Bharat Heavy Electricals Limited

Heavy Electrical Equipment Plant, Haridwar-249403

Office of AGM (BL-1 Test Bed)

Tender Document

Name of Work : Hiring of 02 no's balancing pedestals and electronics for overspeed balancing installation in block-1 for a period of one year.

Section : Electrical Machine Group (Bl-1, Test Bed)

Tender Enquiry No. : PR/BL-1/EM/WC/016/012 Dated: 11/11/2016 (Friday)

Due date of Tender Opening (Part-1): Dated:09/12/2016 (Friday)

Place of Submission of Tender / Bid: Tender Room, Purchase Deptt., 4th floor, Main Administrative Building, BHEL, HEEP, Haridwar-249403 (Uttarakhand)

All the parties are requested to kindly visit Bl-1 shop, HEEP Haridwar before participating in the tender for actual working conditions. Visit shall be made on any working day between 9:00am to 4:00pm with prior intimation. For arranging visit and all other tender related queries, the party shall contact the under given office.

Vishal Verma
DGM (Bl-1/EM),
BHEL (HEEP), Haridwar-249403 (Uttarakhand)
Email: vishalv@bhelhwr.co.in
Phone: 01334 – 284127 & 284262

Details of Tender Document

Name of Work:

Hiring of 02 no's balancing pedestals and electronics for overspeed balancing installation in block-1 for a period of one year

The Tender document has been detailed as Follows:

(1) Notice Inviting Tender(NIT**)**……..**(Annexure-AA)**
(2) Techno-commercial Bid …… **(Annexure-B)**
(3) Price Bid ……**. (Annexure-C)**
(4) Check List ……**(Annexure-D)**
(5) Certificate by Chartered accountant ……**….(Annexure-I)**
(6) Detailed Scope of Work ……**….(Annexure- A)**
(7) Instruction Regarding Reverse Auction……**….. (Annexure-F)**
(8) Balancing Standards…… **(Annexure-E)**

General Instructions:

- Instructions to be followed have been specified clearly in the Techno-commercial bid i.e. Annexure-B of the Tender Document.
- Timely receipt of Tender to the In-charge Tender room within schedule time and date is solely the Responsibility of the bidders.
- All the documents being submitted (either the tender document or supporting documents) shall be ink signed and stamped by the bidder.
- Annexure-I is to be filled by only those who are submitting EM-II certificate.
- Plain white paper shall be used for printing the Tender document downloaded from website.
- Checklist as per annexure-D shall be filled properly and references of documents submitted shall be brought into it.

Issuing Officer

I/We agree with the above

Signature of Contractor with Seal

Annexure-AA

BHARAT HEAVY ELECTRICALS LIMITED

HEEP, HARIDWAR-249403 (UTTARAKHAND)
Phone: 01334-284127, 284262 Fax: 01334-226460
Email: vishalv@bhelhwr.co.in

OPEN TENDER NOTICE (NIT) No. : PR/BL-1/EM/WC/016/012 Dated: 11-11-2016

Sealed tenders are invited in two parts, i.e., (I) Techno-Commercial Offer and (ii) Price Bid, through registered post/ courier/ by hand by **09.12.2016 up to 1:45 pm** from **parties meeting the qualifying requirements** for the under-mentioned work. The party must submit documentary proof of meeting the qualifying requirement mentioned below in "Pre- qualification Criteria" envelope.

Last date of submission of tender	**: Dt. 09.12.2016 (Friday) up to 1:45 pm**
Date & Time of opening of Techno-Commercial Bid	**: Dt. 09.12.2016 (Friday) at 2:00 pm**
Place of submission of tender as well as Place of opening of tender	**: In-charge, Tender Room, Purchase Dep't., 4th Floor, Main Administrative Building, BHEL, HEEP, Haridwar-249403 (Uttarakhand)**

Tender document can be downloaded free of cost from our website (i.e. www.bhelhwr.co.in or www.bhel.com). Any request for tender document by post/courier will not be entertained in any case. However Tender document may also be obtained from the office of undersigned on submission of Cash Receipt obtained from Cash Section, BHEL (HEEP), Haridwar on deposition of the tender cost, on any working day between 08:00 AM to 04:00 PM upto 08/12/2016 (Thursday) . EMD to be paid in the form of Banker's Cheque/Pay Order/ Demand Drafts made in favor of Sr. Accounts Officer (Cash), BHEL-HEEP, Haridwar or in form of Cash deposited in Cash Section, BHEL-HEEP, Haridwar or in form of Electronic fund transfer credited in BHEL account.

Name of the work	Earnest Money (Rs.)	Completion Period	Tender Cost (Rs.)
Hiring of 02 no's balancing pedestals and electronics for overspeed balancing installation in block-1 for a period of one year.	**Rs. 1,41,120/- or OTD of Rs. 5.0 L (One Time Deposit)**	**12 Months**	**500/- (Non-refundable, inclusive of all taxes)**

Tender will be opened on **09.12.2016 (Friday)** at the above said place in the presence of interested parties or their legal representatives. AGM (Bl-1) reserves the right to accept or reject tender without assigning any reason thereof. The period of contract can be extend or shortened as per works requirement. In case the date of tender opening happens to be a BHEL declared holiday, tenders shall be opened on the next tender opening day.

Vishal Verma
DGM (Bl-1/EM)

Pre-Qualification Criteria for Acceptance of Tender

PRE - QUALIFYING REQUIREMENTS (PQR) FOR WORK OF : Works Contract for hiring of 02 nos. balancing pedestals and electronics for Overspeed balancing Installation Block-1, HEEP BHEL Hardwar for a period of one year.

Following PQR for subject work is recommended in line with the common PQR guidelines.

SL. NO	PRE QUALIFICATION CRITERIA	Bidders claim in respect of fulfilling the PQR Criteria Name and Description of qualifying criteria
A	**Submission of Integrity Pact duly signed. (if applicable)**	Not Applicable
B	**Assessment of Capacity of Bidder to execute the work as per clause assessment of capacity of NIT (if applicable)**	Not Applicable
C	**TECHNICAL CRITERIA**	Applicable
C.1	Bidder must be an Original Equipment Manufacturer (OEM) of Balancing pedestals and electronics or authorized representative of OEM. In case the bidder is an authorized representative, bidder should submit a valid Authorization document from the Original Equipment Manufacturer (OEM) of Balancing pedestals and electronics along with the offer.	
C.2	Bidder who wish to participate should have executed, during last seven years ending last day of month previous to the one in which applications are invited, work of hiring (rental basis / leasing) of one set of balancing pedestals and electronics for balancing of rotors upto 40 tonnes or more, for speed upto 3000 rpm or higher and over speeding at 3600 rpm or higher./ OR similar work* as per the following: (a) One single work of similar nature valuing INR 56.45 Lacs or above "OR" (b) Two works of similar nature valuing each of INR 35.28 Lacs or above "OR" (c) Three works of similar nature valuing each of INR Rs 28.22 Lacs or above ***Similar work** means :- Supply, Installation and commissioning of one set of balancing pedestals and electronics for balancing of rotors upto 40 tonnes or more, for speed upto 3000 rpm or higher and over speeding at 3600 rpm or higher. In case the bidder being authorized representative, the condition shall be applicable for their principal, the detail from their principal is acceptable.	
C.3	The following information should be submitted by the vendor about the companies where referred balancing pedestals and electronics as per C.2 have been supplied. This is required from all the vendors for qualification of their offer. However, in case BHEL is one of the customers of bidder as per C.2 and bidder had balanced two rotors of 40 tonnes or more in BHEL successfully on their supplied pedestals & electronics then certificate of satisfactory performance (C.3.7) from BHEL is sufficient. In case the bidder being authorized representative, this condition shall be applicable for their principal, the detail from the principal's customer is acceptable.	

C.3.1	Name of the company / customer, where referred balancing pedestal and electronics set (s) is (are) commissioned.	
C.3.2	Complete postal address of the company / customer	
C.3.3	Month & Year of commissioning	
C.3.4	Parameters of balancing pedestals and electronics supplied (capacity in Metric Ton) & types of rotors and rpm for which pedestals are supplied.	
C.3.5	Name and designation of the contact person of the company / customer	
C.3.6	Phone, FAX no. & email address of contact person of the company / customer	
C.3.7	Agreement with Performance certificate clearly mentioning agreement no. and date from the customers regarding satisfactory performance of balancing pedestals and electronics supplied to them (Original Certificate or Through E-mail directly from the customer) for successful balancing and over speeding of at least one rotor as per C.2 after the date of successful commissioning of pedestals and electronics. The original performance certificate may be returned after verification by BHEL, if required.	
D	**FINANCIAL CRITERIA**	Applicable
D.1	**TURNOVER** Tenderers should have an average annual financial turnover of atleast INR 26 Lacs of last three Financial Years (2013-2014, 2014-15 & 2015-16). Bidders shall submit copy of audited annual accounts (balance sheets and profit & loss account) in support of this.	

Notes :-

1. Relevant documents, meeting above requirements at C and D shall be submitted by bidders otherwise their offer is liable to be rejected. Bidder to submit Balance Sheet and Profit and Loss Account for the respective years as given above along with all annexure. For verification purpose all submitted documents shall be self-attested and stamped by the bidder.
2. Tenderer must submit proofs of PF Code No., ESI Code No., Service Tax registration (in proper taxable service category), Income Tax PAN No. and Labor License (if applicable) (else give undertaking to submit within 15 days after receipt of letter of intent for labor license only). Labor License of Uttarakhand is required.
3. Name, Address, Phone no. and email of certificate issuing authority must be clearly mentioned by bidder in every relevant experience documents.
4. BHEL reserves the right to verify the information provided. Vendor is advised to attach only the relevant certificates against respective clause.

Note:

-BHEL reserves the right to accept or reject any/ all application(s) without assigning any reason thereof.
-All the relevant documents required as per PQR should be submitted in an envelope along with the PQR.
-If any document submitted by tenderer found false at any stage, the tender/ work order will be cancelled immediately and the financial loss to BHEL if any in making alternative arrangement will be recovered from the contractor.
-BHEL will not be responsible for the loss or delay of tenders in transit in any case.
-**All further corrigenda, addenda, amendments, time extensions, clarifications & etc. to the tender, if any shall be hosted only at our website.**

I/We agree with the above

Signature of Contractor with Seal

Issuing Officer

Vishal Verma
DGM (Bl-1/EM),
BHEL (HEEP), Haridwar-249403 (Uttarakhand)
Email: vishalv@bhelhwr.co.in
Phone: 01334-284127 & 284262

Annexure-B

(TECHNO-COMMERCIAL BID)

TENDER ENQUIRY NO.: PR/BL-1/EM/WC/016/012 Dated: 11-11-2016

NAME OF THE WORK: Hiring of 02 no's balancing pedestals and electronics for overspeed balancing installation in block-1 for a period of one year.

TENDER COST: ₹500/- (inclusive of all taxes) for tender document collected by hand.
(Exempted for valid MSME with valid MSME certificate)

Last date for Tender Submission: Dated: 09/12/2016(Up to 1:45pm)

DATE OF OPENING: Dated: **09/12/2016** Friday at 2:00 PM

PLACE OF OPENING: In-charge, Tender Room, Purchase Deptt.,4th floor, Main Administrative Building, BHEL, HEEP, Haridwar -249403(Uttarakhand).

EARNEST MONEY: ₹1,41,120/- (Rupees One Lac forty one thousand one hundred Twenty only) or OTD (One Time Deposit) of Rs. 5.0L is also acceptable.
(Exempted for valid MSME with valid MSME certificate)

Reverse Auction: Bidders must comply with the condition of participation in Reverse Auction (RA). Refer Annexure 'F' or otherwise their bid will be liable to be rejected.

SPECIAL CONDITION FOR MSME:

"MSE suppliers can avail the intended benefits only if they submit along with the 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 attested copy of a CA certificate (Format enclosed at Annexure -I where deemed validity of EM II certificate of five years has expired) applicable for the relevant financial year (latest audited). Date to be reckoned for determining the deemed validity will be the date of bid opening (Part 1 in case of two part bid). Non submission of such documents will lead to consideration of their bid at par with other bidders. No benefit shall be applicable for this enquiry if any deficiency in the above required documents are not submitted before price bid opening. If the tender is to be submitted through e-procurement portal, then the above required documents are to be uploaded on the portal. Documents should be notarized or attested by a Gazetted officer."

I/We agree with the above

Issuing Officer

Signature of Contractor with Seal

SCOPE OF THE WORK Annexure-A

Name of Work : Hiring of 02 no's balancing pedestals and electronics for overspeed balancing installation in block-1 for a period of one year.

S. N.	DESCRIPTION	QTY	COMPLIANCE / REMARKS
1. 0	**PURPOSE:**		
	The balancing pedestals (Quantity=2 Nos.) and electronics are required for hire on rental basis for balancing of Turbo generator and exciter rotors in existing balancing tunnel of Overspeed Balancing Installation in Block-1 BHEL HEEP Haridwar.		
2. 0	**SCOPE OF SUPPLY:**		
	The scope of supply includes "Supply, Installation, Commissioning, Job Proving & Maintenance of 2 Nos. balancing Pedestals and electronics for Overspeed Balancing Installation in Block-1 for hire on rental basis for one year period".	2 Nos.	
3.0	**WORKPIECE DIMENSIONS:**		
	Balancing Pedestals & electronics should be suitable to balance rigid and flexible rotors with following major dimensions: • Max.length of rotor : upto 15000 mm • Max. Rotor Diameter :upto 4000 mm • Rotor weight : 60 Tons max. i.e. max. permissible static load on one pedestal = 30Tons • Journal Diameter : max. upto 560 mm		
4.0	**INSTALLATION AND COMMISSIONING**		
4.1	Supplier shall bring in their balancing pedestals, measurement software and electronics circuitory required for balancing of Turbogenerator rotors and Exciter rotors at our existing balancing tunnel in block-1 on returnable basis. BHEL will allow the supplier to Install and commission the balancing pedestals in our existing balancing tunnel in block-1. **1. Installation and commissioning shall be in the scope of the supplier without any charges.** **2. Deinstallation whenever required shall also be scope supplier without any charge**		
4.2	All tools & tackles / equipments required during installation & commissioning of the balancing pedestals shall be brought by the vendor on returnable basis. Crane facility and lifting tackles like slings, ropes, D-Shackles shall be provided free of charges based on availability.		

