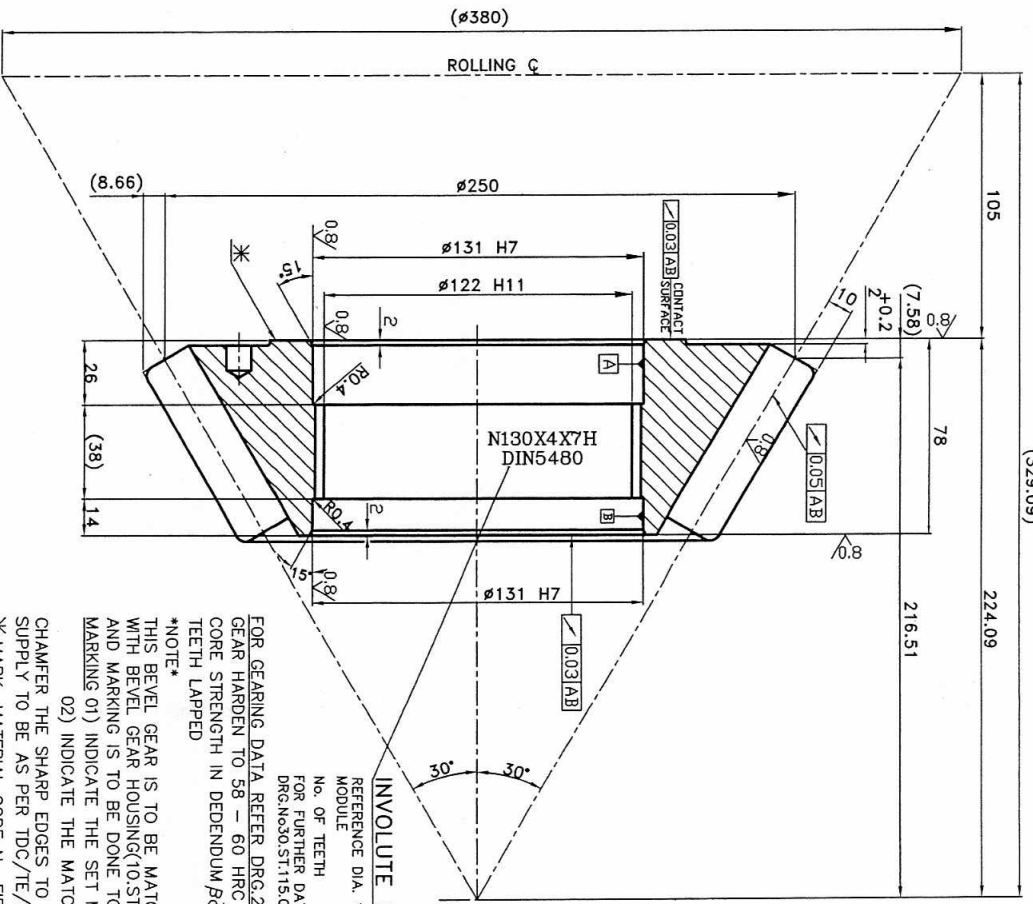


AFTER ROUGH TURNING HEAT TREAT TO $\sigma_B=70-75\text{kg/mm}^2$

FINISH-MACHINED PART

DEVIATIONS OF UNTOLERANCED DIMENSIONS TO BE AS PER IS: 2102-1969 MEDIUM

1.6/0.8/



INVOLUTE SPLINE
 REFERENCE DIA. 130
 MODULE 4
 NO. OF TEETH 31
 FOR FURTHER DATA REFER DRG.No:30.ST.115.01.236

FOR GEARING DATA REFER DRG.20.ST.115.01.113
 GEAR HARDEN TO 58 - 60 HRC DEPTH 1.0 - 1.2mm
 CORE STRENGTH IN DEPENDUUM $\sigma_B=0.2-85-95\text{kg/mm}^2$
 TEETH LAPPED

NOTE
 THIS BEVEL GEAR IS TO BE MATCHED WITH BEVEL GEAR HOUSING(10.ST.115.01.044) AND MARKING IS TO BE DONE TO INDICATE THE SET MARKING 01) INDICATE THE SET MATCHING 02) INDICATE THE MATCHING TEETH

CHAMFER THE SHARP EDGES TO 0.3X45
 SUPPLY TO BE AS PER TDC/TE/MFG-03
 * MARK: MATERIAL CODE No., FIRM'S NAME, P.O.No., & S.L.No.

