T E N D E R S P E C I F I C A T I O N

NO: BHE/PW/PUR/BSJI-ELE/483

FOR

HANDLING AT SITE STORES/STORAGE YARD, TRANSPORTATION TO SITE OF WORK, COMPLETE ERECTION, CHECKING OF CALIBRATION, TESTING, ASSISTANCE FOR COMMISSIONING AND HANDING OVER OF ELECTRICA L PACKAGES VIZ., POWER TRANSFORMERS, ISOLATED PHASE BUS DUCT FOR GENERATOR TRANSFOMER, SEGREGATED PHASE BUS DUCT FOR STATION TRANSFORMER/UNIT AUX. TRANSFORMER, ELECTROSTATIC PRECIPITATOR, GENERATOR CONTROL & PROTECTION PANELS, STATION TRANSFORMER CONTROL & RELAY PANELS, 6.6kV / 0.415 kV SWITCHGEAR BOARDS MCC, LV 0.415 KV BUSDUCTS, SOOT BLOWER SYSTEM, DIGITAL STATIC EXCITATION SYSTEM, 220 VOLT BATTERY SYSTEM, ELECTRICAL HOIST AND ASSOCIATED ITEMS FOR UNIT #1&2 of 250 MW

AT

NTPC-SAIL POWER COMPANY PRIVATE LTD
BHILAI, DISTT: DURG,

CHHATTISGARH

PART –I
(TECHNICAL BID SPECIFICATION, NOTICE INVITING TENDER and GCC)

BHARAT HEAVY ELECTRICALS LIMITED
(*A GOVERNMENT OF INDIA UNDERTAKING*)
POWER SECTOR : WESTERN REGION
345, KINGSWAY: NAGPUR 440 001

Contents

LEGEND:

$: PLACED BEFORE 'GENERAL CONDITIONS OF CONTRACT' IN BOTH HARD AND SOFT COPY DOCUMENTS.

#: ATTACHED AT THE END OF HARD COPY OF TENDER SPECS. PART-I (TECHNICAL BID) AND AS A SEPARATE FILE TITLED 'WEB_NIT_GCC' AS SOFT COPY HOSTED IN WEB PAGE.

@: ISSUED AS SEPARATE BOOKLET IN HARD COPY AS **PART-II** AND AS SEPARATE FILE TITLED 'PRICE_BID' AS SOFT COPY HOSTED IN WEB PAGE.

BHARAT HEAVY ELECTRICALS LIMITED

(A Govt. of India Undertaking)
POWER SECTOR - WESTERN REGION
345, KINGS WAY - NAGPUR 440 001

TENDER SPECIFICATION No: BHE/PW/PUR/BSJI-ELE/483

FOR

HANDLING AT SITE STORES/STORAGE YARD, TRANSPORTATION TO SITE OF WORK, COMPLETE ERECTION, CHECKING OF CALIBRATION, TESTING, ASSISTANCE FOR COMMISSIONING AND HANDING OVER OF ELECTRICAL PACKAGES VIZ., POWER TRANSFORMERS, ISOLATED PHASE BUS DUCT FOR GENERATOR TRANSFOMER, SEGREGATED PHASE BUS DUCT FOR STATION TRANSFORMER / UNIT AUX. TRANSFORMER, ELECTROSTATIC PRECIPITATOR, GENERATOR CONTROL & PROTECTION PANELS,STATION TRANSFORMER CONTROL & REALY PANELS, 6.6kV / 0.415 kV SWITCHGEAR BOARDS MCC, LV 0.415 KV BUSDUCTS, SOOT BLOWER SYSTEM, DIGITAL STATIC EXCITATION SYSTEM, 220 VOLT BATTERY SYSTEM, ELECTRICAL HOIST AND ASSOCIATED ITEMS FOR UNIT #1&2 of 250 MW

AT

NTPC-SAIL POWER COMPANY PRIVATE LTD
BHILAI, DISTT: DURG,

CHHATTISGARH

EARNEST MONEY DEPOSIT: Please refer Special Conditions of Contract Section-15.

LAST DATE AND TIME FOR SUBMISSION OF OFFERS: PLEASE REFER WEB PAGE (**www.bhel.com**) FOR LATEST UPDATES.

THESE TENDER DOCUMENTS CONTAINING PART-I AND PART-II ARE ISSUED TO:

M/s……..

……..

(THESE TENDER DOCUMENTS ARE NOT TRANSFERABLE)

FOR BHARAT HEAVY ELECTRICALS LIMITED

Dy. GENERAL MANAGER (PURCHASE)

PLACE: NAGPUR

DATE :

PROCEDURE FOR SUBMISSION OF SEALED TENDERS & INSTRUCTIONS TO BIDDERS

The bidder must submit his tender as required in two parts in separate sealed covers prominently superscribed as 'Part-I Technical Bid' and 'Part-II Price Bid' and also indicating on each of the covers the tender specification number and due date and time as mentioned in the Notice Inviting Tender.