4.3	Supplier shall make his own arrangement to bring the balancing pedestals and electronics to BHEL and also for return of the same in case supplier is not able to carryout successful balancing of proveout components or after end of the contract period.		
4.4	Supplier shall arrange for adequate protection and packing of the consignment so as to avoid loss and damage during transit and also take appropriate measures to prevent metal parts from rusting, corrosion and collision during transit. Handling instructions shall be clearly printed /painted on the packages. Each package should carry a detailed packing slip. Supplier shall be responsible for any loss/damage during transit due to defective/inadequate packing.		
5.0	**COMPATIBILITY OF BALANCING PEDESTALS & ELECTRONICS**		
	Supplier shall ensure compatibility of their supplied system with following.		
5.1	(A) WITH EXISTING TUNNEL The balancing pedestals, measurement software and electronics circuitory should be compatible to existing Tunnel, Drive motor, Transfer Trolley, Bed Rails, computers, output / display terminals etc. without changing the existing set up substantially.		
5.2	(B) WITH EXISTING TOOLINGS Balancing pedestals shall be suitable for Clockwise and anticlockwise direction of rotation, to existing toolings in use at BHEL i.e Technological balancing Liners and Technological oil catchers. Drawings of the above toolings if required by the vendor shall be provided by BHEL.		
5.3	Supplier shall depute their representative to study the existing system and toolings in use at BHEL before submitting the offer. BHEL will allow the representative to study the existing system in BHEL.		
5.4	**NOTE:** Anything new required due to non compatibility with the existing system / toolings at the time of installation & commissioning and job proveout shall be arranged by supplier without any cost implication.		
6.0	**BALANCING STANDARD**		
	Supplier to confirm that balancing will be carried out as per following BHEL Balancing Standards or better. • TG30006 Balancing of Brushless Exciter rotors • TG30008 Balancing of TG rotors of THRI and TARI designs. Both the standards are attached. (refer Annexure 'E')		
7.0	**PROVE OUT OF PEDESTALS AND ELECTRONICS**		

7.1	Supplier shall carryout prove out balancing of 2 nos. 660 MW rating Exciter rotors free of cost by their engineers, after installation and commissioning of the pedestals in the tunnel.In case vendor has already demonstrated prove out balancing of 02 nos. of 660MW exciter rotors at BHEL Haridwar works the prove out balancing as required above is waived off.		
7.2	In case supplier is not able to carryout successful balancing of prove out components, the balancing pedestals and electronics shall be taken back by the supplier without any payment i.e at no risk basis to BHEL. Subsequently, L2 vendor will be given oppurtunity at L1 vendor rates and terms and conditions.		
7.3	Subsequent to successful proveout of the balancing pedestals, BHEL will have the right to use the pedestals on exclusive use basis for a period of one year without any limitations on number or type of rotors being balanced on the pedestals.		
7.4	**Insurance of prove out component:** BHEL will carryout the Insurance of the prove out components (i.e 2 nos 660MW rating exciter rotors) for one month for each rotor. Insurance premium cost will be deducted from the first running bill of the vendor after reckoning of hire period as per clause 8.1.		
8.0	**RECKONING OF HIRE PERIOD**		
8.1	Reckoning of hire period will start from the date of completion of successful free of cost balancing of prove out of 2 nos. 660 MW Brushless Exciter rotors as per cl. no. 7 by the supplier and certified by the Engineer (test bed). No payment shall be made to the supplier prior to this. In case of vendor who has already demonstrated prove out balancing of 02 nos. 660 MW Exciter rotors the reckoning of hire perod will start from the date of successful installation and commisioning of pedestals at balancing installation at Block-1.		
8.2	BHEL can terminate the rental agreement during the period with one months notice.		
9.0	**EXTENSION OF HIRE PERIOD**		
9.1	In case of satisfactory performance of the balancing pedestals & electronics, BHEL may extend the contract on same rates, terms and conditions upto one year.		
9.2	Validity of offer shall be for a minimum period of 180 days from the date of Tender Opening.		
10.0	**BALANCING TECHNIQUE AND TRAINING**		
	Supplier shall share the balancing technique being followed by them with all concerned in BHEL. Free of cost training on balancing pedestals, electronics and software to BHEL Engineers shall be provided by the supplier during prove out balancing of BHEL components at BHEL.		

11.0	**MAINTENANCE AND MACHINE CALIBRATION**		
11.1	Breakdown maintenance and machine calibration during the hire period will be provided free of cost by the supplier as and when required. In addition to breakdown maintenance preventive maintenance to be carried out on quarterly basis free of cost by the vendor. Supplier shall ensure ready availability of needed consumables / spares / tools & tackles at site during the entire tenure of the contract. In case if any complaint gets unattended for more than 2 days since informing to the supplier then penalty shall be levied on the supplier limited to the rate of rental charge per day from the date of complaint.		
11.2	Visit of maintenance and machine calibration personnel shall be free of cost during the contract period.		
12.0	**EXPERT VISITS**		
	Expert visits of upto 10 days in a year will be included free of cost by the supplier.		
13.0	**OPERATION AND MAINTENANCE MANUALS :**	3 sets	
	Supplier to provide 3 sets of operation and maintenance manuals of the balancing Pedestals, Electronics and softwares. This should include detailed drawings/circuit diagrams with part numbers of spares/consumables etc. The same should be provided in CD-ROM also.		
14.0	**DELIVERY PERIOD:**		
	Material: Max. 3 months from the date of award of contract. Early delivery shall be acceptable.		

Issuing Officer

I/We agree with the above

Signature of Contractor with Seal

INSTRUCTIONS TO BE FOLLOWED DURING FILLING AND SUBMISSION OF TENDER:

1. Tenderer (s) are advised to participate only if, they fulfill minimum qualification criteria as mentioned in tender notice (NIT) and PQR.
2. Tender document can be downloaded free of cost from our website (i.e. www.bhelhwr.co.in or www.bhel.com). Any request for tender document by post/courier will not be entertained in any case. However Tender document may also be obtained from the office of undersigned on submission of Cash Receipt obtained from Cash Section, BHEL (HEEP), Haridwar on deposition of the tender cost
3. Offer must be submitted only on the tender Documents downloaded from our website i.e. **www.bhelhwr.co.in** or **www.bhel.com**, no changes in format is permitted. Any change in format shall lead to disqualification. However in case of tender documents purchased from Department, the same shall be used.

4. **SUBMISSION OF OFFER**

The offer should be submitted in two parts and in following manner:

Techno-Commercial Bid Part-"A"

i. **The First Envelope** shall contain the ink signed and stamped copy of documentary proof of meeting the Pre- Qualification criteria. Along with the other relevant documents, the party shall submit the Performance certificate / experience certificate from previous customers. The first envelope shall be super scribed with "Pre-Qualification Criteria", Name of work, NIT No. & due date of opening.

ii. **The Second Envelope** shall contain the

a) Ink signed NIT Annexure "AA" ,
b) Techno-commercial Bid Annexure-"B" ,
c) Detailed Scope of work as ANNEXURE-"A" ,
d) Check list Annexure-"D".
e) Certificate by Chartered accountant (Annexure-"I")
f) Compliance of Reverse Auction (Annexure-"F")
g) Signed copy of general terms and condition etc. as mentioned in tender documents.
h) Relevant Documents like ESI, PF Code, PAN No., Service Tax Regn. No. etc.

The second envelope shall be super scribed with **"Techno-Commercial Bid"**, Name of work, NIT No. & due date of opening.

The first, third and fourth envelope shall be kept in second envelope along with techno-commercial bid with all the relevant documents.

iii. **EMD: The Third envelope** shall contain the Demand Draft/ Bankers Cheque/Pay order/ Cash Receipt Obtained from Cash Section, BHEL (HEEP), Haridwar on deposition of requisite amount, or Electronic fund transfer receipt towards payment of EMD in BHEL (HEEP), Haridwar account as specified in tender notice be super- scribed with "EMD" Name of work & NIT No. Offer (s) without requisite EMD will not be considered. The EMD submitted in the form of Bank draft/Pay order is to be made in favor of **Sr. Accounts Officer (Cash), BHEL-HEEP, Haridwar** from any nationalized bank**.** ***EMD shall not carry any interest.*** *Parties claiming exemption from submission of EMD shall submit the covering letter in addition with relevant documents notarized or attested (valid MSME certificate) by a Gazetted officer, in the EMD envelope.*

iv.**Tender Cost: The Fourth envelope** The tenderer who have obtained the tender document from the Bl-1/EM Department by hand shall submit the photocopy of Cash Receipt obtained from Cash Section BHEL (HEEP), Haridwar in the fourth envelope.

Price Bid Part-"B"

v).**Fifth Envelope** shall contain only the Price bid as per ANNEXURE-C. Any other information in the price bid shall not be considered and the offer is likely to be rejected. Price bid document shall be ink signed by the bidder at the bottom of the page. The envelope shall be sealed and super scribed with "Price Bid", Name of work, NIT No. & due date of opening of tender.

vi) **Sixth Envelope:**

All the five sealed envelopes shall be kept in another sealed cover (i.e. sixth envelope). The cover shall be super-scribed with "Quotation for (name of work), NIT No. & due date of opening and shall be addressed to In- charge, Tender Room, Purchase Deptt., 4th floor, Main Administrative Building, BHEL,HEEP,Haridwar-249403 (UK) and it should also contain the Bidder address.

5. Offers should be strictly submitted in original tender documents/ format issued by BHEL. If, the offers submitted by any party in their own format, such offer (s) are liable to be rejected.
6. Bidder address shall be written on each envelope.
7. The contractor must ink sign and stamp on each page of tender document including supporting documents submitted with tender.
8. Rate must be quoted in figures as well as in words.
9. Only Part –1 i.e. Techno-commercial bids with requisite EMD and photocopy of Cash receipt of Tender fee (if tender document collected by hand) shall be opened on the due date of opening in the presence of the interested parties available at the time of opening of the tender. Date of opening of Price bids (Part-2) will be intimated to the parties who qualify as per techno-commercial offer.
10. The rates should be valid for a period of six months from the date of opening tender. The rates should be quoted both in figures and words. Please note that if there is mismatch between price given in figures and in words BHEL reserves its right to accept maximum of the two for evaluation, and minimum of the two for award and BHEL's decision in this regard should be acceptable to the bidders.
11. The enclosed scope of work, details out the major activities only. However there may be certain other activities required for completion of the desired work, such related activities will have to be carried out without any extra cost. Also any activity of rectification or rework due to any reason will be done by the contractor without any extra cost.
12. It will be in interest of the contractor to visit shop / Block-1 of BHEL Haridwar before submitting offer to have clear idea about the balancing facility at Block-1.
13. BHEL is not responsible for tenders/offers lost/delayed in transit/ by post etc. The offers reaching this office after due date and time and/or without earnest money will not be considered. The offer should also accompany all documents as per General and Special terms and conditions of contract.
14. Offers not received in line with the tender enquiry are liable to be rejected.
15. BHEL reserves the right to reject a bidder based on their unsatisfactory past performance at any other project in any center /region.

16. Bidders shall enclose the certificate of satisfactory performance, from previous customer in the PQR envelope, along-with the tender documents in support of their claim of having minimum experience of similar works.
17. Vendor shall ensure meeting all statutory obligations as applicable during the contract period.
18. An affidavit (on stamp paper of Rs. 10/-) that none of the bidder's relative is working as officer in BHEL Haridwar to be submitted along with the tender.
19. Deviation from any of the specified requirements should be clearly brought out on a separate sheet titled as deviation. In case of no deviation a "NO DEVIATION STATEMENT" shall be submitted with the tender (Techno- commercial offer).
20. BHEL does not bind themselves to accept the lowest tender or any tender or to give any reason for their decision.
21. If any information / document submitted by the tenderer is found false/ fake at any stage, the tender will stand cancelled and EMD shall be forfeited.
22. It will be deemed that tenderer have gone through all the specifications, contractors obligation, special & general condition of contract and agree to abide by these.
23. Tenders not received in the above manner are likely to be rejected.

Issuing Officer

I/We agree with the above

Signature of Contractor with Seal

TERMS & CONDITIONS

(1) CONTRACTOR's RESPONSIBILITY & OBLIGATION:

(1) Contractor shall carry out the work at his own risk, finance, material human resources and supervision.
(2) Rental charges shall be payable on quarterly basis after reckoning/start of hire period and on presentation of bills by the supplier after successful completion of 03 months. No advance payment shall be made to the supplier.
(3) Contractor is expected to carry out the activities at a fast pace in round the clock shifts and to meet the schedule of BHEL. Any delay on account of the contractor due to inadequate manpower or other reason may attract penalty on the sole discretion of engineer-in-charge.
(4) Contractor shall have supervision on the conduct of his employees.
(5) Contractor shall provide safety appliances, PPE's to all the engaged workmen and shall ensure safety.
(6) Contractor shall supply tools, tackles and other necessary materials to his employees for smooth working.
(7) Any material damaged during installation and commissioning of pedestals shall be supplied by contractor free of cost and the make of the item shall be same as was originally used in the Turbo generator.
(8) Gas cutting and welding facility, Welding electrodes, tools and tackles, hydraulic Jacks etc. shall be arranged by party itself.
(9) Any damage/injury to man/material during work shall be responsibility of contractor.
(10) Contractor shall ensure that other Production activities of the shop shall not be hampered during the execution of work.

(2) BHEL's OBLIGATION:

All tools & tackles / equipments required during installation & commissioning of the balancing pedestals shall be brought by the vendor on returnable basis. Crane facility and lifting tackles like slings, ropes, D-Shackles shall be provided free of charges based on availability.

(3) PERIOD OF CONTRACT:

Reckoning of hire period will start from the date of completion of successful free of cost balancing of prove out of 2 no's 660 MW Brushless Exciter rotors by the supplier and certified by the Engineer (test bed). No payment shall be made to the supplier prior to this. In case of vendor who has already demonstrated prove out balancing of 02 no's 660 MW Exciter rotors the reckoning of hire period will start from the date of successful installation and commissioning of pedestals at balancing installation at Block-1 duly certified by Engineer Test Bed Block-1. The period of contract will be for one year.

