	DOCUMENT RECORD SHEET	SHEET 1 OF 1
	DOCUMENT NO. PE-TS-410-507-E005	NO. OF SHEETS OF DOCUMENT 16

DOCUMENT TITLE: TECHNICAL SPECIFICATION FOR ELECTRICAL LAB EQUIPMENT (METERING & TESTING)

PROJECT TITLE: 1X660mw BHUSAWAL TPS

ISSUE NO.	REVISION PARTICULARS	SIGNATURE AND DATE						
		PREP. BY	CHKD. BY	APPD. BY	COORDINATED WITH			
1	REVISION-00	K	KK KANHAIYA KUMAR	PD				
2								

MAHARASHTRA STATE POWER GENERATION CO. LTD.
1X660MW BHUSAWAL UNIT-6, T.P.S

VOLUME II B

TECHNICAL SPECIFICATION
FOR
ELECTRICAL LAB EQUIPMENT
(METERING & TESTING)

SPECIFICATION NO. : PE–TS–415–556–E002B, REV.0

BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR PROJECT ENGINEERING MANAGEMENT
NOIDA, 201301

CONTENTS

COMPLIANCE CERTIFICATE

The bidder shall confirm compliance to the following by signing/ stamping this compliance certificate and furnishing same with the offer.

1. The scope of supply, technical details, construction features, design parameters etc. shall be as per technical specification & there are no exclusion/ deviation with regard to same.

2. There are no deviation with respect to specification other than those furnished in the 'schedule of deviations'

3. Only those technical submittals which are specifically asked for in NIT to be submitted at tender stage shall be considered as part of offer. Any other submission, even if made, shall not be considered as part of offer.

4. Any comments/ clarifications on technical/ inspection requirements furnished as part of bidder's covering letter shall not be considered by BHEL, and bidder's offer shall be construed to be in conformance with the specification.

5. Any changes made by the bidder in the price schedule with respect to the description/ quantities from those given in Annexure-A [BOQ-Cum-Price schedule] of the specification shall not be considered (i.e., technical description & quantities as per specification shall prevail).

6. All essential accessories for each electrical laboratory equipment required for testing various electrical equipment /devices during Commissioning, Operation and Maintenance of power plant to be ensured by bidder in their offer.

BIDDER'S STAMP & SIGNATURE

1.0 SCOPE

1.1 Design, manufacture, inspection and testing at manufacturer's work, proper packing and delivery to site of Electrical Laboratory Equipment as mentioned in different sections of this specification.

1.2 General technical requirements of the Electrical Laboratory Equipment are indicated in Section – II. Project specific technical requirements/changes are listed in Section-I.

1.3 Electrical Laboratory Equipment shall be supplied along with all essential accessories required for the successful operation of the equipment.

1.4 Detailed technical parameters of Electrical laboratory equipment are listed in Annexure – I of Section-I.

1.5 The requirement of Section-I shall prevail and govern in case of conflict between the corresponding requirements of Section-I and section-II.

2.0 BILL OF QUANTITIES

2.1 Quantity requirement shall be as per 'BOQ cum price schedule' enclosed in NIT.

2.2 Supplier to also give the following undertaking in the BOM: "The BoM provided herewith completes the scope (in content and intent) of material supply under PO No. ----------, dated ------ Any additional material which may become necessary for the intended application of the supplied item(s)/package will be supplied free of cost in most reasonable time."

3.0 SPECIFIC TECHNICAL REQUIREMENT

S.No.	Reference Clause No. of Section-II (if any)	Specific Requirement/Change

4.0 DRAWING & DOCUMENTS TO BE SUBMITTED

4.1 Documents/drawings for each Electrical Laboratory Equipment shall be submitted after placement of order for BHEL & customer's approval inline with NIT.