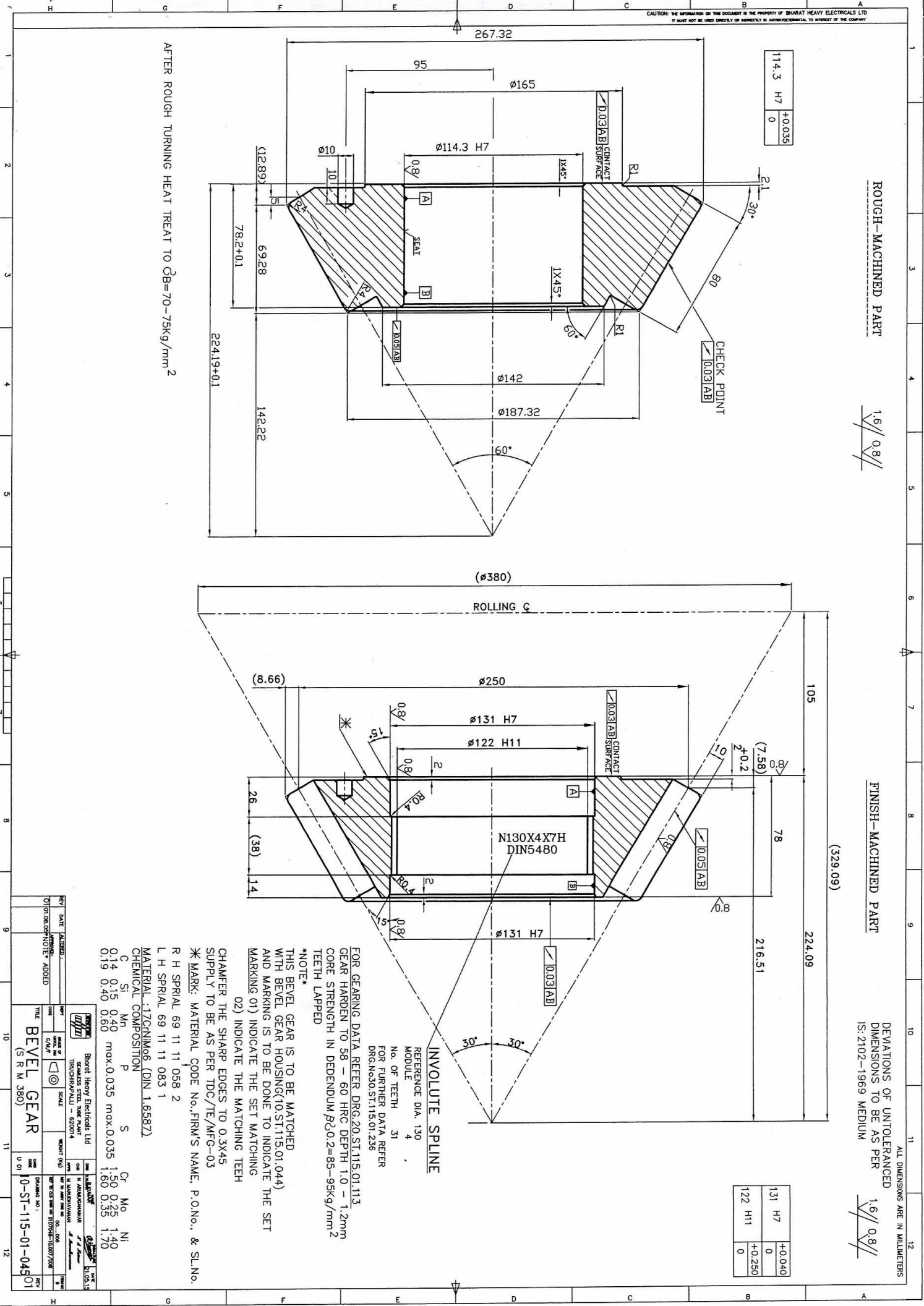
R H SPIRAL 69 11 11 058 2
 L H SPIRAL 69 11 11 083 1
 MATERIAL: 17CrNiMo6 (DIN 1.6587)
 CHEMICAL COMPOSITION

