

**HMT (International) Limited
HMT Bhavan,
59, Bellary Road,
Bangalore – 560 032**

INVITATION FOR EXPRESSION OF INTEREST (EOI)
FOR EMPANELMENT OF PROSPECTIVE VENDORS

HMT (International) Limited is a wholly owned subsidiary of HMT Limited having a name as leading exporter of Machine Tools and Industrial Machinery, Printing Machinery, Spares from the past few decades. HMT(I) strategically sources for its needs machines, equipment and other engineering goods its subsidiaries and other associate Indian manufacturers to provide a complete solution to the manufacturing industry and extend support for any type of requirements.

HMT(I) also offers a comprehensive package of consultancy of technical and engineering services from concept to commissioning on turnkey basis and has setup many Technical Training Centres, Vocational Training Centres, Information Technology Centres etc.

For reviewing the company profile, please visit our website <https://www.hmti.com>

In order to augment its ongoing business, “Expression of Interest” (EOI) is invited from reputed firms for onboarding onto HMT(I) vendor bases for procurement and supply of Machines, Equipment, and other Engineering Products falling outside the manufacturing range of HMT Machine Tools Limited, on requirement basis for Setting up of turnkey projects in the International market.

Reputed Firms, who are interested, are required to apply with relevant details and documents (only technical) on or before 13th April, 2026, 10.00 am by email as instructed in the EOI. Prospective Vendors are requested not to share the Hard Copies of the Technical proposals.

Email ID for submission of Technical Proposal as per EOI: enquiry@hmti.co.in

The covers are to be super-scribed as *“Details for Empanelment of Prospective Vendors for Procurement and Supply of Machines, Equipment and other Engineering Products on requirement basis.”*

The technically qualified vendors will be invited for further discussions/Presentations.

(Gowri Sankar P.)
Asst. General Manager (Products)

EXPRESSION OF INTEREST (EOI)

FOR

EMPANELMENT OF PROSPECTIVE VENDORS
OF MECHANICAL AND ELECTRICAL WORKSHOP
EQUIPMENT FOR SUPPLY TO INTERNATIONAL PROJECTS



HMT (International) Limited
Ministry of Heavy Industries
Government of India

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SECTION - 1

DISCLAIMER

1. The information contained in this Expression of Interest (EOI) document is provided to the Prospective Vendor, by or on behalf of HMT (International) Limited (HMT(I)) on the terms and conditions set out in this EOI document and all other terms and conditions subject to which such information is provided.
2. This invitation to EOI document does not purport to contain all the information that each Prospective Vendor may require.

This invitation to EOI document may not be appropriate for all persons, and it is not possible for HMT(I) to consider the business / investment objectives, financial situation and particular needs of each Prospective Vendor who reads or uses this invitation to EOI document.

Prospective Vendor should conduct his own investigations and analysis and should check the accuracy, reliability and completeness of the information in this invitation to EOI document and where necessary obtain independent advice from appropriate sources.

3. HMT(I) make no representation or warranty and shall incur no liability under any law, statute, rules or regulations as to the accuracy, reliability or completeness of the invitation to EOI document.
4. HMT(I) may at any time, in its absolute discretion, but without being under any obligation to do so, modify, amend or supplement the information in this invitation to EOI document.
5. The issue of this EOI does not imply that HMT(I) is bound to select and shortlist any or all the Prospective Vendor(s).

Even after selection of suitable Prospective Vendor(s), HMT(I) is not bound to proceed ahead with the participation in any or all business opportunities and in no case be responsible or liable for any commercial and consequential liabilities in any manner whatsoever.

6. The Prospective Vendor shall bear all costs associated with the preparation, technical discussion / presentation and submission of EOI.

HMT(I) shall in no case be responsible or liable for the costs regardless of the conduct or outcome of the EOI process.

7. Canvassing in any form by the Prospective Vendor or by any other agency on their behalf shall lead to disqualification of their proposals against this invitation to EOI.

SECTION - 2

TIMELINES OF EOI PROCESS & CONTACT DETAILS

1. TIMELINE OF EOI PROCESS

The schedule of activities of the EOI Process shall be as follows –

Sl. No.	Description	Date
1	Publishing of Notice for EOI document	02.04.2026
2	Last date of Submission of EOI response (HMT(I) reserves the right of extension of the date)	13.04.2026, 1000 Hrs
3	Opening of Bids received from Prospective Bids	13.04.2026, 1030 Hrs

2. CONTACT DETAILS:

All the correspondence / clarifications shall be marked to the following:

Name of Contact	Gowri Sankar P.	Vinayak Jayaprakash
Contact's Designation	Assistant General Manager	Deputy Manager (Products)
Organization Name & Address	HMT(International) Limited HMT Bhavan, #59, Bellary Road, Bangalore – 560032, Karnataka, India.	HMT(International) Limited HMT Bhavan, #59, Bellary Road, Bangalore – 560032, Karnataka, India.
Phone No.	+91 98400 69593	+91 99462 80854
Email ID for clarifications only	products@hmti.co.in	products@hmti.co.in

3. GUIDELINES FOR EOI SUBMISSION

The Prospective Vendor shall forward their documents as part of EOI, to the following e-mail ID:
enquiry@hmti.co.in

The subject of mail should mention ***“EMPANELMENT OF PROSPECTIVE VENDORS FOR INTERNATIONAL PROJECTS”***

SECTION – 3

ABOUT HMT(I)

HMT (International) Limited is a wholly owned subsidiary of HMT Limited having a name as leading exporter of Machine Tools and Industrial Machinery, Printing Machinery, Spares from the past few decades.

HMT(I), a Miniratna Company, Government of India Undertaking, an ISO 9001:2015 Company was established during the year 1974 to undertake exports of machines manufactured by HMT Machine Tools Limited. HMT(I) is a recipient of more than 50 export awards initiated by Engineering Export Promotion Council (EEPC), Government of India, Department of Industries and Commerce of various State Government and other agencies.

HMT(I) also offers a comprehensive package of consultancy of technical and engineering services from concept to commissioning on turnkey basis and it has setup many Technical Training Centres, Vocational Training Centres, Information Technology Centres and others through the Ministry of External Affairs, Government of India. Its track record includes prestigious projects in Algeria, Indonesia, Kenya, Malaysia, Mauritius, Tanzania, UAE, Maldives, Mongolia, Myanmar, Turkmenistan and many other countries.

HMT(I) strategically sources for its needs machines, equipment and other engineering goods its subsidiaries and other associate Indian manufacturers to provide a complete solution to the manufacturing industry and extend support for any type of requirements.

More details about the entire range of HMT(I)'s products and operations can be seen at www.hmti.com.

SECTION – 4

EOI

1. OBJECTIVE OF THIS NOTICE:

The objective of this Notice is to seek EOI from prospective Vendors who can Supply the required machines / equipment for Setup of Mechanical and Electrical Workshop.

The details of the requirement along with the technical specifications are as per Section – 5 and enclosure to EOI.

2. EXPECTATIONS FROM RESPONDENTS TO THIS NOTICE (AS PART OF EOI):

Vendors are expected to furnish the required technical documents through email provided in Section – 2.

- i. Organization Details
- ii. Details of Past Performance
- iii. Literature and Company Profile
- iv. Drawings
- v. Technical Data Sheet
- vi. Item by item Description
- vii. Technical and Performance characteristics
- viii. No Deviation Certificate
- ix. ISO Certificate
- x. Quality Assurance Certificate
- xi. Product Catalogue
- xii. Test Reports / External Lab Test Report
- xiii. Non-Blacklisting Declaration
- xiv. Audited Financial Statements for the last three years

All Prospective Vendors are required to only submit their technical documents in the email. Once HMT(I) shortlists the eligible vendors, item wise prices will be requested from the eligible vendors.

3. ELIGIBILITY CONDITIONS FOR PROSPECTIVE VENDOR

The Prospective Vendor can be Private, Public or Government owned legal entity.

The Prospective Vendor can be a manufacturer, Authorized Reseller, Trader etc. Please note eligible shortlisted Resellers and Traders will have to submit Manufacturer's Authorization Certificate.

EOI is floated for Mechanical and Electrical Workshop requirements as detailed in Section – 5 and the enclosure to EOI. The Prospective Vendors shall provide acceptance for the items for which they would like to be empanelled with HMT(I).

The Prospective Vendors shall empanel with HMT(I) for only reputed makes of machines / equipment requested in the EOI. The Prospective Vendors must indicate the make, model of the items while

submitting the documents. In case the Prospective Vendor participate in the EOI with make other than the make specified make, the Prospective Vendor has to provide the documentary evidence accordingly.

4. RESULT OF EOI:

Based on the data furnished, HMT(I) will shortlist the vendors for future/ firm enquiry.

5. INSTRUCTIONS

- i. A prospective vendor requiring any clarification to the EOI documents may notify the same through e-mail or by post at the address indicated in Section – 2 (products@hmti.co.in) of this EOI.

HMT(I) will respond to any request for clarification or modification of the EOI

Prospective Vendors are advised to regularly visit HMT(I)'s website for clarifications, modifications if any.

- ii. HMT(I) at their sole discretion may inspect the Vendor works / office / reference project sites etc. for the purpose of evaluation, if required. Any assistance / support required in this regard shall be extended by the Prospective Vendor.
- iii. Prospective Bidders are to submit their Technical Bids against the published EOI through email mentioned in Section-2 (enquiry@hmti.co.in).

Initially only Technical documents are to be submitted. No Prices are to be mentioned in the initial response to the EOI.

- iv. HMT(I) shall shortlist and empanel Prospective Vendors based on the technical documents submitted.
- v. Empanelled Vendors shall provide compliance / acceptance to Tender specific Terms and Conditions and submit the Price Bid as password protected file through email when requested.

HMT(I) shall be obtaining acceptance to the Terms and Conditions on a case-to-case basis as per the international tender / enquiry from the shortlisted Prospective vendors. In order to ensure price security and that vendors do not back out, Prospective L1 Vendor will have to submit an Offer Security for 5% of their quoted price.

- vi. Item-wise Evaluation shall be carried out by HMT(I) and the L1 price of each item shall be selected for submission of offer to the International enquiry / tender.
- vii. In case the L1 backs out, before submission of offer to the International Enquiry / Tender, HMT(I) shall request all empanelled vendors to resubmit fresh Price Bids.
- viii. In case HMT(I) receives the International Order on the quoted price based on L1 vendor's make and model, HMT(I) shall place the order on the selected empanelled vendor, and the vendor should ensure that the order is executed in the same executed price.
- ix. HMT(I) shall follow the Public Procurement Policies as applicable.

6. MISCELLANEOUS:

Right to accept or reject any or all Applications:

- i. Notwithstanding anything contained in this invitation to EOI, HMT(I) reserves the right to accept or reject any EOI and to annul the EOI Process and reject all EOIs at any time without any liability or any obligation for such acceptance, rejection or annulment and without assigning any reasons, thereof.
- ii. HMT(I) reserves the right to disqualify any Prospective Vendor during or after completion of EOI process, if it is found there was a material misrepresentation by any such Prospective Vendor or the Prospective Vendor fails to provide within the specified time, supplemental information sought by HMT(I).
- iii. HMT(I) reserves the right to verify all statements, information and documents submitted by the Prospective Vendor in the EOI. Any such verification or lack of such verification by HMT(I) shall not relieve the Prospective Vendor of his obligations or liabilities hereunder nor will it affect any rights of HMT(I).