(4) EARNEST MONEY DEPOSIT (EMD):

1. Tenderers have to deposit the EMD of **Rs. 1, 41,120/- .** The EMD may be submitted in cash as permissible under Income Tax Act (before tender opening) or through banker's cheque /pay order /demand draft (along with offer). Banker's Cheque/Pay order/demand draft should be made **in favor of Sr. Accounts Officer (Cash) BHEL, HEEP, Haridwar**. EMD should be kept in a separate envelope (IIIrd).EMD shall also be accepted as Electronic fund Transfer credited in BHEL account (before tender opening).

In case of no EMD or less EMD even technical bid will not be opened and the offer will be summarily rejected.

OTD (One Time Deposit) of Rs. 5.0L is also acceptable.

2. EMD of unsuccessful bidders shall be refunded back normally within fifteen days of acceptance of award of work by the successful bidder on written request by bidders.
3. EMD shall not carry any interest.
4. EMD by bidder will be forfeited as per tender document, if—
   i) After opening of the tender and within the offer validity period, the tenderer revokes his tender or makes any modification in his tender which is not acceptable to BHEL.
   ii) The tenderer does not commence the work within the period as per LOI/contract.

(5) SECURITY DEPOSIT (SD):

Security deposit is not required.

(6) PAYMENT TERMS:

(1) No advance payment shall be made to the vendor. Rental charges shall be payable on quarterly basis after reckoning/start of hire period as per cl. no.8 of Scope of work and on presentation of bills by the supplier after successful completion of 03 months along with submission of all necessary documents.

(2) All the payments shall be made through e-payment after submission of following documents along with the bill

i) E-payment form duly filled (Form will be provided by BHEL).
ii) Income tax exemption letter (if applicable).
iii) Excise duty / CVD & CST/VAT will be paid on material cost and service tax will be paid on commissioning charges at actual rates. Related original documents to be submitted by bidder for availing MODVAT credit by BHEL.
iv) Service tax shall be reimbursed on actual basis after submission of Service Tax challan with service tax registration in proper category.

(3) Freight & transit insurance charges from dispatching station to BHEL, Haridwar shall be borne by the party.

(4) The material will be dispatched to Central Plant stores, HEEP, BHEL, Haridwar with instructions to forward the same to Addl. General Manager (TEST BED), Block-1, HEEP, BHEL, Haridwar-249403.

(5) Party not agreeing to our payment terms shall be rejected.

(7) WARRANTY:

The vendor shall stand warranty for the smooth working of balancing pedestals and electronics during the rental period from the date of reckoning of the hire period as per cl. no. 8.0 of Scope of work. Any material (supplied by the party) found defective within warranty period will be replaced free of cost by the party without any financial responsibility on BHEL on account of operational issues.

(8) DELIVERY PERIOD:

Material: Max. 3 months from the date of award of contract. Early delivery shall be acceptable.

(9) LIQUIDATED DAMAGES(LD) CLAUSE):

In cases of delay from schedule, attributable to the contractor due to any reason, LD @ 0.5% of the total order value per week of delay in deliveries subject to a maximum of 10% of the total order value. In case of any amendment /revision, the LD shall be linked to the amended /revised PO value.

(10) GENERAL CONDITIONS:

(1) The offers of the bidders who are on the banned list as also the offer of the bidders, who engage the services of the banned firms, shall be rejected. The list of banned firms is available on BHEL web site www.bhel.com.

(2) The Vendor should submit their best price at first stage itself and they will not be allowed to revise the price. Any revision / discount given by the vendor subsequently will be ignored. However price negotiations can be held if found necessary at the discretion of BHEL.

(3) The Vendor shall bring all types of tools, tackles & testing equipments with them required for successful installation & commissioning of the supplied items.

(4) A point wise compliance statement shall be submitted by the party in the same format, against each clause. Non-compliance to any of the clause can lead to dis-qualification of the offer. All the documents must be signed by the party.

(5) BHEL reserves the right to cancel the tender at any stage of tendering till signing of agreement without assigning any reason(s). The tender cost in that event shall not be refunded.

(6) The award of work will be made on the basis of the "Total cost to BHEL".

(7) Any material not specified in scope of supply but required for successful commissioning shall be provided by the vendor free of cost.

(8) Rental contract shall be governed as per BHEL General Conditions of contracts and special terms and conditions.

(9) RULES AND REGULATIONS OF THE CENTRAL/STATE GOVERNMENT: In the event of award of any contract, vendor will have to comply and abide by all the laws/enactment of state and central government. Documents regarding registration with Sales Tax and Excise authorities may also to be forwarded along with income tax clearance.

(10) Any casualty or damage caused to the property or damage to components or person by any untoward incidents while executing this contract will be at the supplier/contractors risk & cost.

(11) The supplier/contractor shall not sub-contract or transfer or assign the contract in full or any part thereof to any other person or firm or company without the previous express written approval of BHEL.

(11) SPECIAL CONDITIONS:

(1) The contractor shall maintain the following during the execution of contract, as applicable;
   i. Valid labor license from Asst. Labor commissioner if applicable.
   ii. P.F. code and abide by the relevant laws & rules.
   iii. E.S.I. code and abide by the relevant laws & rules.
   iv. Insurance Cover (as per workmen compensation act & for working at height) for labors as per the relevant laws & rules.

(2) In case of non-compliance of any of the labor laws as per act by the contractor, he will be responsible for expenses / liability occurring / accruing on BHEL on account of above including expenditure on legal proceedings. All such expenses shall be recoverable from the contractor from any of his running contracts with BHEL or any contract entered thereafter.

(3) The contractor shall not employ a worker less than 18 years of age during execution of his work.

(4) The contractor shall inform BHEL for engaging or removing the labors from the site of work.

(5) Contractor found or reported for non-compliance of the legal obligations during the execution of the contract, shall be debarred from the issue of NITs for at least 01 year or till the proof of compliance is produced.

(6) The work shall be governed by the specifications, general terms & conditions of BHEL contract, special conditions, environment related conditions, new safety clause and any other relevant conditions applicable time to time.

(7) Contractor has to complete the work in time as per demand of In-charge AGM Test Bed, Block-1.

(8) The contractor not completing the work as per BHEL requirement & as directed by the In-charge AGM Test Bed, Block-1, action, as deemed fit will be taken including debarring for the issue of further NITs.

(9) In case more than one contractor quotes L1 rates, the work may be awarded through draw of lottery.

(10) BHEL reserves the right to cancel the tender at any stage of tendering till signing of agreement without assigning any reason(s) thereof. The tender cost in that event shall not be refunded.

(11) Power of attorney / subletting will not be accepted for execution of work.

(12) Taxes as applicable shall be recovered as per rule.

(13) Rates shall be quoted in figures as well as in words and contractor must put his name and signature on each page of the tender documents / undertakings, while submitting his offer, failing of which tender may be liable for rejection. If there is mismatch between prices given in figure and in words, BHEL shall have right to accept maximum of the two for evaluation and minimum of two for award of the contract.

(14) Gate passes / tokens to be issued by the CISF unit shall have to be returned to the pass section of CISF after completion of work, failing of which recovery at the rate as applicable shall be made from the contractor.

(15) Workmen must follow the safety norms and use protective devices.

(16) The contractor will have to protect the BHEL equipment and material from fire hazards or any other damages or loss.

(17) No excuses for hindrance viz. extreme weather condition, non-availability of labor etc. will be entertained for not completing the work.

(18) All necessary precautions for safety of the man/ machine, fire hazard & environmental

aspects shall have to be taken by the contractor for the activities performed by his workers.

(19) Emergency work arises if any, will be dealt on priority and arrangement for proper & timely completion of work will have to be done by contractor.

(20) Involvement in any undesirable activity by him or his workmen will be viewed seriously and attract strict action including cancellation of contract or debarring from tendering.

(21) Contractor shall maintain a bank account in any of the nationalized banks with Internet Banking facilities at Hardwar. This should be suitable for e-payment by BHEL.

(12) RISK PURCHASE CLAUSE

In case of delays in services or non-fulfillment of any other terms & conditions given in the work order the purchaser may cancel the work order in full or part thereof and may also make the purchase of the service from elsewhere / alternative source at the risk and cost of supplier. Vendor does not agree to above clause, their offer is liable to be rejected. In case any vendor accepts risk purchase clause initially and subsequently declines to honour the term in the eventuality of RISK PURCHASE, they may be banned for business with BHEL.

Opening officer **Accounts Representative**

Issuing Officer

I/We agree with the above

Signature of Contractor with Seal

UNDERTAKING
(BY CONTRACTOR)

1.	I/ We have carefully perused all the terms and conditions of the tender, NIT including special conditions mentioned in the tender before quoting the offer and I/we commit to abide by them in to. I/we have read BHEL General Conditions of Contract and agree to abide by the same.
2.	I/ We shall abide by and fulfill the requirement of all the statutory obligations in respect of EPF, ESI, labour licence and all other provisions of labour laws applicable to me/us and maintain Documents/ Registers/ Records as applicable and produce the same to BHEL officials or statutory authorities whenever desired.
3.	I/ We shall abide by Service Tax Act/ Rules as applicable.
4.	I/ We agree to provide the number of workmen as per the requirement of BHEL subject to the maximum as mentioned in the contract.
5.	I/ We shall provide duly signed employment card/ identity with photograph to the workmen supplied under the contract.
6.	I/ We shall ensure payment of ESI, PF, income tax, service tax and all other statutory duties and taxes leviable against the contract/ payment to the workmen.
7.	I/ We shall pay BHEL prescribed wages as applicable from time to time including leave with wages to the workmen as per rules/ act.
8.	In case of non-compliance of any of the statutory obligations, labour laws by me/us, I/we shall be responsible for all expenses / liability occurring/ accruing on BHEL because of this including all expenditure on legal proceedings. All such expenses shall be recoverable from any of my / our running contract with BHEL or any contract entered thereafter.
9.	I/ We shall maintain valid labour licence throughout the period of contract.
10.	Details of Tender cost deposited Reference No. of Cash Receipt …….
11.	Details of earnest money enclosed with the offer is as under: a) Amount …… b) (i) Cash Receipt No. ……. Date……. (ii) Demand draft No. …….. Date……Bank……..
12.	PF No. ……. ESI No. …… Service Tax No. ……

SIGNATURE OF CONTRACTOR DATE (WITH SEAL)

ACCOUNT REP. OPENING OFFICER ISSUING OFFICER

I/We agree with the above

Signature of
Contractor with
Seal

Annexure-D

(CHECK-LIST)

This check list must be filled properly & submitted in separate envelope along with Techno commercial offer.

Sl. No.	Details of Criteria	YES / NO	Remarks
1.	Submitted documents like Profit & Loss Account statement or Balance sheet etc.in support of clause (C) of PQR.		
2.	Submitted proofs along with award letter/ contract agreement of carrying out similar work i.e. Submitted documents of having minimum experience of similar work as per clause (C) ***Pre-qualification criteria*** mentioned in Tender notice.		
3.	Submitted copy of Satisfactory performance certificate from previous customer i.e. For the work for which documents have been submitted in support of PQR clause (C).		
4.	Does the document submit in support of PQR clause(C) contains the value of Work.		
5.	Does the document submitted in support of PQR clause(C) contains the brief scope of work.		
6.	Submitted a disclosure Affidavit on stamp paper of Rs.10/- about the fact if any of the bidder's relative is working as an officer in BHEL, Hardwar.		
7.	Submitted documents related to PF Code No.		
8.	Submitted documents related to ESI Code No.		
9.	Submitted documents related to PAN based Service Tax Registration No.(in proper service tax category)		

I/We agree with the above

Issuing Officer

Signature of Contractor with Seal

10.	Submitted copy of PAN card.		
11.	Valid Labor License from Labor Commissioner, Dehradun. (Else give undertaking to submit within 15 days after receipt of letter of intent).		
12.	Photocopy of Cash Receipt obtained from Cash Section BHEL (HEEP), Haridwar against payment of Tender Fees, in case tender document is collected by hand.		
13.	Submitted Earnest Money.		
14.	Validity of offer is 180 days from the date of opening.		
15.	Submitted No Deviation Statement / Deviation on a separate sheet.		
16.	Ink Signed and Stamped on each page of tender document		
17.	Self-Attested on each of the supporting documents submitted.		
18.	Submitted Notarized copy of NSIC Certificate or copy Attested by a Gazetted Officer (if applicable)		

Note: - In the Remarks column reference nos. of various supporting documents submitted can be filled.

Issuing Officer

I/We agree with the above

Signature of Contractor with Seal

Annexure-I

Certificate by Chartered Accountant on letter head
(only for those who are submitting EM-II Certificate)

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-11) ..... dtd:....., Category:..... (Micro/Small)). (Copy enclosed).

Further verified from the Books of Accounts that the investment of the company as per the latest audited financial year ..... 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.S.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

(Strike off whichever is not applicable)

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

Or

The company has been graduated from its original category {Micro/ Small) (Strike off which is not applicable) and the date of graduation of such enterprise from its original category is ..... (dd/mm/yyyy) which is within the period of 3 years from the date of graduation of such enterprise from its original category as notified vide S.O.No.3322(E) dated 01.11.2013 published in the gazette notification dated 04.11.2013 by Ministry of MSME.