C	Si	Mn	P	S	Cr	Mo	Ni
0.14	0.15	0.40	max.0.035	max.0.035	1.50	0.25	1.40
0.19	0.40	0.60			1.60	0.35	1.70

REV	DATE	ALTERED	BY	CHKD
01		ADDED		

TITLE	SCALE	WEIGHT (KG)	DRG. NO.
BEVEL GEAR			0-ST-115-01-04801

Bharat Heavy Electricals Ltd
 STEEL TUBE PLANT
 TRICHYAPALU - 620014



CAUTION THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LTD. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.

FIRST ANGLE PROJECTION (ALL DIMENSIONS IN MILLIMETRES)

MAIN DETAILS

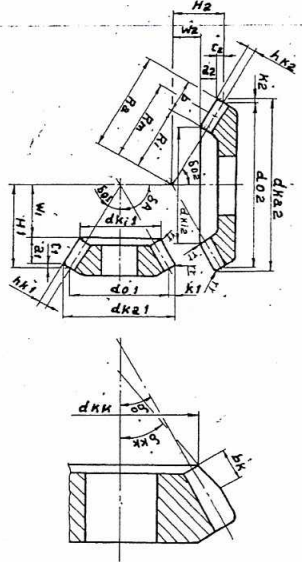
$\beta A = 60^\circ$
 $Z_2/Z_1 = 1.0$
 No. OF TEETH IN DRIVER
 $X_1 = 0.0$ = PROFILE CORRECTION FACTOR OF THE PINION ($= -X_2$)

$R_2 = 80.0$
 $\beta_1 = 30^\circ$
 $\beta_2 = 30^\circ$

CUTTERMODULE $M_n = 10.0$
 $Z_1/Z_2 = 18/18$
 $d_{o2} = 250.0$
 $R_{a1}/\beta = 3.13$
 $\beta_{P1} = 30.0$
 $\beta_{P2} = 30.0$
 $\beta_k = 0.0$
 CUTTER NORMAL MODULE $M_n = 10$
 $H_g = 22.50$
 [OUTERFACE MODULE $M_g = 13.8889$
 $M_{ha} = 10.42$
 [CUTTER NORMAL MODULE $M_n = 10$
 $H_g = 22.50$
 AS IN MOST CASES]

WHEEL DESIGN DATA FOR MACHINE TYPE 630
 $R_2 = 250.0$
 $R_1 = 170.0$
 $R_m = 210.0$
 $No. OF TEETH Z_P = 36$
 $MD = 213.596$
 $MIC SETTING DISTANCE$

$P = 187.548$
 FIXED CIRCLE RADIUS OF THE CYCLOID



CUTTER HEAD
 RADIUS = 170
 No. OF GEAR(SPEED) $Z_{W1} = 5$
 No. OF GEAR(SPEED) $Z_{W2} = 5$
 $\phi_n = 20$
 TOOTH FORM = 1

TURNING DIMENSIONS :

$H_1 = 10.0$
 $H_2 = 216.51$
 $d_{k1} = 267.32$
 $r_1 = 69.28$
 $w_1 = 142.22$
 $d_{k2} = 187.32$
 $C_1 = 5.0$
 $H_{k2} = 10.0$
 $H_2 = 216.51$
 $K_1 = 8.66$
 $a_2 = 69.28$
 $w_2 = 142.22$
 $d_{k1} = 267.32$
 $C_2 = 5.0$
 $\gamma_2 = 4.0$
 $d_{k1} = 187.32$
 $k_2 = 8.66$

TEETH CROWN THICKNESS

$S_{k1}/M_n = 0.617$
 $S_{k2}/M_n = 0.746$
 $\phi_{kk} = 187.32$
 $\beta_{kk} = 30^\circ$
 $b_k = 0.0$
 (S_{k1} = TOOTH CHEST THICKNESS AT PINION AT SMALL DIA)
 (S_{k2} = TOOTH CHEST THICKNESS OF PINION AT CENTRE)