Part-I (Technical Bid) cover-I:
Excepting rate schedule, all other schedules, data sheets and details called for in the specification shall be enclosed in **part-I "Technical Bid" only.**

EARNEST MONEY DEPOSIT (EMD)

Please see Special Conditions of Contract (Section-15)

Part-II (Price Bid) cover-II:

All indications of price shall be given in this part-II "Price Bid". **EMD shall not be included in this cover.**

These Two Separate Covers-I and II (Part-I And Part-Ii) shall together be enclosed in a third Envelope (Cover-III) along with requisite EMD as indicated earlier and this sealed cover shall be superscribed and submitted to Dy. General Manager (Purchase) at the above mentioned address on or before the Due Date as indicated.

The Qualified bidder will be intimated separately about the status of their offer.

Bidders are requested to make specific note of the following conditions:

1. CONTRACTOR SHOULD HAVE ADEQUATE RESOURCES INCLUDING MAJOR T&P AT HIS DISPOSAL FOR THIS JOB.

2. CONTRACTOR SHOULD HAVE SOUND FINANCIAL STABILITY.

3. TENDERER SHOULD MEET QUALITY REQUIREMENT REGARDING WORKMANSHIP, DEPLOYMENT OF PERSONNEL, ERECTION TOOLS AND NECESSARY INSPECTION, MEASUREMENT & TESTING INSTRUMENTS.

4. BIDDER SHALL MEET ALL THE QUALIFYING REQUIREMENTS AS MENTIONED IN THE NOTICE INVITING TENDER.

5. ALL INFORMATION AS CALLED FOR IN VARIOUS APPENDICES AND CLAUSES OF TENDER SPECIFICATION SHOULD BE FURNISHED. PLEASE REFER THE CHECKLIST. THE DETAILS SO FURNISHED BY TENDERER SHOULD BE COMPLETE IN ALL RESPECTS AND AS PER FORMATS SPECIFIED IN TENDER SPECIFICATION.

6. OFFERS RECEIVED WITH ANY DEVIATION OR WITHOUT RELEVANT INFORMATION AS DESCRIBED ABOVE ARE LIABLE TO BE REJECTED. PRICE BIDS RECEIVED IN THE FORM OTHER THAN SPECIFIED IN PART-II (PRICE BID) ARE LIABLE TO BE REJECTED.

7. **TENDERER SHALL NOTE THAT THEIR OFFER WILL BE CONSIDERED SUBJECT TO THE APPROVAL OF BHEL'S CUSTOMER.**

PROJECT INFORMATION

INTRODUCTION

NTPC-SAIL Power Company Pvt. Ltd. a joint venture of NTPC & SAIL, is going for two coal fired thermal units of 250MW

The proposed plant is located near the town of Bhilai, in Durg District of Chhattisgarh state. Contractor is advised to visit the site and appraise himself about the conditions of the site and infrastructure available in the area for fulfilling their commitment under the contract.

APPROACH TO SITE

The site is approximately 40 km from Raipur. The nearest railway junction station (Broad Gauge) is Durg. Durg is on Mumbai-Howrah main line.

3.0 CLIMATIC CONDITIONS

a) Maximum temperature	:	48-50 Deg Celsius
b) Minimum temperature	:	Deg Celsius
c) Maximum Relative Humidity	:	%
d) Minimum Relative Humidity	:	%
e) Average Annual rainfall	:	mm
f) Seismic Zone	:	
g) Height above MSL	:	M

.

Check List (Vide Para 1.3 Of Section-I of General Conditions Of Contract)				
1	Name of the Bidder with Postal Address for Correspondence			
2	Name of Contact Person with Telephone & Fax No.	Mr./Ms Tel No. Fax No.		
3	Nature of the firm	PROPRIETARY / PARTNERSHIP / LIMITED CO.		
4	Details of EMD Please Indicate whether One Time EMD or, Only for this Tender	DD No. …… DD Date…….. Name of Bank……... Amount: Rs…….		
5	Validity of Offer (BHEL's Requirement: 180 days from Due Date)	Validity _____ days		
6	Mobilization Time (Please refer Section-11 of SCC)	Mobilization Time _____		
7	Whether any conditions stipulated?	Yes (vide Document reference:	No	
		Bidder to note that tender with conditions unacceptable to BHEL shall be rejected.		
8	Bidder has visited the project site and acquainted with the site conditions		Yes	No
9	Details of concurrent jobs are furnished (Appendix-VII)		Yes	No
10	Headquarters organization is furnished		Yes	No
11	Proposed site organization is furnished		Yes	No
12	Names and particulars of directors/partners are furnished		Yes	No
13	Financial status of the firm (Annexure 'A' of GCC) is furnished		Yes	No
14	Profit & Loss Account for preceding three years is furnished		Yes	No
15	Latest Certificate by Bidder's Banker for Overdraft & BG Limits is Furnished (Certificate shall not be older than six months from the Last Date for offer submission)		Yes	No