Date:
(Signature)
Name-
Membership number-

Seal of Chartered Accountant

I/We agree with the above

Issuing Officer

Signature of Contractor with Seal

एन एस आई सी
NSIC
ISO 9001: 2008

राष्ट्रीय लघु उद्योग निगम लिमिटेड
THE NATIONAL SMALL INDUSTRIES CORPORATION LTD.
(A GOVERNMENT OF INDIA ENTERPRISE)
"NSIC BHAVAN" OKHLA INDUSTRIAL ESTATE, NEW DELHI-110 020 (INDIA)

Ref.: NSIC/HO/GP/15(4)/2013-14

18th February 2014

M/s. Bharat Heavy Electricals Ltd.
BHEL House
Siri Fort Area
New Delhi-110066

Kind Attn.: Shri Ratnesh Lal Das, AGM

Sub.: Verification of SPRS Certificate issued by NSIC

Dear Sir,

The Micro and Small Enterprise Sector plays a pivotal role in the overall economic development of the country in creating income and employment opportunities in the rural, semi-urban and urban areas. Marketing is a crucial area where institutional support is required by MSE's. The Government of India, Ministry of Micro Small & Medium Enterprises, New Delhi vide their Gazette Notification No. S.O. 581(E) dated 26.03.2012 has notified that Micro & Small Enterprises registered with the National Small Industries Corporation and others are eligible to get the following benefits under "Public Procurement Policy for Micro & Small Enterprises (MSEs) Order 2012":-

1. Issue of the Tender Sets free of cost,
2. Exemption from payment of Earnest Money Deposit (EMD),
3. In tenders participating MSEs quoting price within price band of L1+15 per cent shall also be allowed to supply a portion upto 20% of requirement by bringing down their price to L1 Price where L1 is non MSEs.

For the convenience and help of Purchasing Authority to verify the genuineness and validity of the certificate(s) issued by NSIC under its Single Point Registration Scheme, NSIC has developed a new link **"Verification of SPRS Certificate"** on our website www.nsic.co.in wherein by entering GP registration number of the unit(s) certificates can be verified. **In addition, the verification of SPRS certificate may also be done by visiting SPRS online website i.e. www.nsicspronline.com.**

Contd...2/-

You are requested to disseminate the above information of the new link for verification of the certificate to all your purchasing authorities.

For any assistance in this regard, our 153 Offices in the country can be contacted and details can also be obtained from our website **www.nsic.co.in.**

Thanking you and ensuring you best service.

Yours faithfully,

(Paramjeet Singh)
General Manager (TM/GP)

Copy to:-
The Chairman-cum-Managing Director
M/s. Bharat Heavy Electricals Ltd.
BHEL House
Siri Fort Area
New Delhi-110066

PRICE BID Annexure 'C'

Name of Work: Hiring of 2 Nos. Balancing Pedestals & Electronics for Over speed Balancing installation in Block-1, BHEL Haridwar on rental basis for 01 YEAR (12 MONTHS).

Tender Notice No. : PR/BL-1/EM/WC/016/012 Dt. 11/11/2016

Place for opening of tender **:** Tender room MAB 4th Floor Purchase dep't

Proposed period of contract : 12 months period

Amount of earnest money : Rs. 1, 41,120/- (Rs. One Lakh forty one thousand one hundred twenty only)

S. No.	Description of item	TOTAL Months	Rate per month (hiring)(In fig. as well as in words) Rs.	Total Amount in Rs. (In fig. as well as in words)
1	Hiring charges of 2 Nos. Balancing Pedestals and electronics for Over Speed Balancing Installation in Block-1 per month.	12		---------- ---------- (i.e. Hiring Rate per month x 12 months)

Service Tax Extra

Total Amount of hiring for 2 Nos. Balancing Pedestals and electronics for 12 months (in Rs.) =

(Total Amount in Rs. in fig. as well as in words)

Note: In case of any discrepancy in amount, the amount in words will be considered as final.

I/We agree with the above

Issuing Officer

Signature of Contractor with Seal

SPECIAL TERMS & CONDITIONS

Name of Work : Hiring of 2 Nos. Balancing Pedestals & Electronics for Over speed Balancing installation in Block-1, BHEL Haridwar on rental basis for 01 YEAR.

1.0 EXECUTION OF WORK :

Supplier shall bring in their balancing pedestals, measurement software and electronic circuitry required for balancing of Turbo generator rotors and Exciter rotors at our existing balancing tunnel in block-1 on returnable basis. Supplier shall make his own arrangement to bring the balancing pedestals and electronics to BHEL and also for return of the same in case supplier is not able to carry out successful balancing of prove out components. BHEL will allow the supplier to Install and commission the balancing pedestals in our existing balancing tunnel in block-1.

2.0 DELIVERY PERIOD :

Material: Maximum 03 months from the date of award of contract. Early delivery shall be acceptable.

3.0 ROAD PERMIT :

The agency shall have to arrange the necessary **Road Permit/Form – 38** as required at their **own cost** for transportation of materials inside Uttarakhand and the agency should have valid **Sales Tax Registration and TIN NO. of Uttarakhand.**

4.0 INSURANCE, PROVIDENT FUND & LABOUR LICENSE OF WORKMEN :

The agency shall compulsorily take insurance under Workmen Compensation Act for all personnel deployed and the insurance must be valid till successful installation and commissioning of pedestals & electronics. The agency must have independent PF Registration No. and they must deposit the prescribed amount to the Statutory Authorities as per the relevant Acts/Rules. The agency should have valid Labour License and they must obtain the labour License prior to commencement of work as per the relevant Acts/Rules.

5.0 GATE PASS & POLICE VERIFICATION OF PERSONNEL :

The agency shall arrange entry/exit gate passes for manpower, Materials & Vehicles from BHEL CISF Security at their own cost as per the prescribed procedures of the CISF. The agency must get the character & antecedents of all personnel deployed to site duly verified from the concerned Police.

6.0 OBSERVANCE OF STATUTORY LAWS :

The agency must observe and comply with all Statutory Laws such as Gas Cylinder Rules, Electricity Act, IBR Act, etc. and all statutory acts & laws as applicable. The agency must observe and comply with all Labor Laws such as Contract Labor (Regulation & Abolition) Act, Minimum Wages Act, Factories Act, Industrial Disputes Act Interstate Migrants Acts, and Payment of Bonus Act, Provident Fund & Miscellaneous Provisions Act, Employees State Insurance Act, Workmen Compensation Act, Payment of Wages Act and other Labor Laws as applicable.

The agency must pay the prescribed wages, bonus, overtime, benefits, taxes & duties, provident fund, inspection fees etc. and they must maintain the prescribed accounts & registers as per relevant acts/rules.

7.0 FACILITIES AT BHEL Works :

The Agency shall have to arrange Accommodation for their Personnel at their own cost. The agency shall have to arrange for the stores and office at shop at their own cost, space for the same shall be provided as per the availability at shop. The agency shall have to provide, at his own cost, all necessary facilities, transport, electricity, water, medical, food, safety equipment, personal protective equipment, first aid etc. as required under relevant statutory acts & rules.

8.0 MANPOWER:

The agency has to deploy adequate nos. of supervisors and skilled, semi-skilled & un-skilled manpower so as to complete the work in the specified completion period.

8.1 The agency shall ensure that no physically unfit/mentally unsound and under-aged person (below 18 years) are employed at any time and shall also maintain the requisite health records of the personnel deployed.

8.2 Contractor shall nominate supervisor for the complete work duration as a single point contact for all technical, administrative and commercial purpose.

9.0 TOOL AND TACKLES:

All tools & tackles / equipment required during installation & commissioning of the balancing pedestals shall be brought by the vendor on returnable basis. Crane facility and lifting tackles like slings, ropes, D-Shackles shall be provided free of charges based on availability.

10.0 TAXES & DUTIES :

10.1 The service Tax, as legally applicable & payable by the contractor under the provisions of applicable law/act, shall be paid BHEL as per the contractor's bill. However, contractor shall have to submit proof of service tax deposited by them immediately after the deposit but not later than the next bill submitted after the due date of deposit.

10.2 Income tax & other statutory deductions as applicable shall be made as per prevailing rates & norms.

11.0 SUBMISSION OF DOCUMENTS :

11.1 The agency shall have to submit the list of Manpower, T&Ps, Consumables & other Materials before commencement of work and they shall also submit copies of Labour License, PF Registration Certification, Workmen Insurance, Gate Passes of Manpower & materials and other statutory documents after mobilization at BHEL works. Agency has to submit quality Plan, Detail Work Schedule and day wise activity schedule before starting of job. During execution of the work, Daily progress Reports and other required Documents shall have to be furnished by the agency.

12.0 JOB PROGRESS & REVIEW :

Daily work planning, scheduling and reviewing of work will be done by the contractor and contractor's representative must attend daily review meeting with BHEL every evening in the work control office and submit progress report daily basis to BHEL. BHEL shall have the option of ensuring completion of the work in time by arranging additional resources and manpower at the risk & cost of the agency in case the job progress is not satisfactory.

13.0 HEALTH, SAFETY & ENVIORNMENT (HSE) :

13.1 Safety inspection of all T&Ps should be completed before start of overhauling work. All safety norms are to be followed during overhaul. Contractor must ensure implementation of 'Safe work practices'. During overhaul contractor should exclusively nominate one safety supervisor who shall coordinate with BHEL on safety aspects.

13.2 All the personnel protective equipments (PPE's) are to be arranged by the themselves.

13.3 Contractor shall ensure safety to all his employees at site work. All the safety equipment as per requirement of the job shall be arranged to their workmen at site by contractor in order to avoid any accident failing which action will be taken against the contractor.

13.4 The total work area is to be cordoned off with proper printed tape etc. & all opening are to be properly barricaded. Proper earthing of the equipment must be ensured. All electrical Connections must be made with proper insulation and plug/socket arrangements. Due care is to be taken for safety & proper housekeeping.

13.5 If BHEL Engineer observes that the safety measures taken by the contractor are not as per requirement of the job, a lump sum amount of Rs. 5000/- will be levied as penalty with first warning and for subsequent failure of the contractor an amount of Rs. 20,000/- limited to max. 5% of the contract value will be levied as penalty. Further, in any case, BHEL will still hold the right to procure the required safety appliances at contractor's cost.

13.6 Agency shall follow all the norms of 5S, ISO and other safety rules (HSE) of BHEL.

14 MISCELLANEOUS :

14.1 Contractor shall depute their representative for necessary co-ordination, follow up and shifting/transportation of materials from and to work spot / workshop / stores etc. Day to day area cleaning and scrap removal & final area cleaning after completion of work to be done as directed by BHEL.

14.2 Any other work not mentioned but which is required for successful completion of work has to be done by the agency at free of cost.

14.3 No idle labour/over-run/de-mobilization/mobilization charges shall be paid in the event of any stoppage of work or the completion period getting extended for any reason.

14.4 The successful bidder shall not sub – contract work in part or whole without the written permission of BHEL and the bidder is solely responsible to the work awarded to the bidder. Any sub-contractor engaged by the contractors will need prior approval from the AGM, Test Bed, Block-1.

14.5 The agency shall observe the highest standard of ethics and shall not indulge or allow anybody else working in their organization to indulge in fraudulent activities during execution of the contract. The contractor shall immediately apprize the employer about any fraud or suspected fraud as soon as it comes to their notice.

14.6 Uttarakhand trade tax/works, as applicable shall be deducted from the running bill and deposited to the Uttarakhand trade tax authority.

14.7 Safe custody of dismantled parts shall be the responsibility of the agency. In the event of part being lost during the work, the cost of the parts shall be recovered from the agency.

14.8 Non mobilization of resources as per instruction of BHEL for above work shall be viewed seriously and suitable penalty may be deducted.

15 ARBITRATION :

15.1 In the event of any dispute or difference arising out of the execution of the Order/Contract or the respective rights and liabilities of the parties or in relation to interpretation of any provision between BHEL and service provider in any manner touching upon the order/contract, such dispute or difference shall (except as to any matters, the decision of which is specifically provided for therein) be referred to the arbitration of the person appointed by the competent authority of BHEL.

15.2 The venue or arbitration shall be at Haridwar.

16 JURIDICTION OF COURT:

Court at Haridwar shall have exclusive jurisdiction to decide the dispute, if any, arising out of or in respect of the contract(s) to which these conditions are applicable.

I/We agree with the above

Signature of Contractor with Seal

Issuing Officer

Annexure "F"

INFORMATION REGARDING REVERSE AUCTION

"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.
2. 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.
3. 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.
4. In case of reverse auction, BHEL will inform the bidders the details of Service Provider to enable them to contact & get trained.
5. Business rules like event date, time, bid decrement, extension etc. also will be communicated through service provider for compliance.
6. Bidders have to fax the Compliance form before start of Reverse auction. Without this, the bidder will not be eligible to participate in the event.
7. 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 Taxes and Duties, 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.
8. Reverse auction will be conducted on scheduled date & time.
9. At the end of Reverse Auction event, the lowest bidder value will be known on auction portal.
10. 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, as provided on case-to-case basis to Service provider within two working days of Auction without fail.
11. In case BHEL decides not to go for Reverse Auction procedure for this tender enquiry, the paper Price bids, already submitted and available with BHEL shall be opened as per BHEL's standard practice.

12. Bidders shall be required to read the "Terms and Conditions" section of the auctions site of Service provider for RA, 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.
13. 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.
14. The Bidder shall not divulge either his Bids or any other exclusive details of BHEL to any other party.
15. **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.**

I/We agree with the above

Issuing Officer

Signature of Contractor with Seal

Annexure 'E'

	उत्पाद मानक PRODUCT STANDARD	TG30006 पृष्ठ 9 का 1 Page 1 of 9

BASED ON OWN EXPERIENCE & FV100061

BALANCING OF BRUSHLESS EXCITER ROTORs

1.0 INTRODUCTION:

The description of the balancing process given herein refers to brushless exciter rotors. This rotor type belongs to the category of flexible rotors with one flexural mode within the operational speed range. The compensation of the unbalance is carried out in multi-correction planes.

In this case, not only the bearing vibrations are taken into account for balancing but also the vibration of the shaft. These shaft vibrations are measured by non-contact pick-ups in both directions horizontal and vertical.

All the measurements are taken at following balancing speeds:

- Operational speed (3000rpm)
- Near 1st Critical speed
- Low speed (below 1/3rd of the 1st Critical speed)

Measurements at low speed on the shaft representing the so-called shaft run out has to be subtracted from the measuring values taken at high speeds in order to get the dynamic component of the shaft vibration. The co-relation of the readings taken on the shaft and their components i.e shaft runout and vibration is depicted in figure here under:

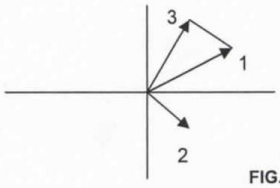


FIG. 1

Herein is :

1 = Total reading taken at high speed on the shaft.

2 = Shaft runout taken at low speed.

3 = Dynamic component of the shaft vibration.

