	BHARAT HEAVY ELECTRICAL LIMITED			Enquiry No. :	
	UNIT'S ADDRESS			Due Date :	
	UNIT'S PHONE NOS.			Supplier Qtn.	
	CONTACT PERSON'S NAME/DESIGN./PHONE NO./E-MAIL (FROM PURCHASE DEPTT.)			Date :	

3 - ROLL VERTICAL PYRAMID TYPE SECTIONAL BENDING MACHINE FOR BENDING OF COPPER BUSBARS OF TURBO GENERATOR

NOTE:-

1. Vendor(OEM) must submit complete information against clause no. 22.0 The offer meeting this clause would only be processed.
2. The "Offered" Column and where applicable, the "Deviations" & "Remarks" Column of this format shall be filled in by the Vendor and submitted along with the offer. Inadequate / incomplete, ambiguous, or unsustainable information against any of the clauses of the specifications/requirements shall be treated as non-
3. The offer and all documents enclosed with offer should be in English language only.

ADDRESS OF THE SUPPLIER :	ADDRESS OF THE INDIAN AGENTS :
TELEPHONE NOS.:	TELEPHONE NOS.:
FAX NOS.:	FAX NOS.:
E-MAIL ADDRESS :	E-MAIL ADDRESS :

SCOPE: Supply , Erection& Commissioning of 3 - ROLL VERTICAL PYRAMID TYPE SECTIONAL BENDING MACHINE for Sectional bending of copper bus bars of Turbo Generators complying with specification as below.

SL. NO	DESCRIPTION OF BHEL REQUIREMENT Specification No.S-EMT-251/00 Dt.25.06.2016	SPECIFY / TO BE CONFIRMED BY	OFFERED	DEVIATIONS	REMARKS
1.0	**PURPOSE :** 3- Roll Vertical Pyramid Type Sectional bending machine is required for Sectional bending of Annealed copper bus bars at desired radius into circular arc.				
2.0	**SCOPE OF SUPPLY :**				
	The scope of supply includes design, manufacturing, supply, erection, commissioning and proving of 3- Roll Vertical Pyramid Type Sectional bending machine at BHEL works.	Vendor			
3.0	**JOB DESCRIPTION AND TECHNICAL REQUIREMENT OF JOB :**				
3.1	**Job Description:**				
	1. Material : IS: 1897: 2008 , Gr."O"- Annealed Copper.	Vendor			

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	2. Cross - sectional area of Annealed copper bus bar to bend: Thickness : Minimum : 5 mm ; Maximum : 30 mm. Width : Minimum : 50; Maximum: 120 mm.	Vendor			
	3. Minimum bending Diameter : 1000 mm.	Vendor			
	4. Maximum bending Diameter :	Vendor			
	5. Section Modules (Max) : 50 cm^3.	Vendor			
	6. UTS shall be 210 Mpa and Yield Stress shall be 117 Mpa.	Vendor			
3.2	**TECHNICAL REQUIREMENT OF JOB :**				
	1. Type of the machine : Vertical Axis Pyramid Type	Vendor			
	2. No. of driven Rolls :	Vendor			
	3. Feed rate of copper bus bar (m/min)	Vendor			
3.3	**Electric motor:**				
	1.Type:	Vendor			
	2.Make : Siemens/ GE /ABB/ Bharat Bijlee or reputed Indian make acceptable to BHEL.	Vendor			
	3.Ouput in KW:	Vendor			
	4.Speed in R.P.M:	Vendor			
3.4	**Universal Rolls**				
	1.The machine should be supplied with adjustable universal roller set from high alloy, hardened tool steel as a standard equipment, able to bend cross sections specified at				
	2. Diameter of rolls :	Vendor			
	3. Rolls material Grade & Hardness : Material should confirm to C-45 / 42CrMo4 and hardness to be specified.	Vendor			
	4. Heat treatment of rolls : Quenched & Tempered.	Vendor			
	5. All rolls should be tested ultrasonically.	Vendor			
	6. All rolls are parallel /cambered /crowned.	Vendor			
	7. Speed of driving rollers in R.P.M.	Vendor			
	8. Surface finish of rolls :	Vendor			
	9. Surface finish of roll journals :	Vendor			
	10. **One set of drawings** for in-house manufacturing of the **bending dies** to be supplied alongwith the offer.				
3.5	**GEAR BOX**				