Check List (Vide Para 1.3 Of Section-I of General Conditions Of Contract)			
16	Latest copy of IT Return along with copy of PAN Card are Furnished	Yes	No
17	Major T&P and MMD to be Deployed by the Contractor Appendix-III	Yes	No
18	Month-wise Manpower Deployment Plan (Appendix –IV) is furnished	Yes	No
19	Analysis of Unit Rates quoted (Appendix-V) is furnished	Yes	No
20	Month-wise deployment plan for major T&P (Appendix-VI) is furnished	Yes	No
21	Whether all the pages of the Tender Specification documents are read, understood and signed	Yes	No
22	Power of Attorney enclosed in favour of person making offer	Yes	No
23	Bidder has familiarized himself with all Relevant Local Laws & Local Conditions	Yes	No
24	Safety Requirement of this work in a Running plant Premises has been understood.	Yes	No
25	Erection and Commissioning programme furnished	Yes	No
26	List of Jobs completed in last seven years is furnished (Appendix-VIII)	Yes	No
27	Whether copies of detailed Work Orders (with BOQ) and Completion Certificates in support of above furnished	Yes	No
28	Whether contractor has left any job unfinished? If so, give reasons.	Yes	No
29	Whether any client has terminated the contractor's work before completion? If so, furnish reasons for the same	Yes	No

Note: strike off or tick **'yes'** or **'no'**, as applicable

Date: Signature of Bidder

DECLARATION BY BIDDER'S AUTHORIZED REPRESENTATIVE

I, HEREBY CERTIFY THAT ALL THE INFORMATION AND DATA FURNISHED BY ME WITH REGARD TO THE TENDER SPECIFICATION NO. **BHE/PW/PUR/BSJI-ELE/483** ARE TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE. I HAVE GONE THROUGH THE SPECIFICATIONS, CONDITIONS AND STIPULATIONS IN DETAIL AND AGREE TO COMPLY WITH THE REQUIREMENTS AND INTENT OF THE SPECIFICATION. I FURTHER CERTIFY THAT I AM DULY AUTHORIZED REPRESENTATIVE OF THE UNDER-MENTIONED TENDERER AND A VALID POWER OF ATTORNEY TO THIS EFFECT IS ALSO ENCLOSED.

AUTHORISED REPRESENTATIVE'S SIGNATURE WITH
NAME AND ADDRESS

DATE:

TENDERER'S NAME AND ADDRESS

CERTIFICATE OF NO DEVIATION

TENDER SPECIFICATION NO.

BHE/PW/PUR/BSJI-ELE /483

I/WE, M/s ……

HEREBY CERTIFY THAT NOTWITHSTANDING ANY CONTRARY INDICATIONS/ CONDITIONS ELSEWHERE IN OUR OFFER DOCUMENTS, I/WE HAVE NEITHER SET ANY TERMS AND CONDITIONS NOR THERE IS ANY DEVIATION TAKEN FROM THE CONDITIONS OF BHEL'S TENDER SPECIFICATIONS, EITHER TECHNICAL OR COMMERCIAL, AND I/WE AGREE TO ALL THE TERMS AND CONDITIONS MENTIONED IN BHEL'S TENDER SPECIFICATION WITH ASSOCIATED AMENDMENTS AND CLARIFICATIONS.

SIGNATURE OF BIDDER

DATE:

SECTION-3
OFFER OF THE BIDDER

To,
THE Dy. GENERAL MANAGER (PURCHASE)
BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR - WESTERN REGION
SHREEMOHINI COMPLEX
345, KINGSWAY
NAGPUR 440 001

DEAR SIR,
I/WE HEREBY OFFER TO CARRY OUT THE WORK DETAILED IN TENDER SPECIFICATION NO.BHE/PW/PUR/BSJI-ELE/483 ISSUED BY BHARAT HEAVY ELECTRICALS LIMITED, POWER SECTOR-WESTERN REGION, NAGPUR, IN ACCORDANCE WITH THE TERMS AND CONDITIONS THEREOF.

I/WE HAVE CAREFULLY PERSUED THE FOLLOWING LISTED DOCUMENTS CONNECTED WITH THE ABOVE WORK AND AGREE TO ABIDE BY THE SAME.

1. INSTRUCTIONS TO TENDERERS
2. GENERAL CONDITIONS OF CONTRACT
3. SPECIAL CONDITIONS OF CONTRACT
4. OTHER SECTIONS, APPENDICES, SCHEDULES AND DRAWINGS.