It is recommended to carry out the balancing process in Cartesian components rather than in polar form. This recommendation refers to both the vibration measurements as well as the placement of balancing weights.
The rotor should be marked with a Cartesian coordinate system, the axes of which be named by "X" and "Y". In this way, a successive series of balancing measures can be taken by adding and removing weights in two components. Thus, only the groups of weights remaining in each correction plane should preferably be minimized to two. The total arrangement of correction planes is shown in Figure-2a & 2b.

				नाम NAME	दिनांक एवं हस्ताक्षर SIGNATURE & DATE
BL-1 (TB)	N S Rana				
TSX			अनुवादक TRANSLATED BY		
EMT	Vivek Kr.		निर्माणकर्ता WORKED BY	Anita Verma	14.12.15
QAX	BB Tripathi		जांचकर्ता CHECKED BY	S S Meena	14.12.15
सहमत विभाग AGREED DEPTT.	नाम NAME	दिनांक एवं हस्ताक्षर DATE & SIGNATURE	पर्यवेक्षणकर्ता SUPERVISED BY	Anupam Sharma	15/12/15
			स्वीकृति : APPROVED : A K Malhotra (AGM/EME)		22/12/15
REV.NO. 05	SUPERSEDES		निर्माण : PREPARED : EME	जारी : ISSUED : TSX	दिनांक : DATE : 22.09.1988
Dt. : 14.12.15					

2.0 MARKING OF THE ROTOR & READINGS IN COMPONENTS:

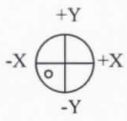
The rotor is marked with " X-Y" coordinate system so that :

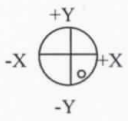
+ X aligns with 0 degree

+ Y aligns with 90 degree and so on

All readings during the balancing process are carried out in the components "X" and "Y" given below.The appropriate recording according to the figure is:

LEFT		RIGHT	
X	Y	X	Y
-30	+13	+15	-36





3.0 LOW SPEED BALANCING:

Low speed balancing is performed at speed where the dynamic behaviour of the rotor can be considered rigid at a speed less than 1/3rd of the first critical speed observed in the balancing facility.

The choice of the appropriate process greatly depends on the kind of balancing machine used.

In hard bearing machines the abc-mode shall be used which enables the unbalances in two selected planes to be directly indicated. The adjustment of the abc-mode is carried out according to Fig-2a & 2b.

If the compensating weights for the initial unbalance exceed 1/6th of the circumference of the balancing groove, the weight should be re-distributed to other planes.

The readings are taken in the components "X" and "Y" with the appropriate sensitivity factor "s" in terms of grams per div. The required no. of correction weights in the components "X" and "Y" are determined.

X = Scale divisions in "X" * s/p
Y = Scale divisions in "Y" * s/p

Where p = weight in grams of each balancing piece.

The same effect of the balancing move can also be achieved by removing weight pieces in the opposite axis of the component.

4.0 HIGH SPEED BALANCING:

With a hard bearing machine (OBI, Block-1 & OSBT Bl-3), high speed balancing should be done without the application of the so-called "additional stiffness".

As mentioned in Clause 1.0 above, three speeds are selected: operational, Near the 1st critical and low speed. Bearing vibrations are measured at high speeds. Readings on the shaft are taken at high speeds and at low speed.

The values taken at low speed (approx. 600rpm or 1/3rd of first critical, whichever is lower) on the shaft have to be subtracted from the values taken at higher speed.

5.0 EVALUATION OF ONE TYPE OF BALANCE CORRECTION:

At high speed, the determination of correction weights is always carried out by test weights. The principle of this evaluation is same for all different type of weight configuration.

The procedure follows the steps shown below: (See Fig-3)

Take a set of readings in "X-Y" components at various speeds and select an appropriate balancing speed (Preferably the rated speed or a speed close to the critical speed)

Draw a graph with the axes "X " and "Y" and mark the 1st measuring point with the current number of the last balancing move.

Place the test weight T in one of the axes "X" or "Y".

The subsequent reading at the same balancing speed is marked in the graph with the current number of the move.

Connect the two measuring points and indicate the direction by an arrow and by an appropriate number of pieces and the respective x-y axis of the test weight T.

Measure the length L of the connecting line.

Drop a perpendicular on to the (extended) connecting line and measure its length D.

Measure the distance E between the intersection and the point last measured.

Calculate the number of the required correction weights in each components as follows:

In the same axis as the test weight : T* E/L

Perpendicular to the test weight axis : T * D/L

Determine the appropriate "X-Y" components of the correction weight using a transparent "X-Y" coordinate system in the point last measured.

6.0 BALANCING WITH MORE THEN ONE WEIGHT TYPE:

The procedure shown in clause 5.0 above is confined exclusively to the evaluation of one correction weight type. It illustrates only the process. When balancing flexible rotors such as generators, exciters etc. the application of normally more than two different weight types can be mandatory. These various weight types may not be subsequently applied one after another but simultaneously.

The determination of correction weights can be done either "by hand" or with the assistance of mathematical methods. Hand balancing means the current vibration readings are depicted on vector diagrams. Each test weight will have associated with it an effect vector for each measuring point and each balancing speed. This results in a great amount of information which has to be simultaneously evaluated and manipulated. By iteration and compromise, a satisfactory approximation can be achieved which minimizes the vibration at rated speed as well as at the critical speeds.

Alternatively to manual balancing, the process can be carried out with the assistance of some computer programmes. This determination of balance correction weights is based on the so called influence coefficient method. A system of "2 x n" equations with "2 x z" unknowns, whereby :

n = number of balancing speeds times measuring locations.
z = number of balance weight types to be applied

can be reduced to a system of " 2 x z" equations with the appropriate number of unknowns introducing the optimizing constraint that the sum square of the residual vibrations be a minimum.

The solution can be optimized by introducing certain weighing factors. For the bearing vibrations whose order of magnitude is small, higher weighing factors are to be chosen.

The optimal selection of the weight types can be determined by some tentative calculations on the computer. A balancing move can be considered optimal if a significant improvement is achieved by a minimum of correcting weights.

The installation of correcting weights in the PMG exciter should be postponed to the end of the whole balancing process, if balancing plane available.

7.0 OVERSPEED TEST:

An overspeed test is conducted, as soon as the vibrations at operating speed are achieved in the range of balancing norms for flexible rotors, refer clause 8.0, at 1.2 times of the rated speed for two minutes for new rotors.

Overspeed testing should be interrupted immediately if bearing vibrations exceed 100 microns (p-p). Recommendations of balancing machine supplier should also be followed to interrupt the overspeed run for safety of balancing machine and rotor. (also refer clause 9.0)

The main purpose of this test is the anticipation of possible influence to which the rotor might be exposed during operation. By anticipating those influences before final balancing, significant changes in the state of balance during operation become less probable. The test can be carried out at any ambient temperature, also refer clause 9.0. At this stage, the vibrations and any possible changes occurring are no quality criteria for the rotor.

Before overspeed test, the location of balance weights should be marked. After overspeed test, a visual inspection of the rotor should be conducted. Any observed changes of the rotor should be immediately reported to the Engg department before further balancing of the rotor.

8.0 FINAL BALANCING & BALANCE QUALITY:

8.1 EXCITER ROTORS WITH CONFIGURATION AS SHOWN IN FIG-2a (Example: EXCITERS OF THRI/500/600MW TGs):

After overspeed test, further balancing would be continued till the vibration level comes within the specified limit. A couple of more runs shall be made to further improve the balance quality, which is determined in terms of maximum permissible residual vibrations.

The final results of balancing should be checked by taking measurements between 600 & 3000rpm at increments and decrements of 100 rpm.

The r.m.s. values of vibration severity in mm/s measured after balancing on the bearing should not exceed the following limits :

At 1st Critical speed : Approx. 1.5 mm/s

At Operational speed (3000rpm) : 0.3 mm/s

The shaft vibrations in terms of Peak to Peak amplitude in micron taken after balancing on the instrument slip rings shall not exceed 50 micron at operating speed and 150 micron at critical speed after the value taken at 600 rpm (approx.) have been subtracted from the values taken at higher speeds.

The values of residual unbalance, in g.mm, measured on the bearing pedestals should not exceed the limits according to balance class G2.5 as per ISO 1940 & ISO 11342 for flexible rotors on all speeds.

The value of the Residual Unbalance is specified below for Exciter rotors for 500/600MW TG ratings:

Total Residual Unbalance on each pedestal : 38197 g.mm *
(i.e. 0.6*2.5 * Rotor weight/(2*PI()*50))
(Weight of Exciter rotor & balancing shaft system for 500/600MW: 8000Kg)
*for any other exciter rotor, acceptable residual unbalance can be calculated according to rotor weight.

The acceptance shall be based on either the limits specified for Residual Unbalance or bearing vibrations of the Exciter rotor and shaft vibrations.

8.2 EXCITER ROTORS WITH CONFIGURATION AS SHOWN IN FIG-2b (Example: EXCITERS OF 660/700/800MW TGs):

After overspeed test, further fine balancing would be continued till the final vibration and residual unbalance level come within the specified limits. More balancing runs shall also be made to further improve the balance quality, which is determined in terms of maximum permissible vibrations & residual unbalance.

The final results of balancing should be checked by taking measurements between 600 & 3000rpm at increments and decrements of 100 rpm.

The r.m.s. values of vibration severity in mm/sec measured after balancing on the bearing should not exceed the following limits:

At 1st Critical speed : Approx. 1.5 mm/s

At operating speed : 0.622 mm/s

The values of residual unbalance, in g.mm, measured on the bearing pedestals should not exceed the limits according to balance class G2.5 as per ISO 1940 & ISO 11342 for flexible rotors on all speeds.

The value of the Residual Unbalance is specified below for Exciter rotors for 660/700/800MW TG ratings:

Total Residual Unbalance on each pedestal : 42017 g.mm
(i.e. 0.6*2.5 * Rotor weight/(2*PI()*50))
(Weight of Exciter rotor & balancing shaft system for 660/700/800MW: 8800Kg)

The shaft vibrations in terms of Peak to Peak amplitude in microns taken after balancing on the shaft near PMG Hub should be recorded for reference.

The acceptance shall be based on either the limits specified for Residual Unbalance or bearing vibrations of the Exciter rotor.

9.0 GENERAL INSTRUCTIONS:

1. The balance run should be tripped for all shaft probes installed at DE and NDE bearing pedestal in horizontal and vertical directions if

   - The overall shaft vibrations for all speed range exceeds 600 microns p-p.
   - The difference of overall (Sigma) and 1X shaft vibration for all speed range exceeds 300 microns p- p.

2. The measured air temperature at all four locations (outside diode wheels, armature and at top of both pedestals) should not exceed 65°C for all speed ranges.

3. The lube oil inlet temperature for bearings is recommended to be set between 35°C and 45°C. It should not exceed 55°C.

4. The bearing metal temperature should not exceed 90°C for all speed ranges.

10.0 CROSS REFERRED STANDARDS:

FV100061, ISO 1940, ISO 11342

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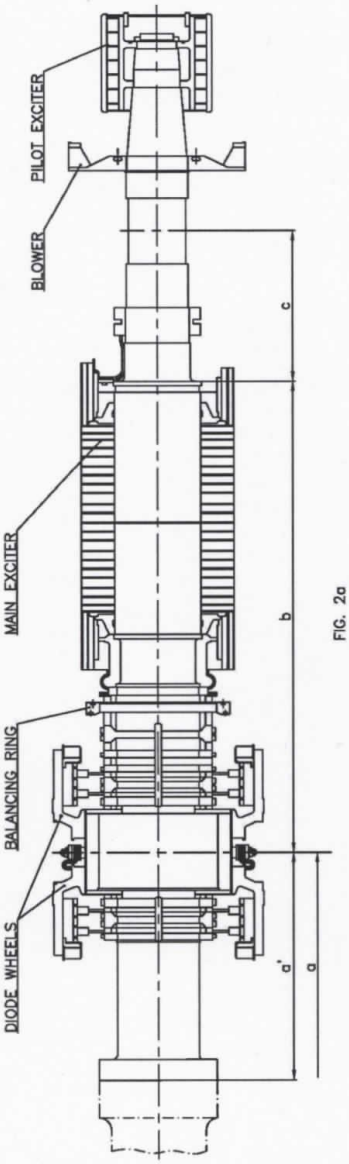

FIG. 2a

DATA OF EXCITERS

RATING	TYPE	REF. DRG. NO.	a'	b	c
500/600 MW	B.Ex. 70/90-30/6-20	3-143-09-01085	1050	2162	708
210 MW	B.Ex. 54/58-30/6-8	3-143-09-01037	1000	1593	477
250 MW	B.Ex. 70/62-30/6-10	3-143-09-01062	1050	1663	517
80 MW	B.Ex. 54/34-30/6-4	3-143-09-01051	300	1235	870

ARRANGEMENT OF CORRECTION PLANES & APPLICATION OF 'a b c' MODE

REV. NO. : 05

निर्माणकर्ता WORKED BY	Anita Verma	Anita	14/12/15
जांचकर्ता CHECKED BY	S S Meena		14.12.15

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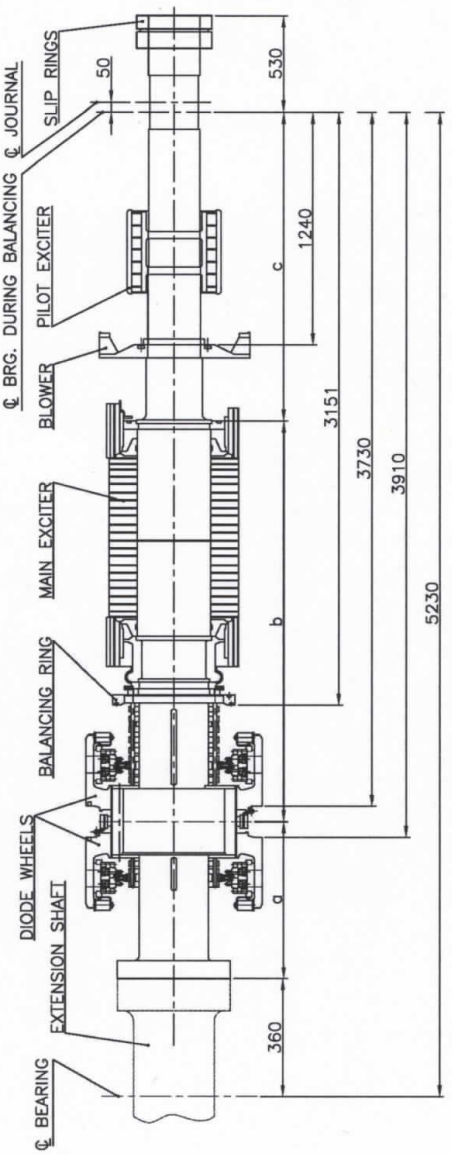