(STEP UP) GEAR RATIO = ϵ_s
 $Z_{n1} = 33,005$
 $Z_{n2} = 33,005$
 $\epsilon_s = 1.305$
 PROFILE UPPER LIMIT = ϵ_p
 $\epsilon_p = 1.292$
 SPIRAL ANGLE = β
 $\beta_m = 31.003^\circ$
 β DEPENDUM = 19.675
 β ADDENDUM = 4.1398

(Z_{n1}, Z_{n2} = IDEAL No. OF TEETH IN THE NORMAL PLANE AT R_m = CENTRE DISTANCE)
 TURNING MOMENT M_T ; STARTING FORCE P_U ; LOAD CARRYING CAPACITY = P_{BB} AS PER LEWIS
 $N = 19795$
 $N_1 = 170$
 $DM_1 = 215.00$
 $V = 1.87$
 $\gamma_1 = 0.1204$
 $\gamma_2 = 0.1204$
 (AVERAGE DIAPY PINION AT MEAN CONE DISTANCE)
 CIRCUMFERENTIAL SPEED AT DM_1 IN m/s
 $P_{BB} = P_U$
 (TOOTH FORM FACTORS)

(N = POWER IN HP)
 $MT = 833.33$
 $PU = 7936$
 $(MT = TORQUE IN KPM)$
 (FORCE IN KR CIRCUM-FERENTIAL)
 (LOAD IN KP)
 (SAFETY FACTOR)

AXIAL FORCES PA RELATED TO P_U
 TURNING DIRECTION OF THE PINION IN SPIRAL PATH = $PA_1 \phi_0 = 73.3$
 $PA_2 \phi_0 = -30.8$
 $PA_1 \phi_0 = -30.8$
 $PA_2 \phi_0 = 73.3$
 TURNING DIRECTION OF THE PINION AGAINST SPIRAL PATH = $PA_1 \phi_0 = -30.8$
 $PA_2 \phi_0 = 73.3$
 $PA_1 \phi_0 = 73.3$
 $PA_2 \phi_0 = -30.8$
 THE LOAD BEARING CAPACITY P_{BB} IS CALCULATED FOR THE MATL. WITH A STATISTICAL FRACTURE STRESS $\sigma_B = 120 \text{ MPa/mm}^2$
 SPIRAL DIRECTIONS WHEEL = RIGHT/LEFT

PINION DRIVES
 $PA_1 \phi_0 = 73.3$
 $PA_2 \phi_0 = -30.8$
 $PA_1 \phi_0 = -30.8$
 $PA_2 \phi_0 = 73.3$
WHEEL DRIVES
 $PA_1 \phi_0 = -30.8$
 $PA_2 \phi_0 = 73.3$
 $PA_1 \phi_0 = 73.3$
 $PA_2 \phi_0 = -30.8$

REV	DATE	ALTERED
01		CHECKED
TOTAL		

DEPT	STATE OF UPRAJAM	SCALE	WEIGHT (kg)	DRAWING NO.	20ST/15.01.113
CODE	C/M/F			REF TO ASBY (OLD Dwg)	0107048-10.009
<p>Bharat Heavy Electricals Ltd, SEAMLESS STEEL TUBE PLANT TRUCHIRAPALLI-820 014</p>					
ITEM NO.	DESCRIPTION	DRAWING NO.	MATL. CODE	UNIT. WT.	QTY.
			MATL. SPEC.		

TITLE	GEAR DATA (SRM 380)
DATE	20ST/15.01.113
REV	00

BHEL, Tiruchirapalli-620014		SSTP / Tool Engineering	Technical Delivery Conditions
Product : BEVEL GEAR & HOUSING			
Document No.	Revision No.	Effective Date	Page No.
TDC/TE/MFG- 03	03	04.12.2009	1 of 2
Revision Record	03 - TDC reviewed and revised		

1.0 PRODUCT :

Sl.No.	Equipment / Product	Drg. No.	Drg. Rev. No.
1.	Bevel Gear SRM 300	20.ST.115.02.188	AS PER LATEST ENQUIRY / PURCHASE ORDER
2.	Bevel gear SRM 380	10.ST.115.01.045	
3.	Bevel Gear Housing SRM 300	10.ST.115.02.039	
4.	Bevel Gear Housing SRM 380	10.ST.115.01.044	

2.0 APPLICATION:

The Bevel gear is used for transmitting the power to the rolls of Stretch Reducing Mill Stand.