I/WE HAVE DEPOSITED / FORWARDED THE EARNEST MONEY DEPOSIT AS PER DETAILS FURNISHED IN THE CHECK LIST.

EMD SHALL BE REFUNDED SHOULD OUR OFFER NOT BE ACCEPTED / EMD NEED NOT BE REFUNDED AND THE AMOUNT MAY BE TREATED AS "ONE TIME EMD" FOR ERECTION AND COMMISSIONING TENDERS OF BHEL-PSWR, NAGPUR. SHOULD OUR OFFER BE ACCEPTED, I/WE FURTHER AGREE TO DEPOSIT SECURITY DEPOSIT FOR THE WORK AS PROVIDED FOR IN THE TENDER SPECIFICATION WITHIN THE STIPULATED TIME AS MAY BE INDICATED BY BHEL, POWER SECTOR-WESTERN REGION, NAGPUR.

I/WE FURTHER AGREE TO EXECUTE ALL THE WORKS REFERRED TO IN THE SAID DOCUMENTS UPON THE TERMS AND CONDITIONS CONTAINED OR REFERRED TO THEREIN AND AS DETAILED IN THE APPENDICES ANNEXED THERETO.

PLACE: SIGNATURE OF BIDDER:
DATE : ADDRESS:

WITNESSES WITH THEIR ADDRESS

SIGNATURE	NAME	ADDRESS
1.		
2.		

SECTION-4

SPECIAL CONDITIONS OF CONTRACT

4.0 SCOPE OF WORK

The work under these specifications broadly covers the complete work of handling at storage yard/stores, transportation to work site, calibration, pre-assembly, erection, testing, pre-commissioning tests and checks and handing over of Electrical Equipment & Associated Auxiliaries of various systems as listed under.

1. GENERATOR TRANSFORMER, STATION TRANSFORMER, UNIT TRANSFORMER AND OTHER TRANSFORMERS OF VARIOUS CAPACITIES
2. ISOLATED PHASE BUS DUCT, SEGREGATED PHASE BUS DUCT AND NON-SEGREGATED PHASE BUS DUCT.
3. SOOT BLOWER SYSTEM
4. 6.6KV, 415V AC, 220V DC, 24 VOLT, & UPS SWITCHGEAR BOARDS
5. 415 VOLTS LV BUS DUCTS
6. DIGITAL STATIC EXCITATION SYSTEM
7. ELECTROSTATIC PRECIPITATOR
8. ELECTRICAL HOISTS AND ELEVATORS
9. CONTROL & RELAY PANELS
10. HT/LT MOTORS TESTING AND ASSISTANCE FOR COMMISSIONING
11. ANY OTHER ASSOCITED SYSTEMS REQUIRED FOR COMPLETION OF THE BOILER-TURBINE-GENERATOR (BTG) PACKAGE.

For proper planning, monitoring and smooth execution of job at site, the contractor will be required to maintain his own computer, printer etc along with operator at his site office.

BHEL uses its own software SOMS (Site Operation and Management System) for total project execution and billing. The contractor shall also provide adequate and suitable manpower for updating/entries into SOMS in BHEL computers at site.

Scope of work is further detailed in various clauses hereafter.

4.1 GENERAL REQUIREMENTS

4.1.1
The intent of specification is to provide services according to the most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for proper and efficient execution of this work shall not relieve the contractor of the responsibility of providing such facilities to complete the work without any extra compensation.

4.1.2
The work to be carried out under the scope of this specification covers the complete work of loading, handling, transporting, unloading, preassembly, erection,

calibration, testing, air flushing, pre-commissioning tests, Assistance for Commissioning of systems, trial run of various auxiliaries and equipments, achieving various milestones till handing over of the unit to BHEL's customer. The work shall conform to dimensions and tolerances specified in various drawings that will be provided during the erection. If any portion of the work is found to be defective in workman ship or not conforming to drawings or other specifications, the contractor shall dismantle and re-do the work duly replacing the defective materials at his cost, failing which the work will be got done by engaging other agencies or departmentally and recoveries will be effected from contractor's bills towards expenditure incurred including 30% departmental charges.

4.1.3
The terminal points decided by BHEL should be final and binding on the contractor for deciding the scope of work and effecting payment for the work done.

4.1.4
The work shall be executed under the usual conditions affecting major power plant construction and in conjunction with numerous other operations at site. The contractor and his personnel shall cooperate with personnel of BHEL, BHEL's customer, customer's consultants and other contractors, coordinating his work with others and proceed in a manner that shall not delay or hinder the progress of work of the project as a whole.

4.1.5
The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, supervision, engineering and construction management. The contractor should ensure proper planning and successful & timely completion of the work to meet the overall project schedule. The contractor must deploy adequate quantity of tools & plants, modern/latest construction aids etc. He must also deploy adequate trained, qualified and experienced supervisory staff and skilled personnel.