FIG. 2b

DATA OF EXCITER

RATING	TYPE	REF. DRG. NO.	a	b	c
660/700/800 MW	B.EX. 70/90-30/6-20N	0-143-09-01038	1050	2162	1658

ARRANGEMENT OF CORRECTION PLANES & APPLICATION OF 'a b c' MODE

REV. NO. : 05	निर्माणकर्ता WORKED BY	Anita Verma	14/12/15
	जांचकर्ता CHECKED BY	S S Meena	14.12.15

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METHOD OF COMPUTATION OF CORRECTION WEIGHTS

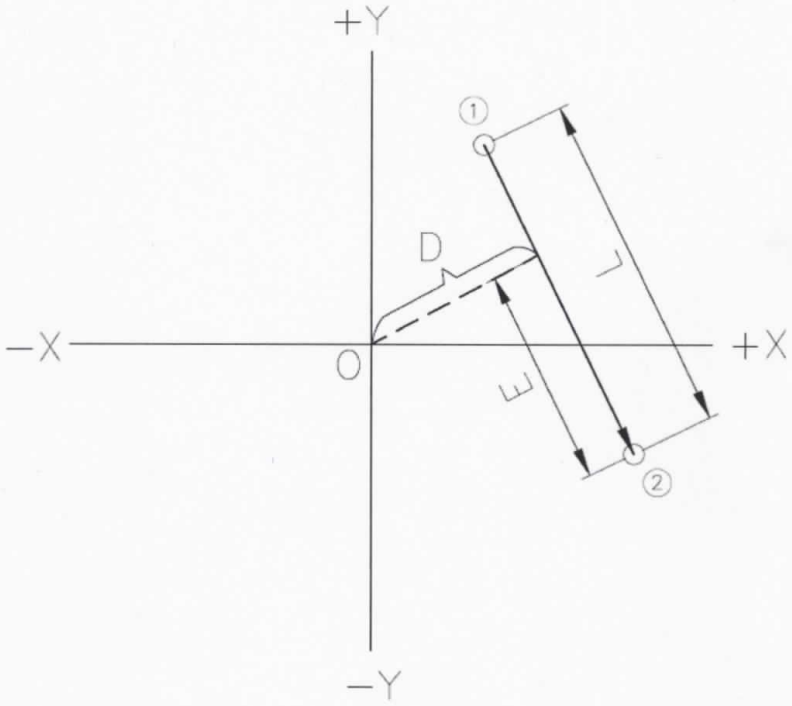

FIG. 3

REV. NO. : 05

निर्माणकर्ता WORKED BY	Anita Verma	Anita	14/12/15
जांचकर्ता CHECKED BY	S S Meena		14.12.15

उत्पाद मानक (हीप : हरिद्वार)

PRODUCT STANDARD (HEEP: HARIDWAR)

TG 30008

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BASED ON W 2333 OF KWU
DATED MAY 1989

BALANCING OF TG ROTOR TYPE THRI AND TARI

1.0 INTRODUCTION :

The balancing instructions described here apply to 2-pole generator rotor type THRI & TARI. Balancing of rotor may be carried on DJ 90 machine or DH 90 machine or any other machine. It is desirable to carry out balancing process in Cartesian components. Readings during balancing process are to be recorded preferably in X and Y components on the Vectormeter.

2.0 ALIGNMENT AND MARKING OF THE ROTOR :

The rotor is marked with a X-Y co-ordinate system so that the X-axis coincides with the neutral axis, the Y-axis with the pole axis. All balancing measures are carried out by respectively adding and removing weights in these components.

2.1 Alignment of TG Rotor with Balancing Machine: (Looking from Drive End)

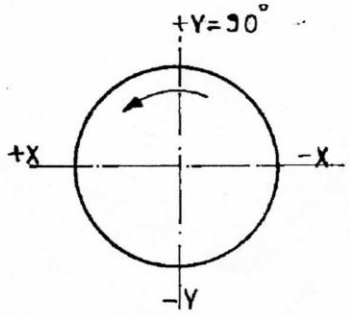
As shown in Figure 1;

+X aligns with 0 degree

+ Y aligns with 90 degree

- X aligns with 180 degree

- Y aligns with 270 degree



3.0 LOW SPEED BALANCING :

Low speed balancing is carried out in the two correction planes, preferably in the balancing grooves of the retaining rings at TE & EE. If the necessary balance corrections here are too large, the weights are to be appropriately distributed on the planes "EE core" & "TE core"(See Fig.1).

BL-I TESTING	S.K. BHARDWAJ			HIMANSHU S. RATHA	05.03.16
TUM (OSBT)	SHEESH RAM		अनुवादक TRANSLATED BY		
QAX	B.B. TRIPATHY		निर्माणकर्ता WORKED BY	SHIVANGI GUPTA	05.03.16
TSX	LALIT KUMAR		जाचकर्ता CHECKED BY	R.K. SHARMA	05.03.16
			पर्यवेक्षणकर्ता SUPERVISED BY	R.C. SHARMA	5.3.16

महमत विभाग AGREED DEPTT.	नाम NAME	दिनाक एवं हस्ताक्षर DATE & SIGNATURE			
SUPERSEDES			स्वीकृति APPROVED : A.K. MALHOTRA		Gr. NO. 6.00
REV.NO. 03			निर्माण PREPARED : EME	जारी ISSUED : TSX	दिनांक DATE : 11/11/1993
Dt. 05.03.16					
CHANGE ADVICE NO.	TGE-16-21	10.03.16			

सामग्री सूची संख्या INVENTORY NO. P-5805

As mentioned above, the correction weights necessary at low speed are indicated directly in the so called abc-mode. The setting of the abc-mode is carried out according to the rotor dimensions; whereby

a = distance between the TE bearing centre and the TE retaining ring groove.

b = distance between the TE and EE retaining ring grooves.

c = distance between the EE retaining groove and EE bearing centre.

r 1 = radius of the TE retaining ring groove.

r 2 = radius of the EE retaining ring groove

Low speed balancing is performed at a speed where the dynamic behavior of the rotor can be considered rigid i.e. at a speed less than 1/3 of the 1st critical speed observed in the balancing facility.

The readings are taken in the components X and Y with the appropriate sensitivity factor "S" in terms of grams per division. The required number of correction weights in the components X and Y are determined.

X : scale divisions in X*S / P
Y : scale divisions in Y*S / P
Whereby P = weight in grams per balancing piece.

4.0 HIGH SPEED BALANCING :

Balancing at high speeds is always carried out in hard bearings. In this respect, the balancing procedure in either of the balancing facilities DH 90, DJ 90 or any other machine is the same in principle. With DH-90, additional stiffness must not be switched on.

While attempting balancing of TG rotors, following fundamentals shall be considered.

- One examines the rotor response to certain test weights at certain selected speeds and rated speed.
- One attempts to find an appropriate combination of correction weights which will minimize the vibrations within the whole speed range.

The different weight types to be applied to the rotor are shown in Figure 2.

While the first two weight sets may not affect the state of balance achieved at low speed, this restriction does not apply to the further types of correction weights. It is therefore, preferable to use initially the V-weight set and/or the S-weight set before using the others. As a general rule, the state of balance achieved at low speed should be affected as little as possible.

The V-weight set distributed to 3 planes is specified by the weight element placed in the centre plane. The compensating weights for the outer planes can be calculated by the formulae given in figure 3 according to the rotor dimensions.

The S-weight set distributed to 4 planes is specified by the weight element placed in the TE Core plane. The complementing counter weight of the same magnitude is placed in the opposite direction in the EE core plane. This internal couple unbalance is compensated by an equivalent couple unbalance in the outer planes as shown in Figure 2. The compensating weights are calculated by the formulae given in figure 3.

The specification of V & S weight sets should always refer to the X-Y components though the actual weights have to be allocated to the S-T components of the oblique-angled co-ordinates shown in Figure 1.

Transformation formulae from the X-Y system to the S-T system and vice versa are given below;

With ε = angle between a row of bolts and the pole axis

$$S = (Y / \cos \varepsilon + X / \sin \varepsilon) / 2$$

$$T = (Y / \cos \varepsilon - X / \sin \varepsilon) / 2$$

$$X = (S - T) * \sin \varepsilon$$

$$Y = (S + T) * \cos \varepsilon$$

The transformation can also be performed by graphical method. An appropriate diagram is reproduced in Fig. 4-A which refers quantitatively to the THRI 108/44 generator rotor with $\varepsilon = 32°$ and Figure 4-B is applicable to TARI 93/38 TG rotor with $\varepsilon = 20.8°$.

The often necessary superimposition of a series of different correction weight types can be correctly carried out only by the consistent treatment of the problem in a X-Y system. The performance of the often complex determination of correction weights to be placed in more than two planes can be facilitated by the use of a computer.

A series of runs with the above mentioned test weights is carried out at selected speeds / near critical speed and at rated speed in order to determine the so-called influence coefficients.

5.0 EVALUATION OF ONE TYPE OF BALANCE CORRECTION :

At high speed, the determination of correction weights is carried out by trial weights. The principle of this evaluation is the same for all types of weight configuration (see fig. 2) and for all kinds of balancing machines.

The procedure follows the steps shown below (see Fig. 5):

- Take a set of readings in X-Y components at various speeds and select an appropriate balancing speed.
- Draw a graph with the axis X & Y and mark the 1st measuring point with the current number of the last balancing move.
- Place the test weight T in one of the axis X or Y (using experience gained on previous rotors, if possible).
- The subsequent reading at the same balancing speed is marked in the graph with the current number of the move.
- Connect the two measuring points and indicate the direction by an arrow and by the appropriate number of pieces and the respective X-Y axis of the weight T.
- Measures the length L of the connecting line. Drop a perpendicular on to the (extended) connecting line and measure its length D.
- Measure the distance E between the intersection and the point last measured.
- Calculate the number of the required correction weights in each components as follows:
  In the same axis as the test weight : T*E/L
  Perpendicular to the test weight axis : T*D/L
- Determine the appropriate X-Y components of the correction weight using a transparent X-Y coordinate system in the point last measured (see detail in Figure 5).

6.0 BALANCING WITH MORE THAN ONE WEIGHT TYPE :

The procedure shown in clause 5 is confined exclusively to the evaluation of one correction weight type. It illustrates only the process. When balancing flexible rotors such as generators, the application of normally more than two different weight types may be required. These various weight types preferably to be applied simultaneously to reduce balancing time.

The determination of correction weights can be done either by hand or with the assistance of mathematical methods. Hand balancing means the traditional way of evaluation. Each test

weight will have associated with it an effect vector for each measuring point and each balancing speed. This results in a great amount of information which has to be simultaneously evaluated and manipulated. By iteration and compromise, a satisfactory approximation can be achieved which minimizes the vibration at rated speed as well as at the critical speeds.

Alternatively to manual balancing, the process can be carried out with the assistance of some computer programmes. This determination of balance correction weights is based on the so-called influence coefficient method. A system of 2 x n equations with 2 x z unknown whereby;

n = no. of balancing speed times measuring locations.
z = no. of balance weight types to be applied.

can be reduced to a system of 2 x z equations with the appropriate number of unknowns introducing the optimizing constraint that the sum square of the residual vibrations be a minimum.

The solution can be optimized by introducing certain weighting factors for each criterion. By choosing suitable factors, the residual level of certain vibrations can be satisfactorily reduced in order to achieve a good compromise.

The optimal selection of the various weight types can be determined by some tentative calculations on the computer. A balancing move can be considered optimal if a significant improvement is achieved by a minimum of correction weights.

The weight allocation matrix to be applied to the Allocation programme is shown in Figure 6.

Balancing weights should be applied at correction planes between TE & EE bearing journals during balancing process. TE coupling balancing weights shall only be used in the end of balancing process, if necessary.

7.0 OVERSPEED TEST :

An over speed test is conducted as soon as a state of balance is achieved. As changes in the state of balance are expected due to the test, there is no use completing the balancing process before this test.

Rotors shall be overspeeded at 120% speed for two minutes. For repair rotors/re-balancing of TG rotors; overspeeding norms shall be separately intimated by TGE.

During the test, the operator attention should be concentrated on watching the process rather than being distracted by reading and recording vibration data.

At this stage, the vibrations and any possible changes occurring are no quality criteria for the rotor and, therefore, do not require documentation.

Before the balancing process can be continued, a visual inspection of the rotor should be conducted. Any observed changes of the rotor should be immediately reported.

8.0 FINAL BALANCING AND BALANCE QUALITY :

After overspeeding test, further balancing would be continued till the vibration level comes within the specified limit. A couple of more runs shall be made to further improve the balance quality. In principle, the quality can be established by two criteria;

a) In terms maximum permissible vibrations.
b) In terms of the maximum permissible residual unbalance.

The first criterion is verified by taking measurements of the vibrations in the whole speed range. Whereas, the second of the above mentioned criteria describes the balancing quality as a property of the rotor itself and however, the appropriate assessment is rather complex for the flexible rotors.

Therefore, a balancing process should never be stopped as soon as the residual vibration level just reaches or just passes slightly below the limits. One should go on balancing as long as adequate corrections can be made. The final result of balancing should be checked by measurements taken between 600 and 3000 rpm at increments and decrements, respectively of 100 rpm.