1. Insulation Tester (500 V) - 2 Nos

Test Voltage 500V
Insulation Range 0-50/500 mega ohms
Accuracy ±2%
The instrument shall be hand driven insulation tester for checking insulation

2. Insulation Tester (1000 V) - 2 Nos

Test Voltage 1000V
Insulation Range 0-200/200 mega ohms
Accuracy ±2%
The instrument shall be motorized insulation tester for checking insulation

3. Insulation Tester (2.5 kV) - 2 Nos

Test voltages: 2.5kV DC
Insulation Range: 0 to 250 G ohms
Accuracy: ±2%
The instrument shall be battery operated, Digital with LCD/LED display for checking polarizing index, absorption index

4. Insulation Tester (5 kV) - 2 Nos

Test Voltage 5kV DC
Insulation Range 0 to 500 G ohms
Accuracy ±2%
The instrument shall be battery operated, Digital with LCD/LED display for checking polarizing index, absorption index

5. Earth Resistance Testers (Four terminals)- 4 Nos

Portable instrument with four terminals for measurement of earth resistance
Earth resistance: 0-2/20/200/2000/20,000 ohms
Accuracy: ±1%
To test earth resistance

6. Analogue multimeter (Portable) - 10 Nos

Voltage range	0-250mV /2.5/10/25/100/250/500/1000/2500 V AC/DC(min)
Accuracy	± 2%
Current range	0-50µA-10A DC(min) 0-10mA-10A AC/DC(min)
Accuracy	± 2%
Resistance range	0- 2KΩ /200 kΩ /20 MΩ (min)
Accuracy	±2%

7. Digital multimeters – 6 Nos

Suitable for measurement of the following

a) DC Voltage 0-1000 volts
Accuracy ± 0.2%

b) AC voltage 0- 750 volts
Accuracy ± 0.5%

c) DC current 1mA- 10A
Accuracy ± 0.2%

d) AC current 1mA-10A
Accuracy ± 0.2%

e) Resistance 0-200 ohms / 2kohms / 20kohms / 200kohms / 2Mogohms
Accuracy ± 0.2%

Portable with LCD / LED display

8. Moving Iron Ammeters (0-2.5/5 Amps) -2 Nos

Accuracy class: ±0.2

9. Moving Iron Ammeters (0-100 Amps)- 2Nos

Accuracy class: ±0.2

10. DC ammeter – 4 nos

Laboratory, precisions type moving coil ammeter
Current Range: 0 – 7.5/75 A
Accuracy: ±0.5%

11. Clip on Ammeter AC - 4 Nos

for checking load current in service condition

Range	0-400-1000 Amps
Strength	650V & 2KV/min
Accuracy	±2%

12. <u>Digital clamp on multimeter : 2 Nos</u>

Suitable for measuring for AC current

Range	0.01mA to 200A
Frequency	0.1 Hz-1KHZ
Voltage	1mV -750V (AC)

Instrument shall be provided for checking load current in service condition

13. <u>AC Moving Iron Voltmeters - 4 Nos</u>

Voltage	0-150/300/600 V
Accuracy class	0.2

To test panel ammeters .

14. <u>DC Moving Iron Voltmeters - 4 Nos</u>

Voltage	0-125/250/500 V
Accuracy class	0.2

To test panel ammeters ,

15. <u>Digital Phase Sequence Indicator - 2 Nos</u>

Voltage ranges	100-600 volts
Frequency range	25-65 Hz

To test phase sequence

16. <u>Digital frequency meter - 4 Nos</u>

Type	Digital
Cycles	40/50/65
Accuracy	0.1%

To calibrate/check frequency meter

17. <u>Digital Tachometer (Non-contact type) - 4 Nos</u>

Speed Range	0-75000 rpm

To check rpm

18. Timer - 4 Nos

Range 0-0.9999,9.999,99.99,999.9 &9999 sec
Accuracy ±0.01%
Timing purpose

19. Micro ohm meter - 4 Nos

Measurement Range 20μΩ to 200 ohm
Accuracy ±0.03%

20. Wire gauge: 4 Nos

For measuring size of wires

21. Rheostats (660V grade) -

Ratings

a) 10A /25Ω – 3No
b) 18A /6Ω– 3No
c) 5A /500Ω– 3No
d) 5A/ 1000Ω– 3No
e) 2.5A /500Ω– 3No
f) 1A/ 1000Ω– 3No
g) 0.5A / 500Ω– 3No
h) 0.25A/ 1000Ω– 3No
I) 0.1A/ 2500Ω– 3No