4.1.6
Contractor shall erect, align and commission all the equipments and auxiliaries as per the sequence & methodology prescribed by BHEL depending upon the technical requirements. Availability of materials and fronts will decide this. BHEL engineer's decision regarding correctness of the work and method of working shall be final and binding on the contractor. No claims for extra payment from the contractor will be entertained on the ground of deviation from the methods / sequences adopted in erection of similar sets elsewhere.

4.1.7
All necessary certificates and licenses, permits & clearances required to carry out this work from the respective statutory authorities are to be arranged by the contractor expeditiously at his cost and in time to ensure smooth progress of work.

4.1.8
The work shall conform to dimensions and tolerances specified in the various drawings / documents that will be provided during various stages of erection. If any portion of work is found to be defective in workmanship, not conforming to drawings or other stipulations due to contractor's fault, the contractor shall dismantle and re-do the work duly replacing the defective materials at his cost, failing which the work

will be got done by BHEL and recoveries will be effected from the contractor's bills towards expenditure incurred including cost of materials and 30% departmental overheads of BHEL.

4.1.9
Contractor will be required to maintain in his site office at least one PC along with minimum accessories like printer, etc to enable him to carry out site activities in a planned, well coordinated and smooth manner.

4.1.10
The contractor shall execute the work in the most substantial and workmanlike manner. The stores shall be handled with care and diligence.

4.1.11
BHEL reserves right to recover from the contractor any loss, which arises out of undue delay/discrepancy/shortage/damage, or any other causes due to contractor's lapse during any stage of work. Any loss to BHEL due to contractor's lapse shall have to be made good by the contractor.

4.1.12
All transport equipment, handling equipment, tools, tackles, fixtures, equipment, materials, manpower, supervisors/engineers, consumables etc., except otherwise specified as BHEL scope of free issue, required for this scope of work shall be provided by the contractor. All expenditure including taxes and incidentals in this connection will have to be borne by him unless otherwise specified in the relevant clauses. The contractor's quoted rates should be inclusive of all such contingencies.

4.1.13
During the course of erection, testing and commissioning certain rework/ modification / rectification / repair / fabrication etc. may become necessary on account of feedback / revision of drawing. This will also include modifications / re-works suggested by BHEL / customer / other inspection group. Contractor shall carry out such rework / modification / rectification / fabrication / repair etc., promptly and expeditiously. Daily log sheets signed by BHEL engineer and indicating the details of work carried out, man-hours etc. shall be maintained by the contractor for such reworks. Claim of contractor if any, for such works will be governed by clauses 13.1 to 13.8.

4.1.14
All works such as cleaning, levelling, aligning, trial assembly, dismantling of certain equipments / components for checking and cleaning, surface preparation, fabrication of sheets, tubes and pipes as per general engineering practice and as per BHEL engineer's instructions at site, cutting, gouging, weld depositing, grinding, straightening, chamfering, filing, chipping, drilling, reaming, scrapping, lapping, fitting up etc., as may be applicable in such erection works and which are treated incidental to the erection works and necessary to complete the work satisfactorily, shall be carried out by the contractor as part of the work within the quoted rates.

4.1.15
The contractor shall make all fixtures, temporary supports, steel structures required for jigs & fixtures, anchors for load and guide pulleys required for the work

(excepting those specifically included in BHEL scope). However, necessary steel will be provided from the scrap / surplus materials available at site.

4.1.16
The contractor shall take delivery of the components, equipments, chemicals, lubricants etc from the BHEL stores/ storage area after getting the approval of BHEL engineer on standard indent forms of BHEL. Complete and detailed account of the materials and equipments after usage shall be submitted to the BHEL and reconciled periodically. While taking delivery of items from store it may be necessary to handle (shift / relocate) other items (not necessarily those in the scope of the contractor). Separate payment will NOT be made if such situations arise.

4.1.17
Contractor shall plan and transport equipments, components from storage to erection site and erect them in such a manner and sequence that material accumulation at site does not lead to congestion at site of work. Materials shall be stacked neatly, preserved and stored in the contractor's shed and at work areas in an orderly manner. In case it is necessary to shift and re-stack the materials kept at work areas/ site to enable other agencies to carry out their work or for any other reason, contractor shall do it most expeditiously. No claim for extra payment for such work will be entertained.

4.1.18
Plant materials should not be used for any temporary supports / scaffolding / preparing pre-assembly bed etc.

4.1.19
The services, tests and support to be provided by the agency for the work mentioned in various sections of this tender are indicative and not exhaustive, but not limited to these for completion of the work in all respects.

4.1.20
All the work shall be carried out as per the instructions of BHEL engineer. BHEL engineer's decision regarding the correctness of the work and method of working shall be final and binding on the contractor.