7. GOVERNING LAWS & JURISDICTION:

The EOI process shall be governed by, and construed in accordance with, the laws of India and the Courts at Bengaluru, India shall have exclusive jurisdiction over all disputes arising under, pursuant to and / or in connection with this EOI process.

SECTION - 5

TECHNICAL DETAILS

SUPPLY, INSTALLATION, ERECTION & COMMISSIONING AND TRAINING ON THE USE AND MAINTENANCE OF MECHANICAL WORKSHOP EQUIPMENT				
Item. No.	Description of Goods	UoM	Total Qty.	Confirmation for empanelment with HMT(I) (Yes / No)
1	Electrical Hand Drilling Machines	No.	4	
2	Double-Ended Pedestal Mounted Grinding Machine	No.	1	
3	Power Hacksaw	No.	1	
4	Portable Diesel Welding Set	No.	1	
5	Portable Arc Welding Machine	No.	1	
6	Gas Welding Sets	No.	2	
7	Electrode Storage Oven	No.	1	
8	Portable Electrode Drying Oven	No.	1	
9	Pipe Bending Machine (Size: 12.5mm – 100mm)	No.	2	
10	Battery Operated Forklifter – 3T	No.	1	
11	Battery Operated Four-wheeled Platform Trolley – 2T	No.	1	
12	Hydraulic Platform – 1T capacity, adjustable upto 3m height	No.	1	
13	Workbenches, Lockers, Racks, Shelves and Dust-Proof Instrument Boards	Lot	1	
14	Hand Tools and Testing Instruments	Lot	1	
15	Hydraulic Traverse Jacks (Capacity 5T & 10T)	Lot	1	
16	Chain Pulley Blocks	Lot	1	
17	Tripod	No.	1	
18	Mandatory Spare Parts	Lot	1	
19	5Ton Electric Overhead Travelling (EOT) Crane	No.	1	

The Prospective Vendor is requested to refer to the Enclosure to the EOI for the detailed technical specifications of Machines / Equipment / Goods

SUPPLY, INSTALLATION, ERECTION & COMMISSIONING AND TRAINING ON THE USE AND MAINTENANCE OF ELECTRICAL WORKSHOP EQUIPMENT				
Item. No.	Description of Goods	UoM	Total Qty.	Confirmation for empanelment with HMT(I) (Yes / No)
1	Capacitance & Dissipation Factor Test Set	No.	1	
2	Portable Ultrasonic Flaw Detector	No.	1	
3	Handheld Vibration Meter	No.	2	
4	Magnetic Particle Testing Inspection Equipment	No.	1	
5	Micro-Ohm Meter (Digital)	No.	1	
6	Megger (Digital)	No.	2	
7	Tong Tester (Digital)	No.	2	
8	Multi-meter (Digital)	No.	3	
9	Tacho-Meter and Stroboscope (Digital) (2+1)	No.	3	
10	Earth Resistivity Tester (Digital)	No.	1	
11	Phase Sequence Indicator	No.	1	
12	Power & Instrument Transformer Analyser	No.	1	
13	Digital Portable Universal Bridge (LCR Meter)	No.	1	
14	Silica Gel Drying Oven	No.	1	
15	Laptop with Hardware & OS + Monochrome Laser Printer	Set	1	

The Prospective Vendor is requested to refer to the Enclosure to the EOI for the detailed technical specifications of Machines / Equipment / Goods

SECTION - 6

CHECK LIST FOR DOCUMENTS TO BE FORWARDED ALONG WITH EOI

Prospective Vendor should submit following documents along with their Proposal:

Sl. No.	Document Description	Format	Bidder's confirmation (Yes / No / Not Applicable)
1.	Organization Details	Annexure - 1	
2.	Details of Past Performance	Annexure - 2	
3.	Literature and Company Profile	-	
4.	Drawings	-	
5.	Technical Data Sheet	-	
6.	Item by item Description	-	
7.	Technical and Performance characteristics	-	
8.	No Deviation Certificate	-	
9.	ISO Certificate	-	
10.	Quality Assurance Certificate	-	
11.	Product Catalogue	-	
12.	Test Reports / External Lab Test Report	-	
13.	Non-Blacklisting Declaration	-	
14.	Audited Financial Statements for the last three years	-	

SECTION - 7

FORMATS

ANNEXURE – 1- GENERAL INFORMATION

Legal name of company	
Country of constitution:	
Year of constitution:	
legal address in country of constitution:	
Mobile Number of the Concerned Person:	
Email id of the Concerned Person:	
Name and address of the Banker	
<i>Willing to get registered as a Supplier in HMT(I)'s Vendor Base</i>	Yes / No
Attached are copies of original documents of i. Articles of Incorporation or Documents of Constitution, and documents of registration of the legal entity named above ii. PAN / GST Registration Certificate iii. MSME / UDHYAM Registration Certificate	

(Signature of Authorized Signatory)

Name:

Designation:

Address:

Date:

ANNEXURE – 2- PROFORMA FOR PREVIOUS EXPERIENCE

Date:

Prospective Vendor 's Legal Name:

Prospective Vendor should provide information of their executed projects

[illegible]

Signature:.....

Name:.....

Designation:.....

NOTE: A certificate from the customer should be enclosed to indicate that the contract was satisfactorily performed.

**ENCLOSURE TO EOI:
DETAILED TECHNICAL SPECIFICATIONS**

MECHANICAL WORKSHOP EQUIPMENT SPECIFICATIONS

MECHANICAL WORKSHOP EQUIPMENT

2.1 Scope of Works

Scope of work under this section covers the provision of labour, tools, plants, materials and performance of work necessary for the design, manufacture, quality assurance, quality control, shop assembly, shop testing, delivery at site, site storage and preservation, installation, commissioning, performance testing, acceptance testing, training of Employer's personnel, handing over to PHPA-II and guarantee for two years of mechanical workshop equipment, as per the specifications hereunder, each complete with all auxiliaries, accessories, spare parts and warranting a trouble free safe operation of the installation.

For the storage of the tools, testing devices and equipment, suitable number of lockers, racks, shelves and dust and moisture proof instrument boards shall be delivered and installed in the workshop.

The scope of work shall be a comprehensive functional system covering all supply and services including but not be limited to following:

2.1.1 Mechanical Workshop Equipment

- i) Four (4) nos. electrical hand drilling machine,
- ii) One (1) no. radial drilling machine
- iii) One (1) no. long lathe of bed length 2500 mm,
- iv) One (1) no. short lathe of bed length 1200 mm with copying attachment,
- v) One (1) no. universal milling machine,
- vi) One (1) no. double ended pedestal mounted grinding machine,
- vii) One (1) no. power hacksaw,
- viii) One (1) no. Portable diesel welding set,
- ix) One (1) no. Portable Arc welding machines,
- x) Two (2) nos. Gas welding,
- xi) One (1) no. electrode storage oven & One (1) no. Portable electrode drying oven,
- xii) Two (2) nos. pipe bending machines, (size 12.5 mm to 100 mm),
- xiii) One (1) no. battery operated fork lifter of 3T,
- xiv) One (1) no. battery operated four wheeled platform trolley (2T),
- xv) One (1) no. Hydraulic platform of 1T with provision up to 3m height,

Workbenches, lockers. Racks, shelves and dust proof instrument boards for storing of the tools and testing instruments,

- One (1) lot of hand tools and testing instruments,

- xviii) Hydraulic transverse Jacks (Capacity 5T & 10T)
- xix) Chain Pulley blocks
- xx) One (1) no. Tripod
- xxi) Spare parts in accordance to clause 2.8 "spare Parts" of this section,
- xxii) 5 MT EOT crane

Any other item(s) not mentioned specifically but necessary for the satisfactory completion of scope of work defined above, as per accepted standard(s) /best international practices.

- 2.1.2 The scope shall include all components of equipment and auxiliaries which are required for satisfactory operation even though not individually or specifically stated in these specifications. Any item of supply not explicitly listed but otherwise implied by the contents of the specifications or essential for smooth operation of the equipment shall be construed as forming part of the supply and no additional charges shall be payable for the same. All specifications and capacities of various machine tools stated herein could be modified to the nearest or higher sizes and type available and as per manufactures practice these shall be based on the applicable IS or equivalent standard.
- 2.1.3 The scope of supply shall also include all special tools tackles, devices & sling, which are specially made and / or required for complete installation, dismantling, adjustment and maintenance of all equipment.
- 2.1.4 All lubricants, grease and coolants in sufficient quantity with 10% extra shall also be supplied for meeting the needs of various machines and equipment for at least one year period after commissioning of the same. The scope of supply shall include all mandatory spares sufficient for normal operation of equipment for 5 years. The list of such spares shall be mentioned in schedule of mandatory spare parts annexure-IV.
- 2.1.5 However, if the bidder feels that certain additional spares/ devices are required, he may give his recommendations separately in optional spare parts schedule and state each device, item, etc. The mandatory/recommended spares/devices shall be of same material, dimension, workmanship & finish as that of the original.

2.2 Rating and Functional Characteristics

Unless otherwise stated, rating, characteristics, test and test procedures, etc. of the workshop equipment shall comply with the provisions and requirements of the latest applicable International/Indian Standards.

2.3 Performance Guarantee

The mechanical workshop equipment along with all auxiliaries and accessories shall be capable of performing intended duties under specified conditions. The Contractor shall guarantee the reliability and performance of the individual equipment as well as of the complete system.

2.4 Power Supply

- 2.4.1 415 Volts, 3 phase, 4 wire, 50 Hz, grounded neutral A.C. supply shall be made available at the power station by the purchaser. This supply is subjected to following variations:

A.C. Voltage	:	$\pm 10\%$
Frequency	:	-5% to +3 %
Voltage & Frequency values	:	Any combination of the above values

- 2.4.2 Cables for 415 volts, 3 Phase, 4 wires, 50 Hz, grounded neutral A.C. supply will be made available by the project authority up to the main distribution board in the mechanical workshop. The scope of supply starts for the bidder from the main electric distribution board which shall be part of supply, and will further provide all power sources necessary for the workshop area. The bidder will supply all cubicles, switchgear including cables, cable racks/conduits as required. All the cables shall confirm to the relevant applicable standards and shall be Fire Retardant Low Smoke (FRLS) with stranded copper conductor.

- 2.4.3 A.C. switchgear shall be indoor, dust and water-proof with vermin protection, metal clad, air insulating, floor mounting type. A.C. Switchgear complete with two incoming, three phase, 0.415 KV circuit breakers (connected with the power supply from 415V LT switchgears), and requisite number of outgoing 0.415 / 0.240 KV MCCB's according to the number of Machine tools / work benches shall be provided. The switchgear shall be complete with necessary protection against electrical shock and fitted with earth leakage circuit breaker. The bidder's scope covers the power wiring and fixing of outlets up to the devices / bidder tools.

- 2.4.4 The bidder shall indicate the estimated AC power requirements for the equipment covered by these specifications in the bid.

2.5 Design and Construction

2.5.1 Standards

The system and equipment shall be designed, built, tested and installed to the latest revisions of the applicable standards. In the event of other standards being applicable they will be compared for specific

requirement and specifically approved during detailed engineering for the purpose:

2.5.2 Drilling Machine

2.5.2.1 Electrical Hand Drilling Machine

Each drilling machine shall have drilling capacity of 20 mm in steel. The drilling shall have overload protection and speed control. Each drilling machine shall be supplied along with one (1) set of HSS drills of best quality covering the whole drilling range.