The RMS values of the vibration severity in terms of mm/s measured after balancing in air or vacuum should not exceed the following limits; (For DH 90 and DJ 90 pedestals only)

	THRI 108/44	TARI 93/38	TARI 115/52
At the,			
1st critical speed	Approx. 0.5 mm/sec	Approx. 0.5 mm/sec	Approx.0.5 mm/sec
2nd critical speed	Approx. 1.0 mm/sec	Approx. 1.0 mm/sec	Approx. 1.0 mm/sec
Rated speed	0.6 mm/sec	0.6 mm/sec	0.8 mm/sec

For balancing as per criteria (b) the value of residual unbalance, in g-mm, measured on the bearing pedestals should not exceed the limit according to balance class G2.5 as per ISO 1940 OR ISO 11342 for flexible rotors at all speeds. This is valid for all types of machines.

The value of the residual unbalance for TG rotors (50 Hz application) is specified below :

Total residual unbalance on rotor = 8 x wt. of rotor (in kg) – (g-mm)
(for G2.5 Class)

Permissible equivalent modal unbalance = 0.6 x residual unbalance on rotor

The value of unbalance measured at bearing location at first critical speed should not exceed 2.5 times the permissible modal unbalance value.

Example

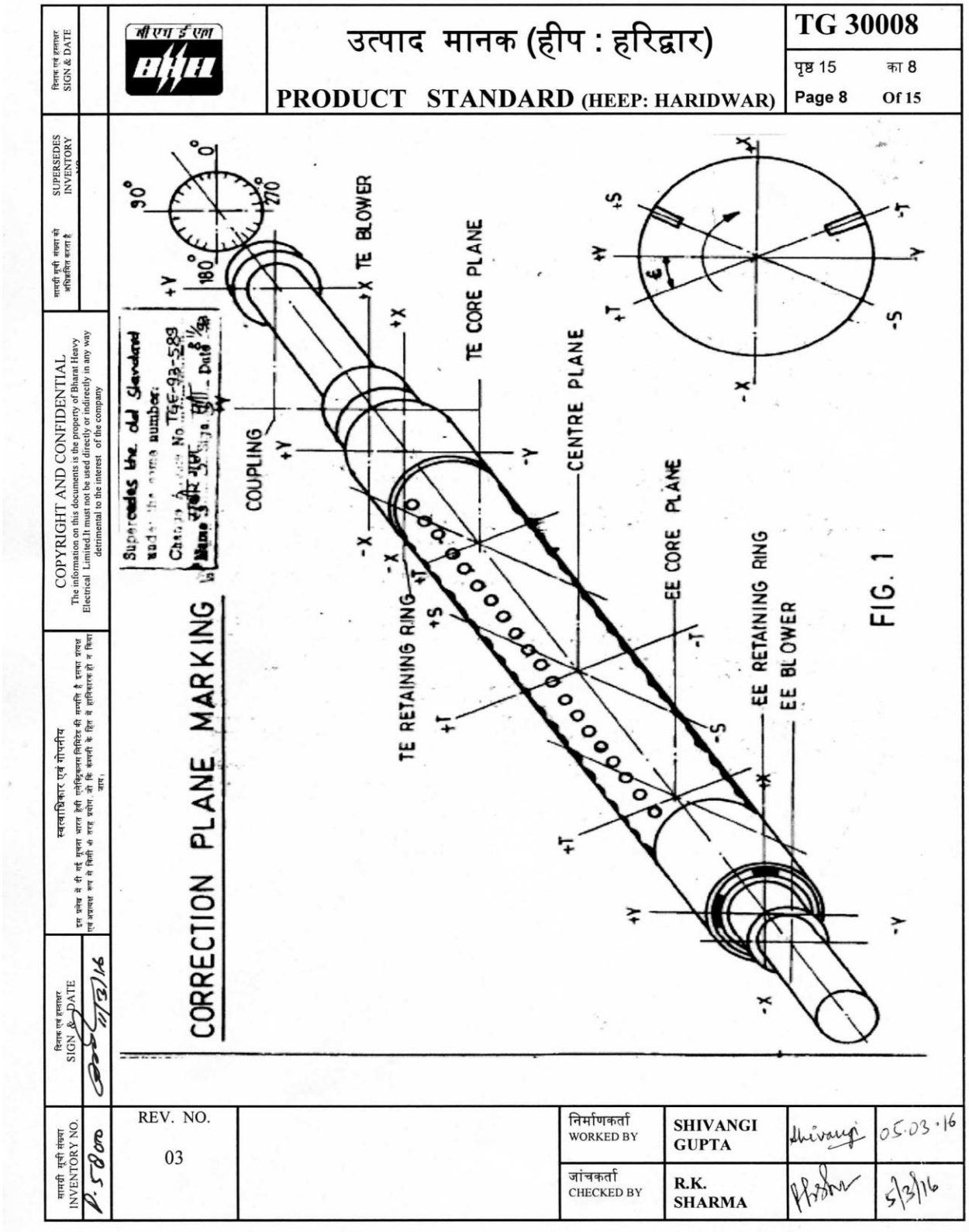
For THRI 108/40 rotor,

Wt. of rotor = 39877.5 kg
Total residual unbalance on rotor at operating speed 3000 rpm = 8 x 39877.5
= 319020 g-mm
Permissible equivalent first modal unbalance = 0.6 x 319020
= 191412 g-mm

FOR BALANCING IN VACUUM :

In case the balancing of the rotor is performed in vacuum, a 2nd run in air after final balance has to be made (duration 01 hour) taking measurements at 3000RPM in time intervals of 5 minutes. The rate of rise of speed should be a minimum 10 minutes, for speed rise from 0-3000 RPM. Expected difference between the beginning and end of this measurement is less than 3 mm/sec. The temperature of rotor shall be checked by contact thermometer at the end of air run on rotor core portion and it is expected to be 60-80^{0}C. This is carried out to ensure thermal stability of rotor and the vibration level must not change abnormally with respect to that observed in vacuum.

9.0 For electrical tests, refer standard TG-WIS-0678.


उत्पाद मानक (हीप : हरिद्वार)
PRODUCT STANDARD (HEEP: HARIDWAR)
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स्वत्वाधिकार एवं गोपनीय
CORRECTION PLANE MARKING
TE BLOWER
TE CORE PLANE
CENTRE PLANE
EE CORE PLANE
EE RETAINING RING
EE BLOWER
TE RETAINING RING
COUPLING
FIG. 1
REV. NO.
03
निर्माणकर्ता WORKED BY
SHIVANGI GUPTA
05.03.16
जांचकर्ता CHECKED BY
R.K. SHARMA
5/3/16

SUPERSEDES INVENTORY NO.

मानकी सूची संख्या को अधिक्रमित करता है

सामग्री सूची संख्या INVENTORY NO. PS 0808

हस्ताक्षर एवं दिनांक SIGN & DATE 11/3/16

हस्ताक्षर एवं दिनांक SIGN & DATE

भा एग ई एल BHEL

उत्पाद मानक (हीप : हरिद्वार)

PRODUCT STANDARD (HEEP: HARIDWAR)

TG 30008

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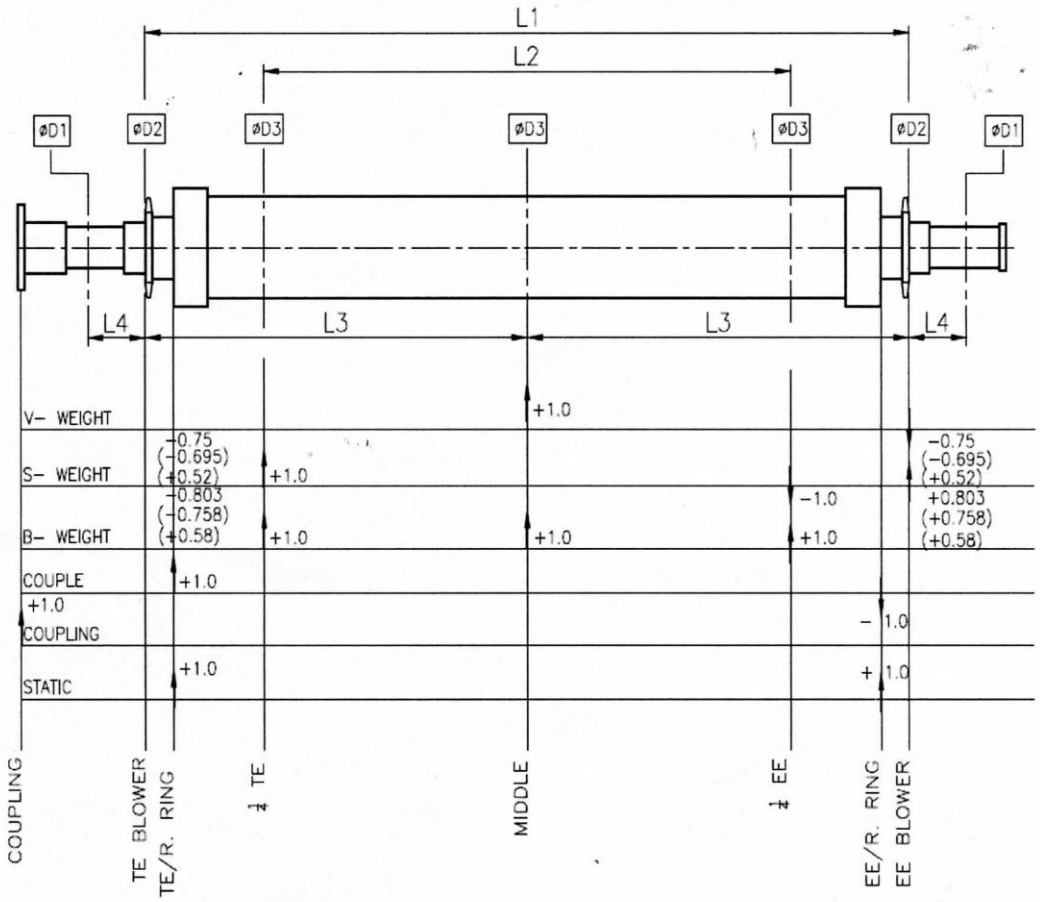


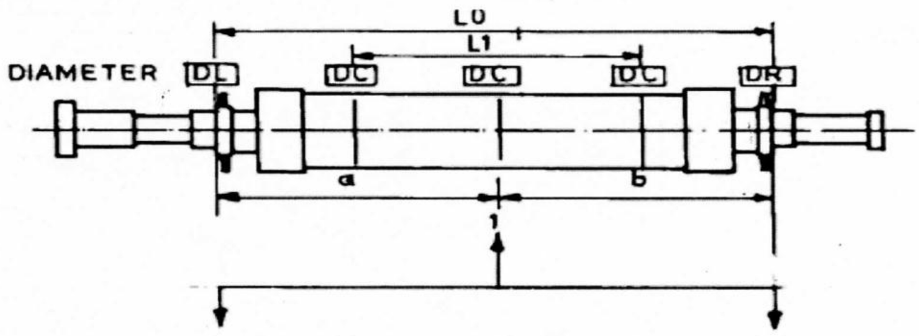
NOTE :–

1. FOR DETAILS OF DIAMETERS & LENGTHS (D1, D2 & L1, L2) SEE FIG 6.
2. BRACKETED VALUES FOR TARI–93/38

BALANCING WEIGHT SETS FOR THRI –108/44, TARI–93/38, TARI–115/52

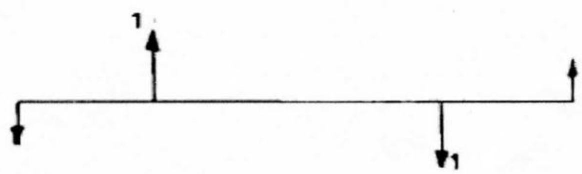
FIG. 2

REV. NO.		निर्माणकर्ता WORKED BY	SHIVANGI GUPTA	Shivangi	05.03.16
03		जांचकर्ता CHECKED BY	R.K. SHARMA		5/3/16



V-WEIGHT

COMPENSATION WEIGHT LEFT	= CENTRE WEIGHT × $\frac{DC \times b}{DL \times L0}$
COMPENSATION WEIGHT RIGHT	= CENTRE WEIGHT × $\frac{DC \times a}{DR \times L0}$



S WEIGHT

COMPENSATION WEIGHT LEFT	= CORE WEIGHT LEFT × $\frac{DC \times L1}{DL \times L0}$
COMPENSATION WEIGHT RIGHT	CORE WEIGHT LEFT × $\frac{DC \times L1}{DR \times L0}$

DETERMINATION OF COMPENSATION

FIG. 3

Change Advice No. TGE-99-588 Name ... Sign. ... Date ...