4.1.21
The weights & dimensions as mentioned against the individual items in Price Bid Part –II "Rate Schedule" are indicative approximate and there may be variation in dimension & weight in actual supply of equipment. No rate variation shall be considered on this account.

4.1.22
The scope of work & description of system / equipment as given in the various clause of this tender specification and rate schedule are only for understanding the system requirement, contractor shall note this point and assess the volume of work prior to submit the offer. No compensation shall be considered later on.

4.1.23
The contractor shall have total responsibility for all equipment and materials in his custody at contractor's stores, loose, semi-assembled, assembled or erected by him at site. He shall effectively protect the finished works from action of weather and

from damages or defacement and shall also cover the finished parts immediately on completion of work as per BHEL engineer's instructions. The machine surfaces/ finished surfaces should be greased and covered.

4.1.24
At all stages of work, equipments/materials in the custody of contractor, including those erected, will have to be preserved as per the instructions of BHEL.

4.1.25
The contractor shall make suitable security arrangements including employment of security personnel and ensure protection of all materials/ equipment in their custody and installed equipments from theft/fire/pilferage and any other damages and losses.

4.1.26
Contractor shall collect all scrap materials periodically from various area of work site, deposit the same at one place earmarked at site or shift the same to a place earmarked in BHEL/ client's stores. In case of failure of contractor in compliance of this requirement, BHEL will make suitable arrangement at contractor's risk and cost.

4.1.27
The entire surplus, damaged, unused materials, packaging materials / containers, special transporting frames, gunny bags, etc., shall be returned to BHEL stores by the contractor.

4.1.28
The contractor shall not waste any materials issued to him. In case it is observed at any stage that the wastage/excess utilisation of materials is not within the permissible limits, recovery for the excess quantity used or wasted will be effected with departmental charges from the contractor. Decision of BHEL on this will be final and binding on the contractor.

4.1.29
For any class of work for which no specifications have been laid down in these specifications, work shall be executed as per the instructions of BHEL engineer.

4.1.30
House keeping in the erection and preassembly area is as important as the well-planned and orderly work. The access to site for inspection, approaches by BHEL and customer engineers and leading of the material shall be made available by the contractor at all times. The shifting and resifting of erection materials, tools and plants and clearance of restrictions, filling of ditches, undulation near the pre-assembly and boiler area is the responsibility of the contractor. Contractor should visit the site and acquaint himself with all restrictions and difficulties that he may encounter during erection/commissioning stages.

4.1.31
The contractor shall take delivery of equipment, materials from the storage yard/ stores/sheds of BHEL/customer he shall also make arrangements for verification of equipment, transportation up to site of work, safe custody, watch and ward of equipment after it has been handed over to him till these are fully erected, tested and commissioned and taken over by the customer. The contractor should note that

the transport of equipments to erection site, assembly yards etc. should be done by the prescribed route without disturbing the other works and contractors and in the most professional manner. Special equipments such as measuring and control equipments, panels, console inserts, switches, cables, conduits etc. shall be stored when taken over by the contractor in appropriate manner as per BHEL's instructions.

4.1.32
The contractor shall handover all parts/materials remaining extra over the normal requirement with proper identification tags in a packed condition to BHEL stores. In case of any misuse or use over actual design requirements, BHEL reserves the right to recover the cost of parts/materials used in excess or misused. Decision of BHEL engineer in this regard will be final and binding on the contractor.

4.1.33
The contractor should take all reasonable care to protect equipment and materials under his custody either in his stores or at site. Copper tubing, Copper busbars, brass fittings, brass valves, contactors, etc., forming an integral part of equipment or system are liable to greater damages / pilferages /theft / losses. It will be responsibility of contractor to arrange for adequate security round the clock for protection from such damages/pilferages/theft/losses.

4.1.34
The contractor shall ensure that all the packing materials and protection devices used for the various equipments during transit and storage are removed before these equipments are erected in position.

4.1.35
Overhauling, cleaning, revisioning, servicing of equipments during erection and commissioning stages will be arranged by the contractor. All equipments shall be preserved and protected before and after erection as per the advice of BHEL engineer.

4.1.36
Substantial portion of Cable laying & termination shall be done by other agencies for those equipment covered under this tender specification. The glands & lugs shall be supplied either loose or fitted with the equipments. Contractor shall take care of this aspect at the time of receipt of the equipment from BHEL stores. Contractor shall account for the quantities received with equipments and shall hand over the same to cabling agency under intimation to BHEL Engineer. Contractor shall extend all necessary help & co-ordinate with the cabling agency during the course of work.

4.1.37
Contractor shall prepare Marked-Up drawings incorporating modifications and deviations from original drawings or prepare fresh sketch for actual installation / connection details if need be, that can be converted to "As-built" drawing.