Weight of the machine shall not be more than 5 kgs.

2.5.5 Double Ended Pedestal Mounted Grinding Machine

The double ended, heavy duty grinding machine shall be capable of grinding, turning tools and drills made of H.S.S., carbide, alloys and for general purpose grinding work. The machine shall be provided with IS approved motors. The grinder shall be provided with dust exhaust equipment for dry grinding operation. The dust exhaust unit shall consist of motor driven suction fan and dust collection and the dust so formed

from wheel head shall be collected by dust collection unit through flexible hose pipe attached to the wheel guard on one side only and coolant pump piping and through for wet grinding on another wheel. The main dimensions and characteristics of the machine shall be generally as specified below, but marginal variation will be acceptable at the discretion of the purchaser.

- Number of grinding wheels & diameter (mm)	2 Nos. of 350 mm diameter
- Distance between machine foot and spindle axis (mm)	915
- Distance between wheel centre to centre	630
- Smallest dia of spindle (mm)	38
- Spindle speed (rpm)	1600

Accessories

- Spare protection for dry grinders (both wheels)	1 set
- Work light	1 set
- Spare wheels	
• Rough	2 sets
• Fine	2 sets
- Grinding wheel dresser	1 set
- To make grinding wheel to come to its original spare	
- Maintenance tools	1 set
- Wet grinding attachment at one end	1 set
- Standard spare parts	1 set

2.5.6 Power Hacksaw

Power hacksaw shall be suitable for operation with 415V $\pm$ 10%, 50Hz (-5% to +3%) power supply with following particulars:

Cutting capacity:

i)	Round section (mm)	300
ii)	Rectangular section (mm)	250x250
iii)	Stroke per minute	60 to 100

The following standard accessories shall be provided with the hacksaw:

- One (1), coolant tank (with chips separator),
- One (1) set of electrically driven coolant Pump with motor and coolant piping and nozzle.
- Fifty (50) power blades extra

- d) One (1) adjustable bar rest,
- e) One (1) V shape vice jaws to cut material in bundle,
- f) Emergency stop push button.

2.5.7 Welding Set

2.5.7.1 Portable Diesel Welding Set

The wheel mounted directly coupled to diesel engine with necessary flywheel, 300 Amp generator welding set shall be supplied with all the necessary accessories required for the manual start of engine by hand. The current of the welding generator can be adjusted by a regulator mounted on the set. The diesel tank mounted on the set shall have sufficient capacity for the 8 hours operation of the set. The generator winding shall be of standard quality and "F"-class insulation.

There shall inbuilt provision for the cooling of engine and generator. All the components used for the assembly of set shall conform to respective ISS. The flywheels shall be guarded by necessary wire mesh. The maneuver ring of set shall be suitably designed.

The engine and generator shall be painted with high quality gray paint.

Necessary accessories with the welding set

Number units	1 no.
--------------	-------

- a) Welding screen with 1 no. additional goggle
- b) Welding electrodes holder with 5 mts. Long 300 Amp

Welding cable lead & 1 no. spare

- c) Chip pine hammer 1 no.
- d) Welder hand glove pair
- e) One set of maintenance tool such as spanner set, etc.
- f) Wire brush 1 no.
- g) Starting handle to engine 1 no.

2.5.7.2 Portable Arc Welding Set (Pin type)

The welding transformer shall be of pin, regulator taps, oil type and housed in steel tank with heavy wound primary and secondary coils. The coils shall be made of pure copper. The transformer shall be provided with variable choke for current control and manufactured in accordance with (IS:1851). The transformer shall be suitable to operate on 400/440V, 50 cycle A.C. supply. The transformer shall be mounted on four rubber wheels and handle for easy mobility inside the power house.

The transformer shall have the following specification but marginal variation will be acceptable at the discretion of the purchaser.

No. of units	1 no.
Welding current regulator taps	7 nos.
Max. Output (amp)	350
Max. Continuous hand welding current at 60% duty cycle (Amp)	300
Welding current at 100% duty cycle (Amp)	180
Min. Hand welding current (Amp)	50
Max. /Min. Electrode size (SWG)	6/14
Open circuit voltage (Volt)	65
Max. Welding voltage (Volt)	34
Min. Welding voltage (Volt)	22
Insulation class	A

Accessories

-	Copper welding cable conforming to IS:9857, 30 mts length	2 Nos.
-	Earthing clamps	2 Nos.
-	Wire brush SS 5 rows	2 Nos.
-	Chipping hammer	1 No.
-	Spare lenses, plain and dark each	20 Nos.
-	Hand gloves	3 Pairs
-	Armor head screen	1 No.
-	Head screen	1 No.

2.5.7.3 OXY – Acetylene Gas Welding Equipment

The gas welding equipment shall be used for welding and cutting with acetylene/oxygen gas. The main dimensions and characteristics of the set shall be generally as specified below but marginal variation will be acceptable at the discretion of the purchaser.

Number of units	2 sets
- Oxygen cylinder of standard size (gas filled)	1 no.
- Double stage gas regulator with two gauge	2 nos.
- Acetylene cylinder of standard size	1 no.
- Double stage gas regulator with two gauge	2 nos.
- Wheel cart for carrying standard size two gas cylinders	1 no.

Accessories

- Standard spare parts	1 Set
- Standard operation and maintenance tools	1 Set
- Gas hose with hose clamps	50m
- Welding torch complete with assorted welding head, welding range (mm)	0.5 To 30
- Cutting head, assorted for cutting range (mm)	3 To 100
- Welding chipping hammer	1 Set
- Welding armour head screen	1 No.
- Welding armour head screen (as per IS:1179)	1 No.
- Chipping brush with 5 rows of SS wire	2 Nos.

2.5.7.4 Electrode ovens

The electrode storage oven and portable electrode drying oven shall be suitable for remoisturizing and heating the welding electrodes at a pre-specific temperature. It shall be robust in construction and designed to meet the stringent demand of continuous operation.

Oven bodies

The CRGA sheet of size not less than 18 SWG used for manufacturing of the oven shall be of best quality. The oven body shall ensure the

minimum heat loss due to convection. The inner medium (i.e. between inner and outer wall of the oven shall be reinforced with heat insulant material such as glass wool/mineral wool etc. the door shall be of turntable hinges construction with a provision of heat insulation sealing washer which shall ensure no heat loss and have tendency auto closer.

Heating element and their control

The heater element shall be of nichrome wire filament material. This shall be arrangement such a way so as to avoid localized heating and hot spot in the oven. The construction of oven shall be such that each element shall be accessible easily and can be changed without requiring any special tool.

To maintain the temperature inside the oven, the heating element shall cut off automatically at pre-specified temperature by means of thermostatic control. The range of temperature shall be adjustable with the knob control mounted outside the oven. Provision of indicating lamps shall be made. All controls, supply leads, protective equipment shall be in the scope of supply.

General technical requirement

1)	No. of unit Operating voltage Capacity	1 no. each AC 230V 50 Hz 3kW for electrode storage oven
2)		1kW portable electrode drying oven
3)	Control	50-400 deg. C thermostat for portable electrode drying oven (coil & rod type)
4)	No. of sleeves	3 for electrode storage/one for drying oven
5)	Indicating lamps	Red and green
6)	Capacity	30 Kg for electrode storage oven/10 kg for drying oven
7)	No. of unit	1 no. (each type used)

2.5.8 Pipe Bending Machine

Pipe bending machine shall be hydraulic hand operated type for bending of mild steel pipes of dimensions 12.5 mm to 100 mm with bending guides of different sizes covering whole range and complete in all respect.

2.5.9 Battery Operated Fork Lifter

One battery operated fork lifter of 3 ton capacity for use inside the powerhouse along with drum handling and crane arm attachments. The Battery operated fork lifter will be as per IS:10517 and other relevant applicable latest BIS standards for accessories including Battery & Battery Charger.

S.No.	Capacity	3000 Kg minimum
1.	Power source	Electric with Power Steering
2.	Battery and Charger	Suitable Battery of reputed make with test certificate and battery charger
3.	Drive Motors	AC motors with manufacturer's test certificate
4.	Mast Type	Suitable to have free lift of 1000 mm or more
5.	Maximum Fork Height (MFH)	3000mm
6.	Features	Lights package (head/tail/brake/side indicator, reverse), reverse horn and rear view mirror)

2.5.10 Battery Operated Four Wheeled Platform Trolley

Platform trolley shall be used to carry heavy machine parts/jobs to various locations inside the power house. The platform type trolley shall have the following specifications but marginal variation will be acceptable at the discretion of the purchaser. The trolley shall be made of welded construction with not less than 50 x 50 x 6 mm M.S. angle frame body and 3 mm M.S. sheet platform. Suitable stiffener and cross members shall be provided to the platform to take care of bulging due to heavy loads. It shall be provided with 4 Nos. of 30.0 x 8.0 cms. of solid rubber bonded wheels fitted with double ball- bearings. Turntable shall be of heavy duty.

-	No. of units	1
-	Capacity (Tonne)	2
-	Platform size (mm)	1500 x 1000
-	Spare Wheels (with ball bearings)	2 Nos.

2.5.11 Hydraulic Platform

A working mobile type Hydraulic platform shall be provided which shall be hydraulic operated of 1T capacity for a height upto 3m.

2.5.12 Work Benches, Lockers, Rack, Shelves and Dust Proof Instrument Boards

Wooden Work Bench

- No. of units 1 no.
- Size (LxWxH) (mm) 2000x1000x800

a) Material & construction details

It shall be made of seasoned good quality wood. The wood shall be sufficiently hard to withstand rough usage. Cross members shall be suitably placed to provide additional strength to the work bench. The bench shall have minimum four straight legs. The top surface of the bench shall not be less than 65mm thick and shall be finished true. Three tire lockable drawer cabinets shall be provided on both sides of the front face of work bench. The bench shall be given two coats of wood polish.

Rear top portion of one of the work bench shall be equipped with instruments and current supplying board. The metal enclosure of the board shall be composed of sheet-steel with minimum thickness 2.5mm. The board shall be dust and vermin proof. It shall be completely equipped, wired and painted and shall have rated insulation in accordance with the Electricity Act. The overall dimensions of the board shall be such that it can accommodate all the equipment as specified. The equipment to be flush mounted on the front cover shall be as given below:

- Main power switch , three pole, hand operated
- Indicating lamp showing ON/OFF position of 415 C AC incoming supply
- Current operated earth leakage circuit breaker in the circuit before the distribution AC supply.
- Instruments with anti-glass having instrument size of 48x48mm, measuring range 1.25x rated value and accuracy class 1.5.

The power supply unit shall be provided with

- Sockets for 415/240 V, 50Hz power source
270 V, 48 V, 24 V DC
Ammeter and voltmeters for each source with indicating light

- 240 V, 50Hz, series/direct current supply source with 200 Watt lamp connection for testing minor jobs.
- b) Four (4) storage locker cabinets of appropriate size each having six (6) lockers of at least 350mm x 457mm size.
- c) Four (4) tools storage cabinets of sheet steel construction each with at least six (6) numbers full extension lockable drawers. The overall size of each unit shall not be less than 1000(H) mm x 710(W) mm x 700(D) mm.
- d) Six (6) racks each with six nos. shelves having overall 2500 mm (min.) height and 2000 mm length (min.)
- e) Four (4) machine tool cabinets with full extension lockable drawers and doors in sheet steel construction. The overall size of each unit shall not be less than 1600(H) mm x 710(W) mm x 770(D) mm.