22. Micrometer - 3 Nos

To measure size of very fine copper wires upto 50 SWG

23. Mercury in glass thermometer - 3 Nos

Range 0 to 150°C, 12 inch long
Purpose To measure temperature

24. Hand operated crimping m/c with tool set - 3 Nos

Type up to 95sq. mm
For cable joints and terminations

25. Soldering Iron-8Nos

input :35W

26. <u>High voltage Detector - 1 Nos</u>

Electronic type with audio visual indication

Power Supply	Dry Cell
Voltage Range	(a) Suitable up to 33KV
	(b) Suitable up to 400KV
Indication	Visual—LED
	Audio – Buzzer

27. <u>Digital Ductor Ohmmeter- 1Nos</u>

Range:	1 micro ohm to 20 ohms
Accuracy:	□0.2%

28. <u>Analog Phase Sequence Indicator - 2 Nos</u>

Voltage ranges	100-500V AC volts
Frequency range	45-60 Hz

To test phase sequence

29. <u>Wattmeter - 3 Nos</u>

Voltage range:	110/240/440 Volts
Current Range:	1/5 Amps
Power factor	1.0 (Unity)
Acc. Class	-0.2

SECTION-II

STANDARD TECHNICAL SPECIFICATION

1.0 TECHNICAL REQUIREMENTS

1.1 Basic technical requirements for Electrical Lab Equipment shall be as indicated in this section, in addition to technical requirements specified in Section-I.

1.2 The intent of specification is not to specify herein all the details of design and manufacture. However, the equipment shall confirm in all respect to high standards of design engineering and workmanship and shall be capable of performing in continuous commercial operation up to vendors guarantee.

1.3 The Bidder may note that the equipment range, rating, quantities as detailed herein, are the minimum requirement only. All accessories for the equipment not covered here, if necessary for satisfactory and trouble free operation of the equipment, shall be quoted by the Bidder.

1.4 The instrument shall be suitable for satisfactory operation at an ambient temperature from 0°C to 55°C.

1.5 The Analog instruments shall be provided with knife-edge pointer and anti – parallax mirror.

1.6 The Bidder to quote only 'one' make/model against each equipment best to suit specification requirement.

1.7 The instrument shall be suitable for hand held operation, rugged in construction and suitable for field use.

1.8 All the equipment components shall be procured from reputed manufacturers and make of equipment shall be subject to the approval of BHEL/ BHEL's Customer.

1.9 Bidder to note that "In case any offered make / model becomes obsolete or is stopped manufacturing by manufacturer, next higher model of the same make may be considered for ordering / supply at contract stage, without any price implication. In such cases, bidder is required to furnish valid confirmation letter from OEM as proof of change of model (citing reason: obsolete technology or stopping of manufacturing with date of effect) and that the offered model is "technically equivalent or better".

2.0 CODES AND STANDARDS

Some of the standards, which shall generally be followed, are listed below. Other applicable relevant standards for any component part, even if not covered in listed standards shall be followed.

i) IS – 6103 Method of test for specific resistance (resistivity) of electrical insulating fluid.

ii) IS – 6700 Requirements of general purpose Cathode Ray Oscilloscope.

iii) IS – 722 Specification for AC electricity meters.

iv) IS – 8143 Specification for plugs & keys for resistance boxes.

v) IS – 6104 Method of test for interfacial tension of oil against water.

vi) IEC-51 Direct acting indicating analogue electrical measuring instruments and their accessories.

vii) Any other relevant National/ International standards as mentioned in Section-II with technical specification.