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	1. Make & Type :				
	2. Gear Ratio :				
	3. Temperature range :				
	4. Grease/oil :				
3.6	**BEARINGS**				
	SKF/FAG or equivalent reputed make acceptable to BHEL, self-aligning roller bearings and cylinder roller bearings shall be used in all journals.				
3.7	**CONSTRUCTION:**				
	1. The main frame should be of robust construction with well proportional members and reinforcement.	Vendor			
	2. The guide bar in the frame should be machined accurately for fitment and precise movement of adjustable roll with respect to the two fixed rolls which are power driven through heavy duty reduction Gear Box.	Vendor			
	3. The adjustable movement is power actuated and push button controlled.	Vendor			
	4. Hydraulic infinitely variable drive on all three rolls via Low speed hydraulic motors.	Vendor			
	5. Adjustable friction clutch for the fixed roll compensating for the difference in speed between the inner and outer circumference of the bent section.	Vendor			
	6. Hydraulic infinitely variable swing arm adjustment of the movable bending rolls.	Vendor			
	7. The control desk shall be connected through a flexible wires to the machine and can be moved to a convenient location for operator flexibility.	Vendor			
	8. Timer controlled forced lubrication system shall be provided to lubricate the main bushing of rolls and spur gears.	Vendor			
	9. The lubrication cycle time setting with respect to the main drive rotation shall be provided.	Vendor			
	10. Chassis grease shall be used for lubrication system.	Vendor			
	11. Suitable indication on console shall be provided to indicate low level of lubricant in lubrication pump for refilling the grease.	Vendor			
	12. suitable interlocks shall be provided to prevent reverse movement of rolls when rolls are moving in forward direction and vice-versa.	Vendor			
	13. Limit switches shall be provided to prevent over travel of adjustable roll.	Vendor			
	14. Electromagnetic brake shall be provided to stop the rotation of the roll at desired point.	Vendor			
	15. Mechanical overload protection shall be provided.	Vendor			
	16. Machine should be fitted out for **cold and hot** working condition.	Vendor			
4.0	**OPERATION AND CONTROL SYSTEM:**				
	1. Push Button shall be Pendent Push button Control	Vendor			

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	2. Pendent Push Button control for all functions shall be provided with operating Voltage of maximum 24 Volts.	Vendor			
	3. Electronic speed control by potentiometer in the pendent control box.	Vendor			
	4. Electronic speed control of all movements of the machine.	Vendor			
	5. Digital Read Out (DRO) is provided in the console to know the position of the adjustable roll with respect to the fixed rolls with in ± 1 mm.	Vendor			
	6. Emergency switch to be provided for the emergency stopping of the machine instantaneously.	Vendor			
5.0	**HYDRAULIC SYSTEM:**				
	All Hydraulic valves shall be of modular construction. All hydraulic operating components to be mounted on the manifold in convenient location for easy approach for Maintenance. Preferably outside the frame, behind and on side of the machine.	Vendor			
6.0	**AIR COMPRESSOR :**				
	As per the requirement of pneumatic systems provided in the Sectional bending machine, supplier should offer suitable air compressor if necessary for the operation of the machine.	Vendor			
7.0	**GENERAL ARRANGEMENT DRAWING :**				
	1. General arrangement drawing of the offered Machine indicating the constructional features and Technical Specification including Overall size and Weight, Total Power requirement etc. are to be furnished in the offer.	Vendor			
	2. General Arrangement Drawing in line with Sl. No.7.1, is to be submitted for BHEL approval within one month after placement of Purchase Order.	Vendor			
8.0	**OPERATIONAL & MAINTENANCE MANUAL :**				
	Operation and maintenance manual in English language, will be supplied along with the Sectional bending machine. **Qty:** Four sets in hard copies (with Ring binders and good quality paper) and one set soft copy in CD.	Vendor			
	In addition to other information, O&M Manual should contain the following also :	Vendor			
	1. Electrical schematic diagram.	Vendor			
	2. Hydraulic/Pneumatic circuit diagram.	Vendor			
	3. Wiring diagram indicating layout of cables, plugs, junction boxes, terminal strips etc.	Vendor			
	4. Detailed assembly drawings with clear markings of each component giving reference of manufactures for each assembly / sub-assembly.	Vendor			
	5. Operation & maintenance manual of machine.	Vendor			
	6. Operation & maintenance manual of all auxiliary systems/ equipment.	Vendor			