2.5.13 Hand Tools and Testing Instrument

Following hand tools of approved make shall be supplied:

- 1) Two (2) sets of heavy duty alloy steel Ring-headed spanners of size M6 to M64 mounted on a wrench board or tool box,
 - 2) Two (2) sets of heavy duty alloy steel open-headed spanners of size M6 to M64 mounted on a wrench board or tool box,
 - 3) Two (2) sets of heavy duty alloy steel socket wrench (12 sides) of appropriate drive of the size M6 to M64 mounted in a wrench board or in a toolbox.
 - 4) Two (2) sets of heavy duty alloy steel single-headed ring spanners of size M24 to M64 mounted in a wrench board or tool box,
 - 5) Two (2) sets of heavy duty alloy steel open-ended slogging spanner of size M24 to M110 in a wrench board or in a tool box,
 - 6) Two (2) sets of double acting wrench handles having drive sizes $\frac{1}{4}$ ", $\frac{1}{2}$ ", $\frac{3}{4}$ ", 1" and 1 $\frac{1}{2}$ ".
 - 7) Two (2) sets of heavy duty alloy steel sockets of various size for each of above drive sizes in a tool box,
 - 8) Two (2) sets of universal joints and extensions of the size 100 mm, 200mm, 300 mm, of the drive sizes similar to above ratchets handles,
 - 9) Two (2) sets of torque wrenches with adjustable torque setting for the above drive sizes,
 - 10) Two (2) sets of torque multipliers with input of above drive sizes and output of corresponding next higher drive size,
- Two (2) nos. of pneumatic wrench with torque adjustment for above drive sizes,

- 12) Four (4) Spirit levels (coarse and bubble type) (Accuracy min. 0.5mm/meter),
- 13) Two (2) nos. of Digital thermometers,
- 14) Two (2) nos. of Mechanical Tachometer,
- 15) Outside Micrometer (least count 0.01mm)

Size (mm)	Mechanical
0-25mm	4
0-100	2
100-200	2
200-1000 (covering all the ranges in step of 100)	1 no. each

- 16) Inside (stick) Micrometer (least count 0.01mm)

Size (mm)	Mechanical
50-200mm	2
50-1000	1
1000-5000	1

- 17) Digital Vernier Calliper (least count 0.02 mm or better)

Size (mm)	Nos.
150	2
300	2

- 18) One (1) set of Optical precision level instrument of high accuracy for precise levelling and height measurement along with associated accessories, with following specification:

- | | | | |
|------|--|---|----------|
| i) | Telescope magnification | - | 42x |
| ii) | Objective aperture | - | 50mm |
| iii) | Sensitivity of telescope level | - | 8"/2mm |
| iv) | Levelling accuracy | - | 0.2" |
| v) | Minimum reading of microscope | - | 0.02mm |
| vi) | Standard Deviation for double run per km | - | +/-0.2mm |

- 19) One (1) set of Mechanical Height Gauge for measurement upto 600mm (Accuracy +/-0.05mm)

- 20) Depth Gauge (Accuracy of +/-0.04mm or better)

Size (mm)	Mechanical
150	2
300	1

- 21) Two (2) nos. of Master Level 200mm (least count 0.02 mm /m)
- 22) One (1) no. of Square level 200mm (least count 0.02 mm /m)
- 23) One (1) set of slip gauge (set of 87)
- 24) Two (2) set of 500x500mm master surface plate,
- 25) One (1) set of 1000x1000mm master surface plate,
- 26) One (1) set of roughness measuring instruments,
- 27) One (1) set of straight edge camel back 3000mm
- 28) Set of nylon slings (endless) having minimum factor of safety as 7

Size	Quantity
Minimum 6 m length sling each for 5 Ton 10 Ton 20 Ton	4 nos. 4 nos. 4 nos.
Minimum 8 m length sling each for 40 Ton 60 Ton 80 Ton	4 nos. 4 nos. 4 nos.

- 29) 8 set each D-shackles of 5, 10, 20, 40, 60, 80 ton
- 30) 8 set each eye bolts of sizes M6 to M36 and M48, M56
- 31) Pressure testing device pump motor operated along with provision of manual operation up to 40bars

2.5.14 Hydraulic Transverse Jacks (Capacity 5T & 10T)

2.514.1 The jack shall be robust and simple in construction, manufactured with stringent quality control measures at every stage of production and in accordance with acceptable standards. The body, piston, pumps and all other accessories shall be conforming to standards mark and design. All the accessories shall be in the scope of supply. The equipment shall be complete in all respects.

2.5.14.2 The body of the jacks containing the hydraulic oil shall be as per the IS standard and shall be able to withstand the pressure and load upto the marked capacity. The steel used shall be of good quality and high performance during loading condition. A suitable size handle shall be fixed on the body for handling the jack.

2.5.14.3 The piston operating head shall be suitably hinged to the base of the jack body and shall give friction free movement to the piston meant for pressing the oil from the jack sump.

2.5.14.4 The operating rod of standard length made of drop forged steel with proper hand ripping cross cuts at one end, shall be supplied along with the jacks.

2.5.14.5 The top of the jack shall be suitably flame hardened and shall ensure no chipping with the shift operation of the equipment.

The technical requirements are as follows:

Capacity	Height	Lift	Transverse	No. of Unit
5T	500 mm	300 mm	250 mm	1 No.
10T	500 mm	300 mm	250 mm	1 No.

2.5.15 Chain Pulley Blocks

2.5.15.1 The chain pulley blocks shall be robust in construction and shall be housed in rugged frame. The equipment shall conform to Indian standards in quality and test performance. The frame hooks, load chains, load break. Etc. shall be included in the scope of supply. All chain hoists shall conform to test requirements as per IS-3832.

2.5.15.2 The frame shall be steel fabricated, shaped so that it may occupy minimum head room and shall ensure permanent alignment of spindles and gears. The frame shall enclose and protect the load chain wheel and brake unit. There shall be a detachable steel cover totally enclosing the gears.

2.5.15.3 The hooks shall be of forged steel construction and fine machined to have proper shape. For material composition and its strength, the hooks shall conform to IS-8.

2.5.15.4 The top hooks shall swivel in a crown head forming the part of the frame and the bottom hooks shall rotate on balls housed in a cross head wheel.

2.5.15.5 Bottom hook shall be equipped with safety latch.

2.5.15.6 The load chain wheel shall be fabricated from malleable cast iron and shall have pockets accurately cased to receive calibrated load chain. It shall be conforming to IS-2108.

All gears shall be accurately machined cut from alloy steel and case hardened to ensure long life. The load spur wheel shall be mounted

on two lubricated ball bearings. The axles shall be of ground carbon steel.

2.5.15.8 The load chain shall be higher tensile steel grade 40 and conforming to IS-3109. All chains shall be electrical resistance welded and heat treated to give ductility toughness and wear resistance. Each chain link shall be tested to twice the safe working load and shall withstand shock loads also.

2.5.15.9 The load brake shall be self actuating sorer and disc type. The mechanical brake shall engage instantly and shall provided uniform performance with rated loads or less than the rated capacity.

2.5.15.10 The hand chain wheel shall be made from Grey iron grade Fe-260 and shall conform to IS-210. The hand chain wheel shall have a bore with square threading and pockets accurately casted to receive calibrated hand chain. There shall be provision for hand chain guards o prevent the chain from snagging and fouling. The hand chain guards shall be removable type for easy refilling of chains.

2.5.15.11 There shall be adequate lubricating/greasing provision in the totally enclosed gear case. The driving pinion shall be provided with grease nipples for bearing lubrication and between load spur wheel bore and driving pinion to ensure smooth and trouble free operation.

Technical Requirements:

Capacity	Quantity
2 T	1 no.
3 T	1 no.
8 T	1 no.

2.5.16 Tripod

The tripod shall be made from G.I. pipes of IS mark, suitable to hold the load at the height of 5.0 m. All central axles, hooks etc. shall be in the scope of supply. The equipment shall be able to lower and lift the load safely. One of the pipes shall have climbing arrangement to approach the lifting hook for fixing of pulley etc.

The hook shall be made of tested quality steel preferably from drop forged steel, the end eyes of the hooks shall be machined to close tolerance to ensure free movement of hook. The axle of the tripod shall be case hardened and made up of carbon steel, threaded at one end for adopting the nut.

No of Unit.

1 No.

2.5.17 EOT Crane

The crane shall be complete in all respects including bridge girders, end carriages, trolley assembly, hoisting machinery, wire rope, hook block, motors, gearboxes, brakes, electrical panels, control system, limit switches, power supply arrangement, safety devices and all accessories required for safe and reliable operation.

The crane shall be suitable for handling mechanical components, maintenance tools and workshop materials.

a. Basic Technical Parameters

- Rated Capacity (SWL): 5 Ton
- Type of Crane: Electric Overhead Travelling Crane (EOT)
- Crane Configuration: Double Girder
- Service Location: Indoor Mechanical Workshop
- Span: 10 meters
- Maximum Height of Lift: 7 meters
- Long Travel Length: 20 meters
- Duty Classification: Class II / M5 (Medium Duty)
- Power Supply: 415 V $\pm 10\%$, 3 Phase, 50 Hz AC
- Control Voltage: 110 / 230 V
- Ambient Temperature: 5°C to 45°C

b. Applicable Standards

The crane and all its components shall be designed and manufactured in accordance with the latest applicable standards including but not limited to:

- IS 3177 – Electric Overhead Travelling Cranes and Gantry Cranes
- IS 807 – Design, Erection and Testing of Cranes
- IS 2266 – Steel Wire Rope for General Engineering
- IS 5749 – Forged Hooks
- IS 2062 – Structural Steel
- IS 325 – Three Phase Induction Motors
- IS 2148 – Flameproof Electrical Equipment (where applicable)
- IS 800 – General Construction in Steel

Equivalent international standards such as ISO, DIN or FEM may also be followed where applicable.

c. Design Requirements

The crane structure shall be designed for strength, rigidity and stability. All structural members shall be designed considering dynamic loads, impact factors and fatigue stresses.

The design shall consider:

- Rated load plus weight of hook block and lifting tackle
- Self weight of crane components
- Impact load during lifting
- Wind load (for indoor condition minimal consideration)
- Lateral forces during travel
- Fatigue due to repetitive operations

Maximum permissible deflection of the bridge girder shall not exceed $1/600$ of the span under rated load.

d. Crane Bridge

The crane bridge shall consist of two fabricated steel box girders interconnected by rigid end carriages. The girders shall be fabricated from rolled steel plates conforming to IS 2062.

Features:

- Box girder construction with stiffeners
- Rail mounted on top of girders for trolley movement
- Walkways with chequered plates
- Handrails and toe guards for operator safety
- Access ladder for maintenance

All welds shall be performed using qualified welding procedures.

e. End Carriages

End carriages shall support the bridge girders and transmit loads to crane rails. Each end carriage shall consist of:

- Fabricated steel frame
- Crane wheels
- Drive shafts
- Bearings
- Gearboxes and motors for long travel motion

The wheels shall be forged steel with hardened tread surfaces. Double flanged wheels shall be provided to prevent derailment.

f. Trolley Mechanism

The trolley assembly shall move on rails mounted on the crane bridge. The trolley frame shall be fabricated from structural steel sections.