4.2 WELDING, NON-DESTRUCTIVE TESTING ETC.

A) Installation of equipment involves good quality welding, NDE checks etc.

B) Welder deployed for aluminium welding shall have experienced and approved by BHEL and MSEB after due qualification process/testing.

C) Welding of all structural steel & aluminium shall be done only by the qualified and approved welders.

D) All the welders shall be tested and approved by BHEL engineer before they are actually engaged on work though they may possess the IBR/other certificate. BHEL reserves the right to reject any welder without assigning any reason.

E) The welded surface shall be cleaned of slag and painted with primer paint to prevent corrosion. For this paint will be supplied by the contractor.

F) Welding electrodes have to be stored in enclosures having temperature and humidity control arrangement. This enclosure shall meet BHEL specifications.

G) Certain types of coated welding electrodes, prior to their use, call for baking for specified period and will have to be held at specified temperature for specified period. Also, during execution, the coated welding electrodes have to be carried in portable ovens.

4.3 TESTING, PRE-COMMISSIONING, AND POST COMMISSIONING:

4.3.1
The contractor shall perform various activities during pre-commissioning, Integrated Testing, post-commissioning stages of equipment covered under this tender specification. It is responsibility of contractor to arranged tools & plants, test equipments, experienced engineers and technicians. Contractor shall earmark separate manpower for respective area of as specified in relevant clause and shall not be disturbed /diverted for other work. The contractor's Assistance for Commissioning group shall work as per the instruction of BHEL Engineer and they shall coordinate day-to-day activity with other agency and BHEL/ Customer. The testing activity may have to be repeated till satisfactory results are obtained and also to satisfy the requirement of Customer / statutory Authority.

4.3.2
The contractor shall simultaneously start testing & Assistance for commissioning activities for equipments to match the mile stone activities of the project.

4.3.3
The mobilization of these Assistance for Commissioning groups shall be such that planned activities are taken up in time and also completed as per schedule and work undertaken round the clock if required. It is responsibility of contractor to discuss on day to day / weekly / monthly basis the requirement of manpower, consumables, tools & tackles / testing equipments with BHEL Engineers and arrange for the same. If at any time the requisite manpower, consumables etc are not arranged then BHEL shall make alternative arrangements and necessary recoveries with overhead cost will be made from the running bills.

4.3.4
Contractor shall cut/open work, if needed, as per BHEL engineer's instructions during Assistance for commissioning for inspection, checking and make good the works after inspection is over.

4.3.5
It shall be specifically noted that the contractor may have to work round the clock and in shifts during the pre-commissioning and Assistance for commissioning period along with or without BHEL engineers and hence considerable overtime payment is involved. The contractor's quoted rates shall be inclusive of all these factors.

4.3.6
In case any rework/ repair / rectification/ modification / fabrication etc is required because of contractor's faulty workmanship which are noticed during the commissioning of, at any stages, the same shall be rectified by the contractor at his cost. If during the commissioning any improvement / repair / rework / rectification / fabrication / modification due to design improvement is required, the same shall be carried out by the contractor promptly and expeditiously. Claim if any, for such work from the contractor shall be governed by clause no. 13.1 to 13.8.

4.3.7
During the Assistance for Commissioning activities and carrying out various tests, if any of temporarily work such mounting of test equipments / cabling etc are required, the contractor shall carry out such work without on any extra cost. The same shall be removed after completion of the activity.

4.3.8
During this period, though BHEL/ client's staff will also be associated in the work, the contractor's responsibility will be to arrange for complete requirement of men and required Tools & Plants, Consumables, Scaffolding and approaches etc., till such time the commissioned unit is taken over for trial operations.

4.3.9
The contractor shall carry out any other tests as desired by BHEL engineer on erected equipment covered under the scope of this contract during testing, pre-commissioning and Assistance for Commissioning, to demonstrate the completion of any part or whole of work performed by the contractor.

4.3.10
The pre-commissioning activities will start in phased manner to meet the various milestones and shall continue till equipments are being commissioning fully with all connected drives/ equipment to HT/LT switchgear or handed over to customer for regular operation. In this duration other erection activities such as cabling or other work shall be carried out by other agency even though HT/LT switchgear board is charged. In order to co-ordinate the work such as issue of safety permit, normalization and compliance of other requirement, contractor shall keep team of one experience engineer / supervisor, technician and helper in each shift specially in 6.6 KV and 415 Volt switchgear rooms at each unit in three shift operation or as decided by BHEL Engineer. The team shall take instruction from BHEL Engineer for day-to-day work and shall not be diverted for other work. No extra payment shall be made for their services.