REV. NO.		निर्माणकर्ता WORKED BY	SHIVANGI GUPTA	Shivangi	05.03.16
03		जांचकर्ता CHECKED BY	R.K. SHARMA	[signature]	5/3/16

	उत्पाद मानक (हीप : हरिद्वार)	TG 30008	
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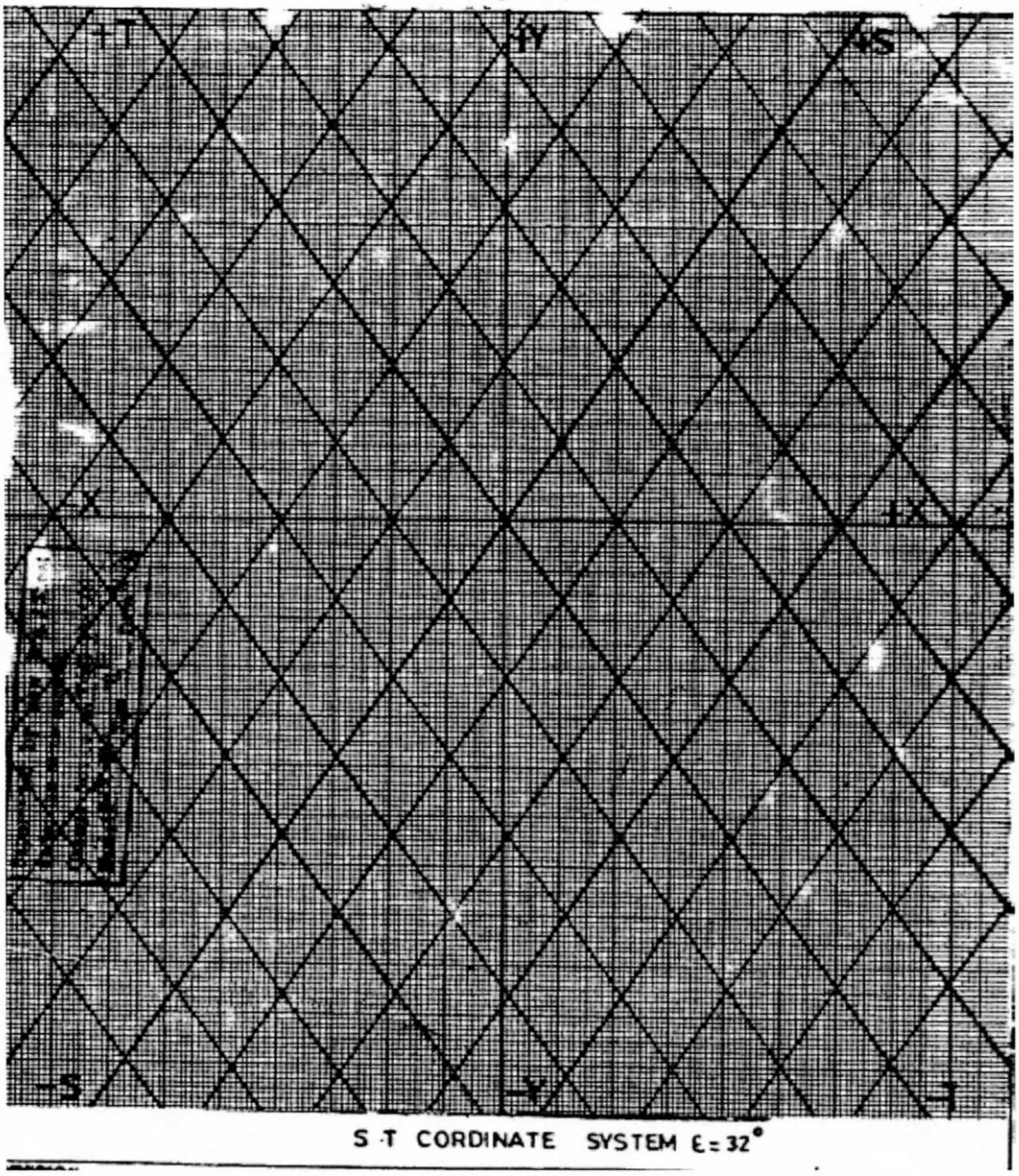
FIG. 4 (a)



S-T CORDINATE SYSTEM $\epsilon = 32^{\circ}$

REV. NO. 03		निर्माणकर्ता WORKED BY	SHIVANGI GUPTA	Shivangi	05.03.16
		जांचकर्ता CHECKED BY	R.K. SHARMA	R.K.Sharma	5/3/16

डिजाइन एवं हस्ताक्षर SIGN & DATE 11/3/16

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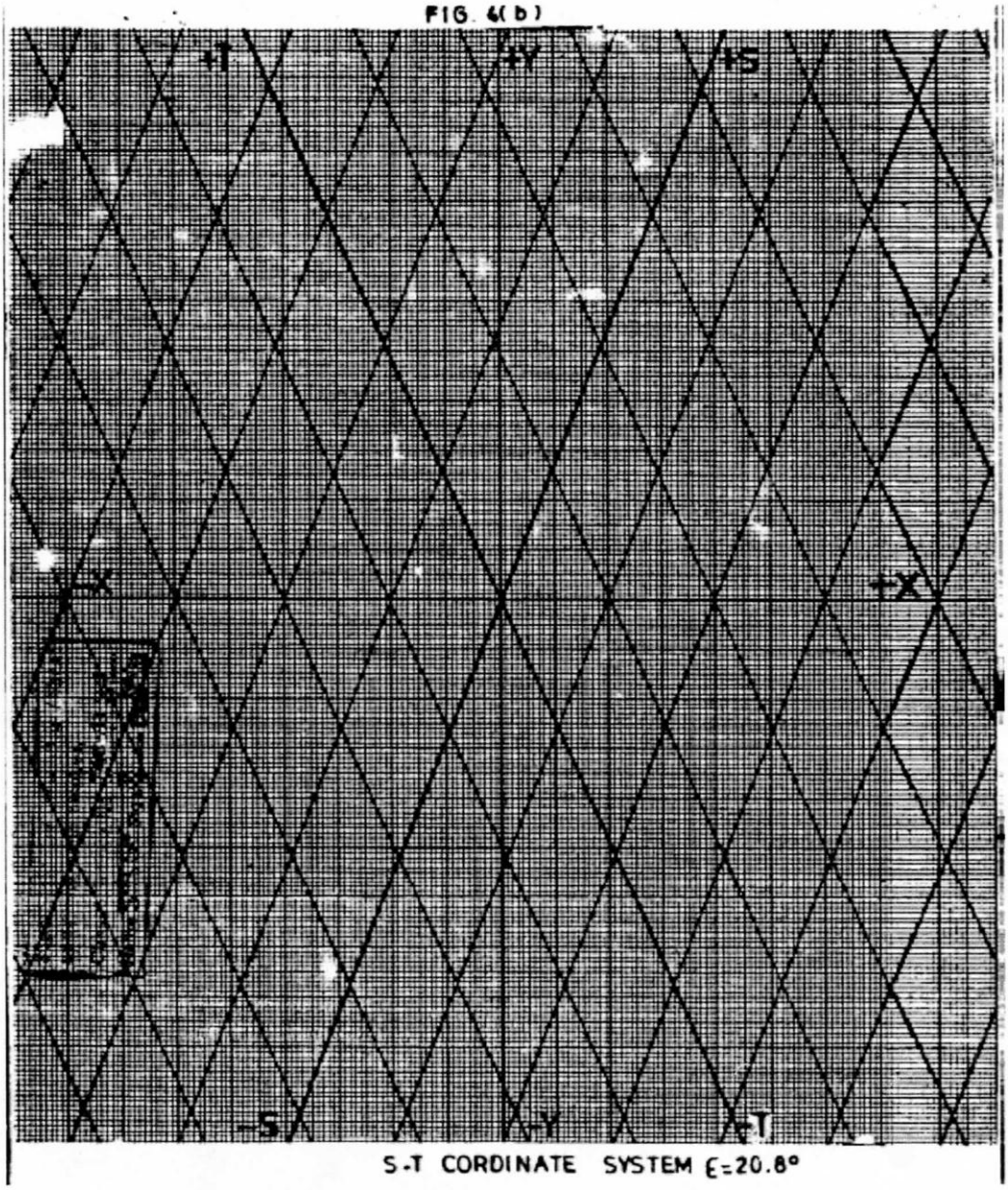
FIG. 4(b)



S-T CORDINATE SYSTEM ϵ=20.8°

सामग्री सूची संख्या INVENTORY NO.	REV. NO.		निर्माणकर्ता WORKED BY	SHIVANGI GUPTA	Shivangi	05.03.16
PR58000	03		जांचकर्ता CHECKED BY	R.K. SHARMA		5/3/16

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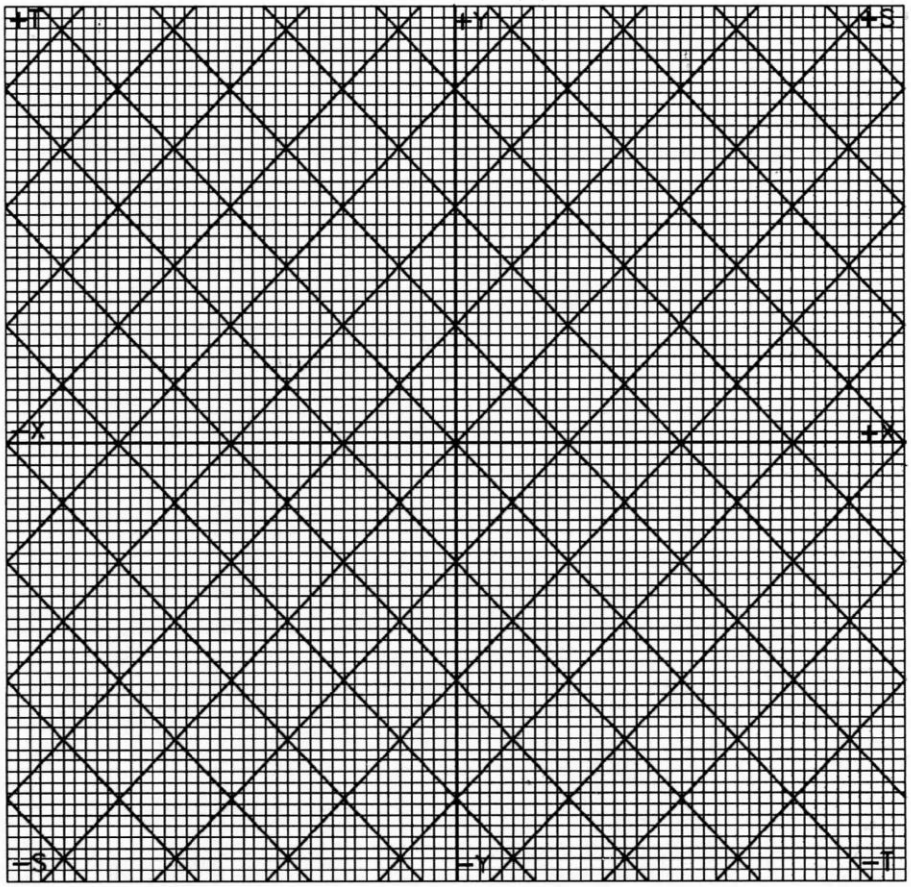
FIG. 6 (C)



S.T. CORDINATE SYSTEM ε=22.5°

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मानकी सूची संख्या INVENTORY NO.	PE50800	REV. NO. 03		निर्माणकर्ता WORKED BY	SHIVANGI GUPTA	Shivangi	05-03-16
				जांचकर्ता CHECKED BY	R.K. SHARMA	RKSharma	5/3/16

METHOD OF COMPUTATION OF CORRECTION WEIGHTS

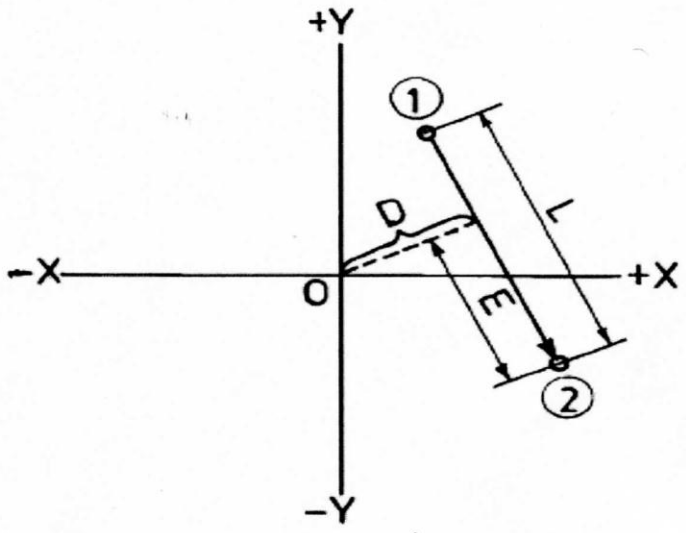

FIG -5

REV. NO. 03		निर्माणकर्ता WORKED BY	SHIVANGI GUPTA	Shivangi	05.03.16
		जांचकर्ता CHECKED BY	R.K. SHARMA	R.K. Sharma	5/3/16

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SUPERSEDES INVENTORY

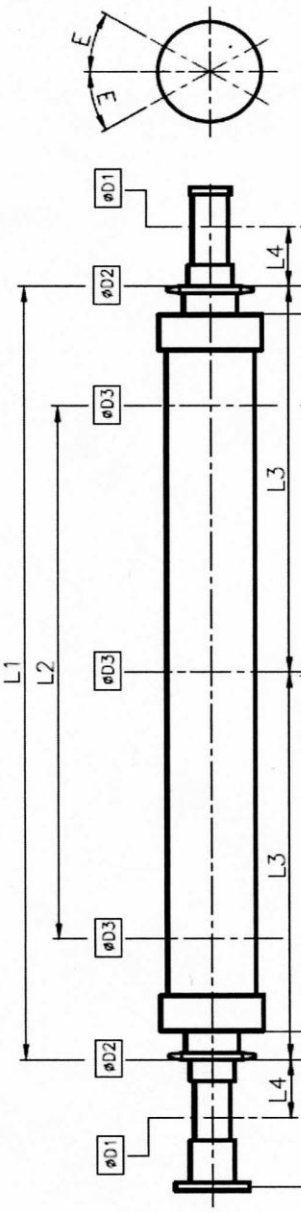
सामग्री सूची संख्या INVENTORY NO. 2-5800

दिनांक एवं हस्ताक्षर SIGN & DATE 11/3/16

दिनांक एवं हस्ताक्षर SIGN & DATE

REV. NO. 03

निर्माणकर्ता WORKED BY	SHIVANGI GUPTA	Shivangi 05.03.16
जांचकर्ता CHECKED BY	R.K. SHARMA	5/3/16



a	b	c	r1	r2	L1	L2	L3	L4	D1	D2	D3	E	Rotor type
1165	5540	1165	450.5	450.5	6430	3440	3215	720	390	634	952	32°	THRI 108/44
1005	5040	1005	390	390	5780	3150	2890	635	300	580	807	20.8°	TARI 93/38
1838	6624	1838	450	450	6624	3680	3312	1180	400	985	1028	22.5°	TARI 115/52

WEIGHT ALLOCATION MATRIX

FIG. 6

V WEIGHT						S WEIGHT				B WEIGHT	
0	0	+1.0	0	0	−0.75 (THRI 108/44) −0.695−93/38	0	−1.0	0	−0.803 (THRI 108/44) −0.758−93/38	0	0
0	0	+1.0	0	0	−0.803 (THRI 108/44) −0.758−93/38	0	−1.0	0	0	−1.0	0
0	0	+1.0	0	+1.0	0	0	0	+1.0	0	+1.0	0
0	0	0	+1.0	0	0	0	0	0	0	0	0
+1.0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	+1.0	0	0	0	0	+1.0	0	0	0
1	1	95	400	400	95	400	95	400	95	95	95
GRAMMES/PIECE						STATIC		COUPLING		COUPLE	