The trolley shall include:

- Hoisting motor
- Gearbox
- Rope drum
- Wire rope
- Hook block
- Trolley wheels
- Trolley drive motor and gearbox
- Limit switches
- Guards and covers

The trolley wheels shall run on machined rails mounted on the crane girder.

g. Hoisting Machinery

The hoisting unit shall consist of an electric motor coupled with reduction gearbox driving a grooved rope drum.

Features:

- Electric hoisting motor suitable for crane duty
- Heavy duty reduction gearbox
- Grooved rope drum
- High strength steel wire rope
- Hook block with safety latch
- Upper and lower limit switches
- Electromagnetic fail-safe brake

The factor of safety for wire rope shall not be less than 6.

h. Hook Block Assembly

The hook block shall consist of forged alloy steel hook conforming to IS 5749. The hook shall be mounted on thrust bearings to allow free rotation. The hook shall include a spring loaded safety latch. Adequate safety factor shall be maintained for hook and suspension components.

i. Motors

All motors shall be squirrel cage induction motors suitable for crane duty.

Features:

- Totally enclosed fan cooled construction (TEFC)
- Class F insulation
- IP55 protection
- Suitable for frequent starting, reversing and braking

Separate motors shall be provided for:

- Hoisting motion
- Cross travel (trolley)

- Long travel (bridge)

j. Gearboxes

All gearboxes shall be totally enclosed oil lubricated type. Helical gears made from alloy steel shall be used.

Gearboxes shall be designed for:

- Smooth transmission
- Minimum noise
- Long service life

k. Braking System

Electromagnetic fail-safe brakes shall be provided for all motions. The brakes shall automatically apply in case of power failure.

Brakes shall be provided for:

- Hoisting mechanism
- Trolley travel
- Bridge travel

l. Electrical System

The crane electrical system shall include:

- Main control panel
- Motors and starters
- Variable Frequency Drives (VFD)
- Limit switches
- Emergency stop circuits
- Overload protection
- Short circuit protection

Power supply to crane shall be through insulated conductor bars or festoon cable system.

m. Control System

The crane shall be operated using a pendant push button station suspended from the trolley or through a wireless radio remote control system.

The control station shall include:

- Hoist up/down controls
- Cross travel controls
- Long travel controls
- Emergency stop push button

n. Safety Devices

The crane shall be provided with adequate safety devices including:

- Overload protection device
- Upper and lower hoist limit switches
- Emergency stop push buttons
- Mechanical end stops
- Rubber buffers
- Rail sweepers
- Safety guards for rotating parts

o. Painting and Surface Protection

All steel surfaces shall be cleaned by shot blasting or mechanical cleaning.

Painting system shall include:

- One coat zinc rich primer, Minimum thickness 50 Micron
- Two coats epoxy/industrial enamel paint, Minimum thickness 100 Micron
- Color of crane shall be safety yellow unless specified otherwise.

p. Inspection and Testing

The crane shall undergo factory inspection and site testing.

Tests shall include:

- No load test
- Full load test
- Overload test (125% of rated capacity)
- Functional testing of all motions
- Electrical insulation test
- Brake test

Test certificates shall be submitted to the purchaser.

q. Documentation

The Contractor shall provide the following documents:

- General Arrangement Drawings
- Structural drawings
- Electrical schematic diagrams
- Operation and Maintenance Manual
- Spare parts list
- Test certificates
- Warranty certificates

2.6 Drawings, Documents and Design Calculations

2.6.1 Design Memorandum

The Contractor shall submit to the Employer a design memorandum prepared in accordance with standard industry practice

2.6.2 Drawings and documents

The Contractor shall submit all the drawings and documents in accordance with requirements stipulated in General Conditions.

2.7 Delivery, Installation and commissioning

The Contractor shall perform the delivery, installation, and commissioning in accordance with standard industry practice.

2.8 Spare Parts

Recommended spare parts shall be supplied in accordance to Annexure – IV of this Section.

2.9 Special Tools

The Contractor shall list and supply all special tools. List of such tools including their make and detailed specification, shall be submitted for acceptance by the Employer.

2.10 Quality Assurance and Testing

The Contractor shall submit the quality assurance plans for all equipment listed under scope of work for approval of the Employer.

2.11 Bidder will be required to train at least Five (5) technical personnel of PHPA at site for (20) twenty days (FREE OF COST) for on site operation and maintenance of the equipment installed in the workshop.

a) Bidder shall indicate/ offer only reputed makes of product/ equipment.

b) The offered equipment shall be of reputed make like:-

Sl.No.	Item of Facilities	Make/Brand
1	MECHANICAL WORKSHOP	
1.1	ELECTRICAL HAND DRILLING MACHINE	BOSCH/ HITACHI/ METABO/ RALLYWOLF
1.2	RADIAL DRILLING MACHINE	BATLIBOI/HMT/NAGMATI/EIFCO/ATLAS
1.3	LONG LATHE	BATULIBOI/ HMT/ NAGMATI/ ATLAS
1.4	SHORT LATHE	BATULIBOI/ HMT/ NAGMATI/ ATLAS
1.5	UNIVERSAL MILLING	BATULIBOI/ HMT/ NAGMATI/ SAGAR

	MACHINE	
1.6	DOUBLE ENDED GRINDING MACHINE	BATULIBOI/ EIFCO/ NAGMATI/ ELMACO
1.7	POWER HACKSAW	KASTO/ EIFCO/ SAGAR
1.8	WELDING MACHINE	ADOR/ ESAB/ L&T/ STERCO/ NATIONAL PANASONIC/ HONDA/CRUXWELD
1.9	PIPE BENDING MACHINE	HYDROBEND/ HMT /BATLIBOI/ ATLAS/INDER
1.10	BATTERY OPERATED FORK LIFTER	GODREJ/ VOLTAS/ JOST
1.11	BATTERY OPERATED TROLLEY	GODREJ/ VOLTAS/ JOST / MAHINDRA STILTER
1.12	HYDRAULIC PLATFORM	GODREJ/ VOLTAS/ JOST / MAHINDRA STILTER
1.13	GENERAL HAND TOOLS	GEDORE/ MEKASTER/ FACOM
1.14	PRECISION MEASURING INSTRUMENTS	MITUTOYO
1.15	POWER TOOLS	BOSCH/ HITACHI/ SHARP/ RALIWOLE
1.16	HYDRAULIC/ PNEUMATIC TOOLS	GEDORE/ MEKASTER/ FACOM
2	GENARAL ELECTRICAL ITEMS	
2.1	MCBs / MCCBs	ABB/ GE/ SCHNEIDER/ L&T/ C&S/ SIEMENS
2.2	PTS/CTS	KAPPA/PRAYOG/PRAGATI/AE
2.3	STARTERS	ABB/GE/SCHNEIDER/L&T/C&S/SIEMENS
2.4	CONTACTORS	ABB/GE/SCHNEIDER/L&T/C&S/SIEMENS
2.5	GENERAL AUXILIARY RELAYS	ALSTOM/ABB/L&T/VATECH/BHEL/ SIEMENS/SCHNEIDER/TELEMECANIQUE
2.6	GENERAL PROTECTION RELAYS	ALSTOM/ABB/L&T/VATECH/BHEL/ SIEMENS/TOSHIBA
2.7	TERMINAL CONTRACTORS/TER MINAL BLOCKS	WAGO/PHOENIX/ALMEC
2.8	MOTORS	ABB/ALSTOM/KEC/CGL/BBL/ SIEMENS/JYOTI/GE

3.	GENERAL MECHANICAL ITEMS	
3.1	GENERAL HAND TOOLS	GEDORE, MEKASTER, FACOM
3.2	VALVES-AIR CIRCUIT * DN 50 AND BELOW	BHEL/FOURESS ENGINEERING/AUDCO INDIA LTD./ LARSEN & TOUBRO/ VICKERS SYSTEM/ REXROTH INDIA/ KEYSTONE/ GELENFIELD & KENNEDY/ HERION FLUIDTRONIC/ TYCO/ YUKEN/ MOONG CONTROL/ MANNESMAN REXROTH/ WANDFLUH
	* ABOVE DN 50	BHEL/FOURESS ENGINEERING/AUDCO INDIA LTD./ LARSEN & TOUBRO/ VICKERS SYSTEM/ REXROTH INDIA/ KEYSTONE/ GELENFIELD & KENNEDY/ HERION FLUIDTRONIC/ TYCO/ YUKEN/ MOONG CONTROL/ MANNESMAN REXROTH/ WANDFLUH
3.3	VALVES – OIL CIRCUIT * DN 50 AND BELOW	BHEL/FOURESS ENGINEERING/AUDCO INDIA LTD./ LARSEN & TOUBRO/ VICKERS SYSTEM/ REXROTH INDIA/ KEYSTONE/ GELENFIELD & KENNEDY/ HERION FLUIDTRONIC/ TYCO/ YUKEN/ MOONG CONTROL/ MANNESMAN REXROTH/ WANDFLUH
	* ABOVE DN 50	BHEL/FOURESS ENGINEERING/AUDCO INDIA LTD./ LARSEN & TOUBRO/ VICKERS SYSTEM/ REXROTH INDIA/ KEYSTONE/ GELENFIELD & KENNEDY/ HERION FLUIDTRONIC/ TYCO/ YUKEN/ MOONG CONTROL/ MANNESMAN REXROTH/ WANDFLUH
3.4	VALVES – WATER CIRCUIT * DN 50 AND BELOW	BHEL/FOURESS ENGINEERING/AUDCO INDIA LTD./ LARSEN & TOUBRO/ VICKERS SYSTEM/ REXROTH INDIA/ KEYSTONE/ GELENFIELD & KENNEDY/ HERION FLUIDTRONIC/ TYCO/ YUKEN/ MOONG CONTROL/ MANNESMAN REXROTH/ WANDFLUH
	* ABOVE DN 50	BHEL/FOURESS ENGINEERING/AUDCO INDIA LTD./ LARSEN & TOUBRO/ VICKERS SYSTEM/ REXROTH INDIA/ KEYSTONE/ GELENFIELD & KENNEDY/ HERION FLUIDTRONIC/ TYCO/ YUKEN/ MOONG CONTROL/ MANNESMAN REXROTH/ WANDFLUH

3.5	PIPES SEAMLESS	
	*STAINLESS STEEL	JINDAL /PRAKASH ISMT/ SUBALAKSHMI/ MAHALAKSHMI
	*CARBON STEEL	JINDAL /PRAKASH ISMT/ SUBALAKSHMI/ MAHALAKSHMI
3.6	PIPES – ERW	
	*STAINLESS STEEL	JINDAL /PRAKASH/SURYA ROSHNI
	*CARBON STEEL	JINDAL /PRAKASH/SURYA ROSHNI
4.	INSTRUMENTATION	
4.1	ELECTROMEGNATIC TYPE ULTRASONIC FLOW METER/ RELAY	ENDRESS + HAUSER
4.2	THERMOSTATS	INDFOSS INDUSTRIES
4.3	RTD	SIKA

SCHEDULE OF OPTIONAL ITEMS
(Particulars to be filled by Bidder)

SL. No.	Description	Make & Model No.	Quantity (Nos.)

Signature of Bidder

SCHEDULE OF RECOMMENDED SPARE PARTS

Bidder must quote for the set of recommended spare parts for five years
trouble free service for each item

Sl. No.	Description/Make	Quantity (Nos.)