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	7. Spare parts list along with the drawing, specifications and address of the manufacturer.	Vendor			
9.0	**FOUNDATION PLAN :**				
	1. Foundation plan of the Sectional bending machine will be supplied by the supplier within one month from the date of issue of purchase order. The foundation will be prepared by BHEL under the supervision of supplier's representative if desired by the supplier.	Vendor			
	2. Foundation bolts, anchoring material and other items required for fixing of the Sectional bending machine on foundation will be supplied along with the machine. Specification details of grouting mortar required for the foundation of the machine, is to be furnished by the vendor.	Vendor			
10.0	**POWER SUPPLY AND ENVIRONMENT CONDITION :**				
	1. Power Supply: BHEL will provide input power supply 3 phase, 3 wire, 415 + / - 15% volt, 50 + / - 3% Hz to nearby Isolator switch (BHEL Scope). Cable connection from Isolator Switch to the Control Panel of Sectional bending machine and remaining cable / wire connection from control panel to the Sectional bending machine , will be in the Scope of the vendor. There will be no neutral wire and earthing will be provided through shop structure column.	Vendor			
	2. **Environment Conditions**: The Sectional bending machine shall be suitable for operation in tropical conditions with ambient temperature from 0 to 50 degree centigrade and relative humidity form 2 to 100%.	Vendor			
	3. **Noise Level**: Maximum noise level of Sectional bending machine should be 85 DB (A) at normal load condition, one meter away from the machine with correction factor for background noise, if necessary.	Vendor			
11.0	**ERECTION & COMMISSIONING OF SECTIONAL BENDING MACHINE :**				
	Supplier to take full responsibility for carrying out the erection, start up, testing of machine, it's control & all types of other supplied equipment , machining of test pieces etc. Service requirement like power, air & water shall be provided by BHEL at only one point to be indicated by supplier in their foundation/layout drawings. Other requirements like crane and helping personnel shall also be provided by BHEL. Details of these requirements should be informed by vendor in advance.	Vendor			
12.0	**PROVING OF SECTIONAL BENDING MACHINE:**				
	Proving of components at BHEL works by sectional bending of five nos.copper flats , will be carried out by the supplier as per attached Annexure-I and Spec.Sl.No.3. . All the required inputs are in the scope of vendor.	Vendor			
13.0	**OTHER ESSENTIAL ITEMS :**				
	Full description along with quantity and price of other items not covered at Sl. No 4.0 to 12.0 as above but are essential for the installation, commissioning and operation of the sectional bending machine, is to be mentioned specifically in the offer.	Vendor			