3.0 DESIGN CRITERIA:

3.1 Electrical Laboratory Equipment shall be used for calibration & diagnostics of various electrical equipment/ devices during Commissioning, Operation and Maintenance of power plant.

3.2 The Equipment will be kept in a clean but hot, humid and tropical atmosphere when not in use. Equipment will be placed in dust laden, hot, humid atmosphere during its use.

3.3 For continuous operation at specified rating, temperature rise of various equipment/ components shall be limited to the permissible value stipulated in the relevant standards and this specification.

4.0 TEST REQUIREMENTS:

4.1 All equipment to be tested as per latest edition of relevant standards. Further, testing shall include verification of physical, functional & technical parameters of equipment & accessories, in line with approved datasheet.

4.2 The tests shall be carried out by the vendor at in-house lab/ OEM lab/ Third party govt. accredited lab. Charges for all these tests shall be deemed to be included in the bid price.

4.3 Vendor to furnish test report to BHEL for review/ acceptance. BHEL/BHEL's customer may witness the testing of equipment.

5.0 PACKING:

All equipment shall be properly packed in Galvanized sheet steel trunk/ box with proper lock & key arrangement except for equipment which are trolley mounted or are already available in rugged steel/wooden box packing. Further, any damage (reading error/calibration error/broken parts/missing parts etc) found on receipt at site, leading to replacement of parts/whole item, shall be to bidder's account.

6.0 DEMONSTRATION TO BHEL / BHEL'S CUSTOMER

6.1 The vendor shall be responsible for demonstration of the supplied equipment at site, conforming the satisfactory operation.

6.2 The equipment for which demonstration is required at site shall be intimated by BHEL.

6.3 The charges for visit to site for demonstration at site shall be in-line with Annexure- I of Section-II.

7.0 PERFORMANCE GUARANTEE

The bidder shall guarantee that the equipment offered shall meet the requirement as stipulated in this specification and as confirmed by them in Technical Data Sheet. In case the performance of equipment is not as per performance guarantee, the bidder will have to replace the equipment at site free of cost.

8.0 DRAWING DATA & MANUAL

8.1 To be submitted with the bid as technical offer:

a) Compliance to Technical parameters of various equipment as specified in Annexure-I of Section-I in Data Sheet – B (as enclosed).

b) Technical leaflets/ Catalogues/Product Manual of the Equipment

The Bidder may note that the drawing, data and manual listed herein are minimum requirement only. The Bidder shall ensure that the other necessary write-ups, curves and information required to fully describe the equipment are submitted with the bid.

8.2 Following documents/drawings shall be submitted after placement of order for BHEL & customer's approval:

a) Technical Datasheet for each equipment
b) Technical leaflets/ Catalogues/Product Manual of the Equipment
c) Tests Reports and calibration certificate
d) General arrangement drawing showing constructional features, accessories, connections, range and rating, mounting arrangement, space requirement etc.
e) Detail instructions for application, assembly & testing of equipment.
f) Wiring and schematic diagrams (if applicable).
g) Instruction manual/ O&M manual of individual equipment

8.3 Instruction manual/O&M Manual of individual equipment

The manual shall clearly indicate in English the installation and connection method, check list of the tests to be carried out before commissioning of equipment. Maintenance and Calibration method shall also be provided in the manual.

8.4 Bidder to furnish all user instruction manuals, maintenance, handling, installation manuals & all test reports complete in all respect in bound volumes & soft copies to BHEL / BHEL's customer at the time of handing over the same to BHEL / BHEL's Customer.

8.5 Bidder to note that quoted item cost shall include cost of main item, cost of all accessories required for successful operation of equipment and testing cost of all equipment test as per relevant standard.