Signature of Bidder

ELECTRICAL WORKSHOP EQUIPMENT SPECIFICATIONS

ELECTRICAL WORKSHOP EQUIPMENT

1.1 GENERAL TECHNICAL CONDITIONS

- 1.1.1** This technical specification covers design, manufacturing, testing at manufacturer's works before dispatch, supply, transportation, insurance till defect liability period, delivery at project site in Bhutan, handling, storage & preservation at site for Electrical Workshop Equipment/ instruments at Punatsangchhu-II HE Project, Bhutan based on established design as per applicable IS or equivalent standards and guaranteed for two years of trouble free and safe operation in climatic conditions as specified in Volume-I of the bidding documents.

The bidder shall submit a proposal based on his experience on the type of equipment and tools to be put in the Electrical Workshop in the power house while taking into consideration that the workshop facilities will be required for essential maintenance works and on-site repairs of the power house equipment.

The details and specific technical requirements regarding engineering, manufacture, supply, erection, testing and commissioning are covered in the following sections of the specifications.

1.2 SERVICE CONDITIONS

1.2.1 Climatic Conditions

The equipment to be supplied shall be designed to operate satisfactorily in the climatic conditions specified in Section-4, Volume-I of the bidding documents i.e. 'Project Features'. However, the broad atmospheric conditions are as follows:

- i) Maximum ambient temperature 35°C
- ii) Relative humidity (max.) 100%
- iii) Service Bay Level (above mean sea level) EL. 582m

1.2.2 Seismic Design Criteria

The Power House site is located in Seismic Zone-IV. As such, various equipment shall be designed for installation and operation in earthquake prone area. The seismic loads occur due to the horizontal and vertical accelerations which may be assumed to act non-concurrently. The coefficients for horizontal acceleration as 0.4g and vertical acceleration as 0.2g shall be used for design purposes. The seismic loads shall be equal to the static loads corresponding to the weights of the parts/ accessories multiplied by the coefficient of the acceleration.

1.2.3 Auxiliary Power Supply

The equipment operating mechanisms, various motors, illumination & heating devices, control & protection devices, sensors, alarms etc. shall be suitable for operation with the following LT power supply:

- a) 415 V $\pm$ 10%, three phase, 4-wire, 50 Hz (-5% to +3%), AC power supply;
- b) 240 V $\pm$ 10%, single phase, 2-wire, 50 Hz (-5% to +3%), AC power supply;
- c) 220 V $\pm$ 10%, 2-wire, ungrounded DC power supply.

1.3 ELECTRICAL SYSTEMS OF THE PROJECT

The technical details of the electrical systems of the project are here as under:

1.3.1 Punatsangchhu-II H. E. Project envisages installation of 6 generating units each of 170 MW (188.8 MVA) with 10% continuous additional overload capacity. The power generated at 13.8 kV by these units will be stepped up to 420 kV through 6 banks of transformers each comprises of 3 single Phase (3x70 MVA), 13.8 / 420 / $\square$ 3 kV generator transformers. These transformers will be connected to generators through 17.5kV Isolated Phase Bus-Ducts.

1.3.2 The generator transformers on HV side shall be connected to 420 kV SF6 Gas Insulated Switchgear (GIS) comprising 16 No. of bays.

1.3.3 The GIS shall be connected through 400kV XLPE insulated, single phase copper conductor cables to Pothead Yard from where the power shall be further transmitted to pooling station at Alipurduar in India through two D/C transmission lines. One D/C transmission line shall be connected to Jigmeling Sub-station and the other one D/C line shall be connecting Punatsangchhu-I HEP with Punatsangchhu-II HEP.

1.4 SCOPE OF WORK

1.4.1 This section of the specification covers various instruments mentioned in Annexure-I.

1.4.2 The scope of supply shall include all equipment, instruments, tools, tackles, accessories, auxiliaries, and mountings, including all electrical works required for the commissioning of equipment described hereunder. Electric wiring of equipment with their control switchboards including electric protective devices, starting devices etc. shall be covered in the scope of supply, if required.

All tools and tackles required for operation and use of the equipment shall be supplied and handed over to the Purchaser in

new condition after commissioning of the same.

1.4.4 Other works incidental to and connected with the commissioning of equipment mentioned hereunder shall be in the scope of supply. Services of installation and commissioning staff and the services of testing engineer and provision of necessary instruments required during testing and training shall be covered in the scope of supply.

1.4.5 Deleted.

1.4.6 Any testing and measuring instrument which is not included in scope of supply and is required for maintenance of power station is also to be considered in the scope of supply. The bidder shall furnish the technical parameters in bid.

1.4.7 The ratings and features of testing and measuring instruments shall be compatible to the equipment installed in the power plant. The technical specification of testing and measuring instruments indicated in this section is bare minimum. However, the contractor shall supply the instruments of latest available technical specification.

1.5 GENERAL TECHNICAL REQUIREMENTS

1.5.1 Standards & Regulations

- i. All equipment shall conform to the latest edition of the applicable Indian Standards or equivalent IEC standards. The Contractor shall specify the standard of equipment to which it conforms and shall supply a copy of the same. Similar components of the equipment shall be interchangeable with each other.
- ii. The design and workmanship of the equipment offered shall be in accordance with the best and latest engineering practices and in compliance to relevant safety codes to ensure satisfactory performance throughout their service life.

1.5.2 General Information for Instruments

- i. All the instruments shall be suitable to work under hostile electrical conditions i.e. in live 400 kV switchyard, high ground currents, high level of interfering stray voltages etc. Therefore, accuracy of instrument shall not be variable/ varied beyond permissible prescribed limits.
- ii. All the instruments shall be provided with suitable case comprising to minimum IP54 for preservation, easy transportation and to house all the accessories. Trolley arrangement shall be provided to house and carriage of instruments, wherever required.

- iii. The equipment shall have inbuilt provision for voltage regulation and stabilization and shall have minimum internal power losses. All the equipment shall have proper protection against over voltage and electric shock to the operator. In case the equipment is supported with rechargeable batteries, the charging equipment shall also be in the scope of supply.
- iv. The equipment shall be robust in design, portable type and must be suitable for climatic conditions at site. All the accessories required for efficient and full operation of equipment are included in the scope of supply. The bidder shall furnish the list & details of accessories being supplied with equipment as per Annexure- VI.
- v. Suitable serial/ USB ports and accessories compatible with Laptop along with suitable software to compute and interpret the output or results shall be in the scope of supply. The contractor shall load all the software in the laptop provided by them at site along with latest available operating system.
- vi.
 - a. The bidder may quote for other equipment not mentioned hereunder with proper justification and are mandatorily required for testing, commissioning and maintenance of the plant indicating their rates separately as per **Annexure-III** for optional items. The description of the optional equipment shall be supported with technical details etc.
 - b. The bidder may quote for the other accessories required for enhancing the features and capability of the equipment as optional in **Annexure- III** indicating their rates separately.
 - c. The items covered in **Annexure-III** for optional items shall not be considered for evaluation.

1.5.3 Completeness of Equipment

Any material and equipment, not specifically stated in this specification but which are necessary for satisfactory operation and commissioning of the equipment for the completeness of the equipment separately or Electrical Workshop, shall deem to be included in the scope of supply, unless specifically brought out in deviation statement and shall be supplied without any extra cost.

1.5.4 Recommended Spare Parts

The Bidder shall list the recommended spare parts in **Annexure- IV** required for five years of operation and maintenance of each equipment. Recommended spares shall not be considered for evaluation of the price bid.

TESTING AND MEASURING INSTRUMENTS

Detailed specifications of equipment covered under this section are

as follows:

1.6.1 Capacitance and Dissipation Factor Test Set (Capacitance and Tan Delta)

1.6.1.1 The equipment offered shall be suitable and convenient for measuring the Capacitance & Dissipation factor (Tan Delta) in transformers, shunt reactor, generator components, bushings, circuit breakers, cables, CTs, VTs, motor coils, protective surge arrestors etc. The equipment shall permit direct reading of the measured dissipation factor without further calculations. The equipment shall be fully automatic and shall be designed to provide a comprehensive insulation capacitance and dissipation factor test. The equipment shall include interference suppression circuit that ensures accurate measurements even under severe interference or noise condition.

1.6.1.2 The equipment shall have provision to display the test voltage, insulation current, capacitance, Tan Delta, inductance, power, power loss, power factor, leakage current, internal partial discharges etc. The equipment shall be complete with various terminals and sockets for connection of the test specimen and required cable set.

1.6.1.3 The test set shall have data storage facility not less than 100 sets of test results for retrieval and analysis. Standard results shall be easily transferable to Laptop using the suitable interface to be supplied along with equipment. Necessary software for receipt and storage of data on Laptop is also in the scope of supply. Data logging with graph of voltage v/s Tan delta to know and compare with old results/ manufacturer's data is also required.

1.6.1.4 Accessories

1. Calibrator for capacitance and Tan Delta.
2. 1 No. Oil test cell
3. 1 No. Solid test cell
4. Resonating inductor to extend the range of Capacitance and Tan Delta. Etc.

1.6.1.5 General Requirements

1. The equipment shall have automatic / switching facility for following modes:
 - Ungrounded specimen test (UST mode).
 - Grounded specimen test (GST mode)
 - Grounded specimen test with guard/ shielding (GST-G).
2. Suitable protection shall be provided for short circuit & breaking down of test specimen. The equipment shall shut down quickly without any voltage surge at output.

3. The equipment shall be provided with audio visual alarm to indicate abnormal condition.
4. Provision to change overload limits for voltage or current or both, if required. All operator controls shall be at earth potential.
5. Protective circuit breaker and transformer thermal sensor to guard against sustained overloading of the power supply.
6. An interlock shall be provided to actuate safety barrier, warning lights (audio-visual alarm) etc.
7. Capacitance & dissipation measuring bridge with direct reading of capacitance and dissipation factor.

1.6.1.6 Technical Requirements

The equipment shall comply to the following minimum specifications:-

S. No.	Parameters	Rating/Range
1.	Transformer	
	Type	High voltage transformer with controlled output complete with protection circuit and necessary shielding.
	Output voltage	0-12kV AC (Continuously adjustable)
	Resolution	10 V
	Accuracy	± 1% of reading
2.	Output current	0-250mA (continuous) 1
	Resolution	mA or better.
	Accuracy	±1% of reading
3.	Capacitance	
	Range Accuracy	0 to 10 μ F (multi ranges)
	Resolution	± 0.5% of reading or better 0.1 pF
4.	Dissipation factor	
	a) Range	0 to 200% (Direct)
	b) Accuracy	± 1% of reading or better. 1x
	c) Resolution	10 ⁻⁴ or better.
5.	Shielded Standard Capacitor	100 pF ±5%, 12kV

6.	Display	LCD display / LED display
7.	Safety Features	Open grounded, Zero start control & Short circuit protection, Over Voltage protection, interlock for HV output.

1.6.2 PORTABLE ULTRASONIC FLAW DETECTOR

1.6.2.1 The equipment having microprocessor based control, shall be mainly suitable for following applications:

1. To detect flaws in welded and brazed joints.
2. To locate internal anomalies in energized oil filled equipment such as power transformers, shunt reactor etc.
3. To detect corona, partial discharge, pump cavitation and loosening of internal parts.
4. To detect leakage in valves and compressed air leaks and to detect the bad bearings.
5. To monitor flow and valve position and air borne ultrasonic noise.
6. It shall be suitable for indoor as well as outdoor operations.