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14.0	**PAINTING :**				
	The Sectional bending machine will be painted to RAL 6011 Reseda green or as per BHEL option. **Note:** Supplier will repair the painting with the original paint in case the same is damaged in transit.	Vendor			
15.0	**SPARES:**				
	1. Set of spares indicating essential and optional on following categories, suitable for 2 years trouble free operation of the Sectional bending machine, is to be offered.	Vendor			
	a. Mechanical	Vendor			
	b. Electrical	Vendor			
	c. Electronics	Vendor			
	d. Pneumatic	Vendor			
	2. Detailed item wise-price list of the spares along with the name and address of suppliers for all bought out items to be offered against each of the above categories along with quantity recommended.	Vendor			
	3. Vendor will give offer validity of two years for the spares after erection & commissioning the Sectional bending machine at BHEL works.	Vendor			
16.0	**TRAINING:**				
	Training of two BHEL engineers at suppliers works for 3 days / mutually agreed period in the area of control in electrical/ electronics, operation, Hydraulic, mechanical/ pneumatic maintenance of the cold bending machine.	Vendor			
17.0	**PRE-ACCEPTANCE WITH TEST RUN AT VENDOR'S WORKS :**				
	1. Demonstration of all features of the machine, control system & accessories to the satisfaction of BHEL for efficient and effective use of the machine	Vendor			
	2. Pre-acceptance of Machine with test run will be witnessed by BHEL Engineers deputed for pre-dispatch Inspection at supplier's works. During pre-dispatch inspection, the supplier shall carry out the cold bending of minimum 3 nos. of copper flats as per attached Annexure-I and Spec.Sl.No.3. **Note:** Copper flats required as per attached **Annexure-A** and Spec.Sl.No.3 for Sectional bending , will be arranged by the supplier.	Vendor			
18.0	**GUARANTEE :**				
	Guarantee for complete Machine and its Controls for 24 months from the date of final acceptance of the Machine at BHEL works.	Vendor			
19.0	**QUALITY PLAN :**				
	Quality plan of the machine will be submitted to BHEL for approval within one month from the date of issue of purchase order.	Vendor			

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20.0	**PACKING :**				
	Sea worthy and rigid packing for all the items of the machine and other supplied items, to avoid any damage / loss in transit. All small and loose items like spares etc., should be suitably marked and properly packed in wooden boxes.	Vendor			
21.0	**GENERAL :**				
	1. Total connected load (KVA) / Input of the Machine:	Vendor			
	2. Floor area required (Length,Width,Height) for complete machine & accessories.	Vendor			
	3. Painting of Machine / Electrical Panels : RAL 6011 Reseda Green (Polyurethane paint)	Vendor			
	4. Total weight of the machine.	Vendor			
	5. Weight of the heaviest part of machine.	Vendor			
	6. Weight of the heaviest assembly / sub-assembly of the Machine.	Vendor			
	In addition all other features of the machine model and points agreed during clarification shall be in the scope of supply.	Vendor			
22.0	**QUALIFYING CONDITIONS :**				
	Only those vendors (OEMs), who have supplied and commissioned at least one **3- Roll Vertical Pyramid Type Sectional bending machine** or higher sizes for similar applications in the past ten years (on the date of opening of Tender) and referred machine is working satisfactorily for more than one year (on the date of opening of Tender) after commissioning, should quote. The following information should be submitted by the vendor about the companies where referred Machines have been supplied. The vendor to submit the P.O copy / performance certificate, from the companies where referred machines have been supplied. This is required for all the vendors for qualification of their offer.	Vendor			
	1. Name of the customer / company where referred Machine is installed.	Vendor			
	2. Complete postal address of the customer.	Vendor			
	3. Month and year of commissioning.	Vendor			
	4. Parameters of Machine(s) supplied and application for which the Machine is supplied.	Vendor			
	5. Name and designation of the contact person of the customer.	Vendor			
	6. Phone, FAX no. and email address of the contact person of the customer.	Vendor			
	7. Performance certificate from the customers regarding satisfactory performance of Machine supplied to them (Original certificate or Through E-mail directly from the customer)or P.O. Copy .The Original performance certificate may be returned after verification by BHEL, if required.	Vendor			

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	8. BHEL reserves the right to verify the information provided by vendor. In case the information provided by vendor is found to be false/incorrect, the offer shall be rejected.	Vendor			

Srinivasarao P
Sr. Engineer / EM-Tech

S. Naveen Kumar
Sr.Engineer / EM-Prodn.

M. Sharath,
Engineer / EM-M&S