3.0 MATERIAL : 17CrNiMo6 of DIN 1.6587

3.1 Conduct Ultrasonic Test on Raw Material after proof machining in accordance with SA 388.

Acceptance Standard in accordance with **Clause 3.3.4.2 of ASME Sec VIII Div.2**. Test result shall be certified by **NDT Level II** qualified personnel as per **SNT-TC-1A (Society for Non destructive Testing)**

3.2 Raw Material Chemistry :

The firm shall submit the Original Mill Test Certificate (or)

Copy of Original Mill Test Certificate and NABL accredited Lab test certificate for the material chemistry in original

4.0 CONDITION OF SUPPLY:

Each bevel gear & housing shall be individually forged, hardened and tempered & case hardened as given below in clause 6.0.

5.0 DIMENSION AND TOLERANCES:

Shall be as given in the drawing.

6.0 HEAT TREATMENT:

Carburizing :

Temperature : 920 Degree C

Activation Time : 4 – 5 Hr

Diffusion Temperature : 910 Degree C

Diffusion Time : 2 – 3Hr

Hardening :

Temperature : 820 -830 degree C

Soaking Time : 1 Hr

Quenching Media & Temperature : Oil, 60 – 90 Degree C

Tempering :

Temperature : 150 -180 Degree C

Time : 2 Hr

Cooling Media : Air cool

BHEL, Tiruchirapalli-620014		SSTP / Tool Engineering		Technical Delivery Conditions	
Product : BEVEL GEAR & HOUSING					
Document No.		Revision No.		Effective Date	
TDC/TE/MFG- 03		03		04.12.2009	
Revision Record		03 - TDC reviewed and revised			
Page No.		2 of 2			

7.0 DIMENSIONAL INSPECTION

Dimensional inspection shall be carried out by the supplier and report for the same shall be sent along with the supplies.

8.0 NON DESTRUCTIVE TESTING:

8.1 LIQUID PENETRANT INSPECTION

To be conducted on entire surface after finish machining as per **ASTM E165** and shall be certified by **NDT Level II qualified personnel as per SNT-TC-1A.**

Acceptance standard : All surfaces to be examined shall be free of,

1. Relevant linear indications,
2. Relevant rounded indications greater than 3/16 inch (5 mm)
3. Four or more relevant rounded indications in a line separated by 1/16 inch (1.5 mm) or less, edge to edge.

9.0 MECHANICAL TEST :

9.1 Tensile Test on test coupon as per **DIN 50145**

- Acceptance as per Drawing

9.3 Hardness Test on job & test coupon as per **DIN EN ISO 6508-1**

- Acceptance as per Drawing

9.3 Case depth shall be checked on specimen of suitable size in the same heat treated condition of the gears

- Acceptance as per Drawing

10.0 MARKING:

Shall be done as given in the drawing .

11.0 INSPECTION AT SUPPLIER'S WORKS:

The gears and housing shall be offered for final inspection by BHEL inspector for which advance intimation shall be given by the firm after making ready all the inspection and test records. **Go & No Go Gauges** for checking the internal splines of the gear shall be made/procured by the firm immediately upon receipt of our order and get the same duly approved by BHEL/SSTP. The same shall be used for checking the splines of the gear during final inspection by our inspector. The threads are to be checked using relevant **thread gauges**. The same is to be **collected by the firm upon receipt of our order** and shall be used at the time of final inspection by BHEL inspector. All the gauges shall be returned to BHEL along with the final supply.




12.0 TEST CERTIFICATE:

Following test certificates shall be sent with Materials..

1. Raw Material Chemistry (**Clause 3.2**)
2. Hardness, Tensile Test & Case Depth (**Clause 9.1 to 9.3**)
3. Temperature-Time-Recorder Graph for the Heat Treatment Cycle followed
4. Ultrasonic Test Report for Raw Material (**Clause 3.1**)
5. Liquid Penetrant Test (**Clause 8.1**)
6. Dimension Report (**Clause 7.0**)

13.0 PRESERVATION & PACKING :

1. Supply with rust preventive coating which shall be dry after application and removable by common solvents.
2. Pack suitably to avoid transit & handling damages.

Prepared By	Reviewed By	Approved By
 DM/TE	 DGM / QA&C	 AGM / TE