1.6.2.2 High/ Low Frequency Selection

The equipment shall have provision for selection of high frequency (ultrasonic (20 kHz to 250 KHz)) and low frequency (sonic (100Hz to 20 kHz)) range.

1.6.2.3 The equipment shall be provided with audio and jacks to hear the internal beat of frequency oscillator. A headphone of superior quality of reputed make shall also be in the scope of supply.

1.6.2.4 Filter

1. The equipment shall comprise of 3-position switch that affects sonic band in different frequency ranges to detect faults in sub- station, leak detector to eliminate low frequency background noise and additional background noise.
2. The system/ equipment must have provision of viewing spectra and waveforms on inbuilt oscilloscope. The oscilloscope shall also have provision to view the waveform of incoming signals.
3. All type of probes that shall be required for applications mentioned above and other possible applications are also in the scope of supply.
4. Accelerometer/ Transducers (Air probe) shall be sensitive to both sonic and ultrasonic frequency ranges. The transducers shall be capable to detect activity in either range by heterodyning into the head set, the spike energy and electrical noise from corona and

partial discharges. The transducers shall also detect valve leaks, worn bearings etc. The suitable extension stick to provide safe and easy access of test surface shall also to be supplied.

1.6.2.5 Technical Requirements

The equipment shall comply to the following minimum specifications:

S. No.	Parameters	Rating/Range
1.	Gain/ Sensitivity Adjustment	Up to 100 db, adjustable in 1 db steps.
2.	Battery	8 Hours running period.
3.	Accuracy	±1%.
4.	Display	LCD/LED
5.	Frequency range	100 Hz to 250 kHz.
6.	Test Range	10mm to 1 m in steel – in 5mm steps.
7.	Computer Compatibility	Relevant ports and links shall be provided.

1.6.3 HAND HELD VIBRATION METER

1.6.3.1 The equipment shall be suitable to measure the Vibration frequency, Vibration Velocity, Vibration displacement, vibration acceleration, bearing conditioning unit, process-able relative shaft vibration & speed and sound level of rotating machines particularly in turbine pit and near draft tube.

1.6.3.2 The equipment shall be portable type, one-hand operated, user friendly and usable in ambient conditions. The instrument shall be covered with suitable portable weatherproof case for transportation to site of application and a container for its preservation in site store. The equipment shall be modular with enhanced features.

1.6.3.3 The instrument shall have following features:

1. Numerical live display of measurements.
2. Graphic display of amplitude and phase of measurement.
3. Instrument shall have feature of sufficient data storage along with further expansion facility.
4. Instrument shall have facility of connecting vibration acceleration sensor, velocity sensor and displacement sensor (eddy current sensor) & process parameter sensor (transducer).
5. Instrument shall be battery operated with charger suitable for power operation and charging.

6. Instrument shall have in-built self-test function.
7. Averaging function for noise influence and beat effect reduction.

1.6.3.4 The equipment shall be supplied with all accessories including power supply, ear phone, case etc. and all types of testing probes including 5 meter extension cable length along with all types of sensors and transducers required for proper functioning of instrument.

1.6.3.5 Technical Requirements

The equipment shall comply to the following minimum specifications:

S. No.	Parameters	Rating/Range
1.	Measurement range.	
	1. Acceleration	0-200 m/s ²
	2. Velocity	0-50 mm (minimum)
	3. Displacement	0-20 mm
2.	Frequency Range	1-5000 Hz.
3.	Accuracy	± 3%

1.6.4 MAGNETIC PARTICLE TESTING INSPECTION EQUIPMENT

1.6.4.1 The equipment shall be portable type, mainly suitable to detect the surface defects in casting, welding and forging of equipment of Power House i.e. runner blades, guide vanes, rotor shaft, cheek plates etc.

1.6.4.2 The equipment shall comprise of portable magnetic inspection unit, magnetic paste application device and other accessories. The equipment must have built-in system, which shall be stable and shall regulate the operating power supply system. All the accessories such as cables (probes), connectors etc. those required to operate the equipment shall also be in the scope of supply. The cable shall be provided with proper lugs compatible to equipment.

1.6.4.3 The equipment shall comprise of suitable current control varying from zero to maximum output.

1.6.4.4 The magnetic paste application device shall be capable to apply the paste evenly on the surface under test. The equipment shall have the facility by which the quantity of paste can be controlled and monitored.

1.6.4.5 Wet method and fluorescent inspection materials shall be used for magnetic particle inspection.

MICRO OHM-METER (Digital)

This test kit shall be portable light weight, robust and tropicalized to

suit outdoor application for monitoring condition of bushings, isolators, circuit – breakers, bus-bars etc. by measuring contact resistance and shall include all accessories like probes, test leads & clamps. The test instrument shall provide contact resistance in digital display.

1.6.5.2 The equipment offered shall have the feature to measure the resistance in normal mode, auto mode, continuous mode, inductive mode and unidirectional mode.

1.6.5.3 The instrument shall be suitably packed in a portable leather case or in a case of such material as is able to resist wear during its use. Calibration shunts of different ranges shall also be in scope of supply.

1.6.5.4 Technical Requirements

Micro ohm meter shall meet the following minimum technical requirements:

S. No.	Parameters	Ratings
1.	Resistance range	0.1 μ Ohm -1000m Ohm
2.	Resolution	0.1 micro ohm
3.	Accuracy	+/- 1% of last digits of display value
4.	Current	Up to 600A
5.	Cable set	As required
6.	Display	LED/LCD

1.6.6 MEGGER (Digital)

1.6.6.1 The equipment shall be digital type and shall be able to generate voltage up to 5000 V and suitable selection switch for voltage to be applied shall be provided in the equipment. The equipment shall rapidly display the test voltage, test current, leakage current, time duration of test, PI Value and Insulation Resistance, external voltage and capacitance. For data downloading to Laptop, suitable serial/ USB Ports along with suitable leads are also to be provided. Necessary software, if required, to download and online display on Laptop shall also to be provided. Equipment shall have memory to store last 50 tests performed, indicating time and date of test performed.

1.6.6.2 Scale shall be calibrated in ohms/ kilo ohms/ mega/ terra ohms for different ranges of insulation measurement. It shall be free from induction effect. The equipment shall have a provision of third terminal called guard terminal. The terminal shall effectively pass the leakage current from the earth system to ground. The equipment shall be able to take the measurements on dead circuit

while adjoining circuits/ system shall be in charged condition and voltage range of adjoining system shall vary from 415 V to 420kV AC (3-phase).

1.6.6.3 All accessories meant for the full, efficient and accurate use of the equipment shall be covered in the scope of supply. There shall be suitable container to house all components.

1.6.6.4 The earthing device of suitable rating for draining the charge to earth shall also be in scope of supply

1.6.6.5 Technical Requirement

The equipment shall comply to the following minimum specifications:-

S. No.	Parameters	Ratings
1.	Output Voltage	Up to 5000 V
2.	Test current range	Up to 5 mA
3.	Insulation resistance measuring range.	0 - 10 Terra Ohm or higher.
4.	IP Rating	IP-65
5.	Accuracy	Voltage- $\pm 3\%$, Insulation resistance- $\pm 2\%$
6.	Timer Mode	15 Second to 60 minutes or higher

1.6.7 TONG TESTER (Digital)

1.6.7.1 The instrument shall be self-contained of rugged construction, suitable for field applications and easy to handle and transport.

It shall be able to measure and display the current, power, power factor, frequency, capacitance etc. The range selection device shall be capable of operation without disturbing the external circuit, during changeover from one position to other.

1.6.7.2 The split core current transformer shall generally be according to IS-2705.

1.6.7.3 All test leads and test probes shall be in the scope of supply. The length of each test lead shall not be less than 1 meter in length, flexible single core and suitably colors coded. The test probes shall be insulated with pointed ends and rust proof metal coating.

1.6.7.4 The equipment shall be provided with data hold facility, low battery indication, overload protection, Continuity test facility, Diode test facility.

Technical Requirements

The equipment shall comply with the following minimum specifications:-

S. No.	Parameters	Range
1.	Range Current Voltage	0-1000 A 0-1000V
2.	Accuracy	± 3%
3.	Display	LCD
4.	Jaw Capacity	55 mm dia
5.	Power Source	Chargeable Battery Operated

1.6.8 MULTIMETER (Digital)

1.6.8.1 The instrument shall be able to display all reading in digital form on the screen. The instrument must use single meter movement with a scale calibrated in Volts, Ohms and Amp.

1.6.8.2 The instrument shall have inbuilt provision for the different functions of voltage, current and resistance to be measured. One selector switch for different functions measurement on AC/DC voltage shall be provided in the instrument and other to select the range. The instrument shall be battery operated. The instrument shall be suitably packed in portable leather case having least wear down during the use. All accessories required like cables/ probes, crocodile clips, etc. shall be supplied along with then equipment. Provision for zero setting and Auto ranging shall be inbuilt with the meter.

1.6.8.3 The offered equipment shall be able to measure DC Voltage, DC current, AC Voltage, AC Current & Resistance, check the continuity of circuit, test capacitor, diodes, transistors etc. to know their condition, measure the current drawn by the circuit.

1.6.8.4 Technical Requirement

The equipment shall comply to the following minimum specifications:

S. No.		Ranges	Accuracy
1.	AC measurement Range		
	Voltage	0V to 1kV	±0.4 % + 40 digits
	CURRENT	0A to 10 Amps	± 0.07% + 5 digits
2.	DC measurement Range		
	Voltage	0V to 1 kV	±0.25% + 5 digits
	Current	0A to 10A	±0.15% + 2 digits

3.	Resistance : 0-50 M-ohms or larger range in the scale of Ohm, KOhm & MOhm Accuracy : $\pm 0.05\%$ of reading +2 digits or better
4.	The quantity measured shall be displayed in the form of a (minimum) four digit number with a properly placed decimal number.
5.	When D.C. quantities are measured the polarity shall be identified by means of a positive or negative sign displayed to the left of the number.

1.6.9 TACHO METER & STROBOSCOPE (DIGITAL)

- 1.6.9.1** The digital tachometer & stroboscope shall be rugged, reliable and accurate instrument to measure rotational & surface speed. The instrument offered shall be easy in handling and contained in leather case for easy transportation. The equipment shall be operable in either clockwise or anticlockwise direction.
- 1.6.9.2** The tachometer shall have provision for both type of measurement i.e. contact and contactless. It shall also be considered to provide two high speed life lubricated precision ball bearing for minimum loading and long life.
- 1.6.9.3** The Stroboscope shall have adjustable Flash Rate by push button on the instrument.
- 1.6.9.4** The screen of the instruments shall be suitably protected from the stray magnetic fields. Provision for hold on reading shall be made in the instruments. All the accessories shall be supplied along with the instruments.
- 1.6.9.5 Technical Requirements**

The equipment shall comply with the following minimum specifications:-

S. No.	Parameters	Tachometer Ratings	Stroboscope Ratings
1.	Range	0-9999 RPM	Flash Rate: 0-9999
2.	Resolution	0.1 RPM	
3.	Accuracy	± 1 RPM	
4.	Display	LED/LCD	
5.	Memory (min)	50	10
6.	Power Supply	Chargeable battery operated	
7.	Auto Cut Off Circuit	To be Provided	
8.	Indication Of Low/normal condition	To be Provided	

1.6.10 EARTH RESISTIVITY TESTER (Digital)

The earth tester shall be used for measuring the earth/ ground resistance, ground continuity. The equipment shall be light in weight, handy portable, having liquid crystal display and suitable for four terminals testing.