SCHEDULE OF PRICES FOR DEMONSTRATION & HANDING OVER TO BHEL / BHEL'S CUSTOMER

SL. NO.	DETAILS	ACTIVITY	UNIT CHARGES
1	LUMP SUM ALL INCLUSIVE CHARGES PER VISIT FOR EXPERIENCED / CAPABLE ENGINEER (EXCEPT DAILY CHARGES)	1 VISIT	**20000/-**
2	LUMP SUM ALL INCLUSIVE CHARGES FOR EXPERIENCED / CAPABLE ENGINEER PER DAY	1 DAY	**5000/-**

Note:

1. TOTAL CHARGES = (Charges as per S.No.1) + [No. of Days(*) x Unit Charges as per Sl. No. 2]
   To be certified by BHEL site

2. Bidder to note that provision of maximum 3 visits amounting to total 6 man days is envisaged for respective bidders.

1X660 MW BHUSAWAL TPS UNIT-6									
TECHNICAL SPECIFICATION FOR ELECTRICAL LABORATORY EQUIPMENT									
PE-TS-415-556-E002B R0									
DATA SHEET-B (Annexure-II of Section-II)									
Sl. No.	**Item Description**	**Quantity (nos)**	**Whether Quoted or not (Yes/No)**	**Make and Model meeting the requirement in totality**		**Country of Manufacture**	**Equipment and accessories confirms to all technical requirements in totality - (Yes / No)**	**Catalogue (attached or not) (Yes/No)**	**Remarks**
				Make	**Model**				
1	**Insulation Tester (500 V)**	**2**							
	Test Voltage: 500V								
	Insulation Range: 0-50/500 megaohms								
	Accuracy: ±2%								
	The instrument shall be hand driven insulation tester for checking insulation								
2	**Insulation Tester (1000 V)**	**2**							
	Test Voltage: 1000V								
	Insulation Range: 0-200/200 megaohms								
	Accuracy: ±2%								
	The instrument shall be motorized insulation tester for checking insulation.								
3	**Insulation Tester (2.5 kV)**	2							
	Test voltages: 2.5kV DC								
	Insulation Range: 0 to 250 G ohms								
	Accuracy: ±2%								
	The instrument shall be battery operated, Digital with LCD/LED display for checking polarizing index, absorption index acc=2								
4	**Insulation Tester (5 kV)**	**2**							
	Test voltages: 5kV DC								
	Insulation Range: 0 to 500 G ohms								
	Accuracy: ±2%								
	The instrument shall be battery operated ,Digital with LCD/LED display for checking polarizing index, absorption index								
5	**Earth Resistance Testers (Four terminals)**	4							
	Portable instrument with four terminals for measurement of earth resistance								
	Earth resistance: 0-2/20/200/2000/20,000 ohms								
	Accuracy: ±1%								
	To test earth resistance								
6	**Analogue multimeter (Portable)**	**10**							
	Voltage range: 0-250mV/ 2.5/10/25/100/250/500/1000/2500 V AC/DC(min)								
	Accuracy: ±2%								
	Current range: 0-50µA-10A DC(min) 0-10mA-10A AC/DC(min)								
	Accuracy: ±2%								
	Resistance range: 0- 2KΩ /200 kΩ /20 MΩ (min)								
	Accuracy: ±2%								
7	**Digital multimeters**	**6**							
	Suitable for measurement of the following :-								
	a) DC Voltage: 0-1000 volts								
	Accuracy: ±0.2%								
	b) AC voltage: 0- 750 volts,								
	Accuracy: ±0.5%								
	c) DC current: 1mA- 10A								
	Accuracy: ±0.2%								
	d) AC current: 1mA-10A,								
	Accuracy: ±0.2%								
	e) Resistance: 0-200 ohms / 2kohms / 20kohms / 200kohms / 2Mogohms								
	Accuracy: ±0.2%								
	Portable , with LCD/LED display								
8	**Moving Iron Ammeters (0-2.5/5 Amps)**	2							
	Accuracy class: ±0.2								
9	**Moving Iron Ammeters (0-100 Amps)**	2							
	Accuracy class: ±0.2								
10	**DC ammeter**	4							
	Laboratory, precisions type moving coil ammeter								
	Current Range: 0 – 7.5/75 A								
	Accuracy: ±0.5%								

11	**Clip on Ammeter AC**	**4**							
	for checking load current in service condition								
	Range: 0-400-1000 Amps								
	Strength: 650V & 2KV/min								
	Accuracy: ±2%								
12	**Digital clamp on multimeter**	**2**							
	Suitable for measuring for AC current								
	Range: 0.01mA to 200A								
	Frequency : 0.1 Hz-1KHZ								
	Voltage : 1mV -750V (AC)								
	Instrument shall be provided for checking load current in service condition								
13	**AC Moving Iron Voltmeters**	**4**							
	Voltage : 0-150/300/600 V								
	Accuracy class: 0.2								
14	**DC Moving Iron Voltmeters**	**4**							
	Voltage : 0-125/250/500 V								
	Accuracy class: 0.2								
15	**Digital Phase Sequence Indicator**	**2**							
	Voltage ranges: 100-600 volts								
	Frequency range: 25-65 Hz								
	To test phase sequence								
16	**Digital frequency meter**	**4**							
	Type : Digital								
	Cycles : 40/50/65								
	Accuracy: 0.1%								
	To calibrate/check frequency meter.								
17	**Digital Tachometer (Non-contact type)**	**4**							
	Speed Range: 0-75000 rpm								
	To check rpm								
18	**Timer**	**4**							
	Range : 0-0.9999,9.999,99.99,999.9 &9999 sec								
	Accuracy: ±0.01%								
19	**Micro ohm meter**	**4**							
	Measurement Range: 20μΩ to 200 ohm								
	Accuracy: ±0.03%								
20	**Wire gauge**	**4**							
	For measuring size of wires.								
21	**Rheostats (660V grade)- 3Nos. of each range**								
	Ratings:								
	a)10A /25Ω	**3**							
	b) 18A /6Ω	**3**							
	c) 5A /500Ω	**3**							
	d) 5A/ 1000Ω	**3**							
	e) 2.5A /500Ω	**3**							
	f) 1A/ 1000Ω	**3**							
	g) 0.5A / 500Ω	**3**							
	h) 0.25A/ 1000Ω	**3**							
	i) 0.1A/ 2500Ω	**3**							
22	**Micrometer**	**3**							
	To measure size of very fine copper wires upto 50 SWG								
23	**Mercury in glass thermometer**	**3**							
	Range: 0 to 150°C, 12 inch long								
	Purpose: To measure temperature								
24	**Hand operated crimping m/c with tool set**	**3**							
	Type : up to 95sq. mm								
	For cable joints and terminations								
25	**Soldering Iron**	**8**							
	input :35W								
26	**High voltage Detector**	**1**							
	Electronic type with audio visual indication								
	Power Supply : Dry Cell								
	Voltage Range : (a) Suitable up to 33KV (b) Suitable up to 400KV								
	Indication : Visual—LED Audio – Buzzer								
27	**Digital Ductor Ohmmeter**	1							
	Range: 1 micro ohm to 20 ohms Accuracy: ⍰0.2%								

28	**Analog Phase Sequence Indicator**	**2**							
	Voltage ranges: 100-500V AC volts								
	Frequency range: 45-60 Hz								
	To test phase sequence								
29	**Wattmeter**	**3**							
	Voltage range: 110/240/440 Volts Current Range:1/5 Amps Power factor:1.0 (Unity) Acc. Class -0.2								

NOTE :-

1) Equipment to be supplied along with essential accessories for successful operation of equipment at site i.e. clamps, clips, leads, carrying case etc.
2) All equipment shall be supplied with valid calibration certificate wherever applicable
3) All equipment shall be properly packed in Galvanized sheet steel trunk/ box with proper lock and key arrangement except for equipment which are trolley mounted or are already available in rugged steel/wooden box packing. Further, any damage (reading error/calibration error/broken parts/missing parts etc) found on receipt at site, leading to replacement of parts/whole item, shall be to bidder's account