1.6.10.1 The instrument shall be equipped with rechargeable type Nickel/ Cadmium batteries. The instrument shall have a set of safety plug to contain cable adopters, accessories like testing leads etc. The cables shall be rolled in reels; grounding rods shall be packed in holder. The whole instrument and the associated accessories kit shall be suitably packed in a durable material packing case.

1.6.10.2 Mode of Operation

The test lead/ cables shall be of 2.5mm dia nickel coated copper. The lengths of the cables/ leads shall be 30m suitably rolled on an insulated cable reel and four spikes of adequate length to be buried in the ground as per standards norms. The depth to which spike shall be buried ground shall be marked on the spikes.

The instrument shall be designed such that it shall prevent loading of the earth/ ground resistance wire during test. The equipment shall conform to its latest IS/IEC/BS Standards.

1.6.10.3 Technical Parameters

The equipment shall comply with the following minimum specifications:

S. No.	Parameters	Range
1.	Earth resistance range	0 Ohm – 30 k Ohm (auto ranging)
2.	Accuracy	±4% of reading ±3Digits
3.	Display	LCD/ LED

1.6.11 PHASE SEQUENCE INDICATOR

The instrument shall be used to check the phase sequence in a power system.

1.6.11.1 The system shall have the following provisions:

- i. There shall be a provision for making the measuring circuit active only at the time of test so that meter does not operate continuously.
- ii. It shall be suitable for working on 40 to 60 Hz, 500 volts AC. The standard accessories such as leads, clamps, and carrying case shall be in the scope of supply.

1.6.11.2 Technical Requirements

The following technical requirements shall be met by the equipment offered:

- i. Voltage presence - Indicated by lighting of LEDs
- ii. Phase/ Neutral search - Signaling by indicator light.
- iii. Phase angle rotation - Signaling via LEDs freeing of neutral/ LED
- iv. Alligator insulated - Enabling a contact on all clips difficult areas of access.

1.6.12 POWER AND INSTRUMENT TRANSFORMER ANALYSER

1.6.12.1 The equipment shall be mainly suitable to measure the

- a) Ratio, winding resistance, leakage reactance and short circuit impedance and polarity of power transformers, Shunt Reactor and distribution transformers,
- b) Ratio, burden and polarity of instrument transformers (CT & PT) installed in the power plant.
- c) The equipment shall also measure the phase and magnitude deviation between Primary and Secondary windings of transformers.

1.6.12.2 The equipment shall come with test display along with software interface having a facility to create automatic customizable reports. The equipment shall be rugged, robust. The equipment shall conform to relevant standards in all respect.

1.6.12.3 It shall be suitable to be operated with chargeable batteries. It shall be equipped with data storage facility up to 200 test results and shall be provided with compatible ports to be connected with Laptop and printer. Any software, if required, is also in the scope of supply.

1.6.12.4 The equipment shall have facility to display transformer turn ratio, excitation current, ratio-error and phase angle deviation.

1.6.12.5 The equipment shall have an emergency shut off button and shall have at least over voltage and overload protection on all inputs and outputs

1.6.12.6 The minimum technical requirement of equipment shall be as below:

S. No.	Parameters	Range
1.	Measurement Range	
	Turn Ratio	0.75 to 20000
	Phase Angle Deviation	±90 degree

	Excitation Current	0 to 500 mA
2.	Accuracy	±0.5%
3.	Display	Digital LCD/ LED

1.6.13 DIGITAL PORTABLE UNIVERSAL BRIDGE (LCR METER)

1.6.13.1 The equipment shall be mainly suitable to measure the Inductance, Capacitance and Resistance of various electrical equipment installed in the power plant. The equipment shall be rugged, robust and suitable to be used under harsh environment.

1.6.13.2 The equipment shall be fully automatic and digital type. It shall also be suitable to be operated with chargeable batteries. It shall be provided with compatible ports to be connected with Laptop and printer.

1.6.13.3 The minimum technical requirement of equipment shall be as below:

S. No.	Parameters	Range
1.		Measurement Range
	i) Resistance	20Ω to 200 MΩ
	ii) Capacitance	200pF to 20mF
	iii) Inductance	20 μH to 20kH,
2.	Accuracy	±0.2%
3.	Frequency range	100Hz to 300kHz
4.	Display	Digital LCD back lit type

1.6.14 SILICA GEL DRYING OVEN

1.6.14.1 The oven shall be suitable to dry the silica gel of two Power Transformers ingressed with moisture. Interior housing of oven shall be of stainless steel. External body shall be of electrolytically coated galvanized steel coated with epoxy/ polyester paint.

1.6.14.2 The oven shall have digital control and display features. The oven shall be provided with variable temperature controller device, timer, forced draft circulation to heat the silica gel, alarm and protection against overload & over heating etc. All the accessories required for operation and maintenance of equipment are in scope of supply.

1.6.14.3 All type of power cables, mounting arrangement etc. are in the scope of supply.

The minimum technical requirement of equipment shall be as below:

S. No.	Parameters	Requirement
1	Capacity	Suitable to dry the silica gel of two no. Power Transformers
2	Temperature Setting	60 deg. To 250 deg C
3	Time Setting	0 – 999 minutes
4	Display	Digital LED/LCD

1.6.15 REMOTE ENGINEERING STATION/ Laptop

1.6.15.1 One remote engineering station (Laptop) and 1 no. Mono Colour Laser Printer with all the hardware and software shall be in the scope of supply. The system shall contain latest version of Hardware and software. The system needs be compatible for all the software provided for workshop equipment/ instruments. The contractor shall load all the software in the Laptop provided by them at site along with latest available operating system.

1.6.15.2 The Laptop shall be provided with built-in wireless, Wi-Fi LAN support interfaces and USB ports and other accessories.

1.6.15.3 Laptop shall be of reputed brand like Dell, HP etc.

1.6.15.4 The minimum technical requirement of system shall be as below:

S. No.	Parameters	Requirement
1.	Processor	Intel i7 or above
2.	Memory (RAM)	16GB
3.	Screen Size	14 inch
4.	Hard Drive	Minimum 1 TB
5.	Battery life	At least 8hr

1.7 OTHER TECHNICAL REQUIREMENTS

1.7.1 Seismic Behavior

Seismic behavior under seismicity is stipulated in Section-4, Volume-I. The equipment shall be expected to behave as below:

- The physical alignment of the equipment along with supporting structures shall not get disturbed and there shall not be any internal flashover and/ or electrical faults.
- No relays, instruments and indicators shall mal-operate.
- Current carrying parts, supporting structures and earth connection etc. shall not get disturbed and/ or shall not break or distort.

Drawings & Data

- a. The Bidder shall fill-in the technical data particulars as per Annexure-II. Separate sheet for all types of equipment shall be furnished.
- b. The Contractor upon completion of detailed design shall review the data supplied by him in the bid and obtain approval to the data based on detailed design from the Purchaser. In this review, the contractor, however, shall not change the basic parameters given in the specification.
- c. In addition, technical literature, photos, relevant standard etc. shall be supplied to give the maximum possible information of the equipment offered.

1.7.3 Makes of Bought out Equipment/ Items

Bidder may indicate/ offer only reputed makes of products/ equipment preferably from ISO certified companies.

The offered equipment shall be of reputed make like M/s Megger Ltd. (U.K.), M/s Doble, M/s HT Italia (Italy), M/s Bruel & Kjaer, (Denmark), M/S H.Tinsley & Co (UK), Time Electronics (U.K.), Isotech (U.K.), M/S FLUKE INDIA, M/s METRAVI etc. and ISO certified only.

The names of vendors other than the ones listed above shall be subject to the approval of the Purchaser. The information and experience of the proposed vendor shall be furnished by the bidder.

1.7.4 Inspection and Tests

- a. All the equipment and materials specified are subject to inspection by Purchaser and/ or his authorized inspection agency. The tests shall be conducted as per the relevant IS/ IEC standards.
- b. All data copies of relevant standards shall be made available to the Inspector during testing process.
- c. The Contractor shall submit the copies of all the Type and Routine Tests carried out at manufacturer's works.
- d. All test data reports, certificates shall be marked with contract order number and Equipment Item Number.
- e. All test data, reports, etc. shall be furnished in seven copies. Purchaser's representative shall witness all tests. In case tests fail, retest shall be conducted after rectification. Reports of failure of tests shall also be recorded for future reference. For testing and trial runs, all arrangement and consumables shall be provided by the Contractor. Routine Test reports for minor components will be acceptable.
- f. A written notification shall be sent to the Purchaser at least 30 days in advance, indicating the time and place of factory tests so that the purchaser or his representative could witness these tests. For witnessing the tests, 4 engineers shall be deputed.

- g. Acceptance of materials, parts and assemblies, or the waiving of the inspection thereof by Purchaser, shall in no way relieve the Supplier from the responsibility of furnishing equipment in accordance with the requirements of these specifications.

1.7.5 Rating Plate

Each equipment shall be provided with a rating plate having all information as per IS requirement and indicating all technical data on it.

1.7.6 Painting

All painted parts of the equipment and accessories shall be painted with approved shade as per relevant IS.

1.7.7 Operation and Maintenance Manuals

For guidance during installation of the work and subsequently for guidance of the plant operating and maintenance staff, the Contractor shall prepare manuals for operation. Five suitably hard bound copies of these manuals (in English only) shall be provided to Purchaser before the dispatch of the equipment. In addition, the Contractor shall supply soft copy of operation & maintenance manual of each equipment.

1.7.8 Training

The Contractor shall provide training facility to at least five persons to use the supplied testing instrument/ equipment, its maintenance and/ or operation and routine maintenance of power house equipment at site without any additional cost.

ANNEXURE-I

SCHEDULE OF REQUIREMENT		
SL. No.	Description	Qty. (Nos.)
1.	Capacitance & Dissipation Factor Test Set	1
2.	Portable Ultrasonic Flaw Detector	1
3.	Hand held Vibration meter	2
4.	Magnetic Particle Testing Inspection Equipment	1
5.	Micro-ohm Meter (Digital)	1
6.	Megger (Digital)	2
7.	Tong Tester (Digital)	2
8.	Multi-Meter (Digital)	3
9.	Tacho-Meter and Stroboscope (Digital)	3 (2+1)
10.	Earth Resistivity Tester (Digital)	1
11.	Phase Sequence Indicator	1
12.	Power & Instrument Transformer Analyser	1
13.	Digital Portable Universal Bridge (LCR meter)	1
14.	Silica Gel Drying Oven	1
15.	Laptop with Hardware and Operating System along with monochrome Laser Printer	1

SCHEDULE OF OPTIONAL ITEMS

(Particulars to be filled by Bidder)

SL. No.	Item	Make & Model No.	Quantity (Nos.)
1.			

Signature of Bidder

SCHEDULE OF RECOMMENDED SPARE PARTS

Bidder must quote for the set of recommended spare parts for five years
trouble free service for each item

Sl. No.	Description/Make	Quantity (Nos.)

Signature of Bidder

SCHEDULE OF ACCESSORIES

(To be filled in by the Bidder)

The Bidder shall quote the list of accessories to be supplied along with each equipment.

S. No.	Description	Quantity (Nos.)

Signature of Bidder _____