4.3.11 INTEGRATED ELECTRICAL TESTING/ASSISTANCE FOR COMMISSIONING

The brief scope of work under is defined as below, but not limited to the following. Contractor shall discuss & finalize testing procedure with BHEL Engineer In-Charge for the test to be conducted on Generator Control & Relay Panel testing. Drawing & documents shall be provided by BHEL at the time of testing. BHEL decision in this regard shall be final and biding on the contractor.

The contractor shall prepare all erection / commissioning log sheets and protocols / test certificates as per field quality plan, get is signed by the concerned BHEL/Customer engineer and submit the same to BHEL engineer as per his instruction.

Contractor shall maintain the charged and commissioned equipment till the same is taken over by BHEL's end customer.

Contractor's quoted rates for all concerned items shall include Integrated Testing as defined hereinafter.

4.3.11.1 GENERATOR CONTROLS AND PROTECTIONS RELAY PANELS & ASSOCIATED EQUIPMENTS SUCH AS BUS DUCTS, GT, UNIT & STATION TRANFORMER, GENERATOR BREAKER etc.

1. Integrated Electrical testing/Assistance for Commissioning of Generator Control and Protection Relay Panels & associated equipment, etc. shall involve various activities like relay testing/setting, simulation checks, testing of energy meters, on/off line functional checks on integrated system.

2. Relay Testing in static condition for Generator, Transformers, and associated system by secondary current injection at different current and recording the time duration.

3. Testing and checking of control and protection interlock scheme in static condition and simulation of protection device contact from internal and external devices of all electrical panels.

4. Measurement of Insulations, Winding Resistance, Polarization Index of winding of Generator & associated equipment/ system.

5. Relay setting and checking the stability of protection relays in static and dynamic condition during the OCC (Open Circuit Characteristic) & SCC (Short Circuit Characteristic).

6. Functional checks / testing of synchronizing schemes, other electrical panels during the static and dynamic by simulation / back charging of generator transformer conditions.

7. Monitoring & recording the various parameters during open circuit and short circuit conditions test on generator & associated field equipment like generator transformer, unit auxiliary transformer. Recording and monitoring measurement.

8. Testing of protection current transformer for ratio test by primary injection, magnetization characteristic, polarity test, and IR measurement. Functional checks of relays of protection system by primary injection.

9. Testing of potential transformer for ratio test by voltage ratio, polarity test, insulation resistance measurement etc, testing of surge capacitors, PT isolator in PTPS cubicle etc.

10. Measurement of Insulation resistance of individual equipment and connected together.

11. Tan delta test on generator & other equipments as required.

12. Calibration of energy meters, tri-vector meters, voltmeters, ammeters, current & power transducers etc.

13. Providing temporary shorting link on bus duct or any other location while testing & normalisation after the test.

4.3.11.2 6.6 KV HT SWITCHGEAR, 415 VOLT LT SWITCHGEAR / MCC & DC DISTRIBUTION BOARD ETC

1. Checking of installation for correctness.

2. Mechanical functional checking/ adjustment of individual breaker.

3. Measurement of Insulation resistance of individual breaker, complete switchgear board and combined insulation resistance of individual breaker with cable connected to drives.

4. Testing of Protection Relay, Thermal over relay, Power transducers Energy/ Ammeters, Voltmeters, Power factor, frequency, tri-vector meters & metering etc. in static & dynamic condition relay

5. Conducting test such as Insulation Resistance measurement, Ratio, polarity, magnetisation characteristic, winding resistance on CT and PT.

6. Checking of electrical control & protection interlock of individual breaker and integration with other system.

7. Calibration of energy meters, tri-vector meters, voltmeters, ammeters, power current & voltage transducers etc.

8. Provide assistance for checking the electrical operation of individuals breakers from remote panels / MMI package.

4.3.11.3 The scope of testing & Assistance for Commissioning of electrically operated actuators for valves, dampers, gates, soot blowers etc., will include meggering, providing loop wire on actuator terminal block, adjustments of mechanical/ electrical or electronic position transmitters, setting of limit/torque switches, cable checking, internal wiring checking, local/remote operation from MCC & MMI package, replacement of limit/torque switches if required.

4.4.1 MEASUREMENTS & WASTAGE & CUTTING ALLOWANCES:

4.4.1 For all payment purposes, measurement shall be made on the basis of actual execution in line with drawings/documents/site requirements.

4.4.2 The measurement for cable, impulse pipes/tubes, GI pipe, conduits, flexible conduits, trays etc. shall be made on the basis of length actually laid.

4.4.3 All the surplus, scrap and serviceable materials, out of the quantity issued to the contractor shall be returned to BHEL in good condition and as directed by the engineer.

4.4.4 All materials returned to stores should carry an Aluminium tag indicating the size and type. More than 5 metres length shall be termed as serviceable and shall be returned size wise and category wise to the owner's stores/yard. Cable of serviceable length being returned to the stores in drums shall have their free ends sealed and the balance lengths on the drum(s) shall be noted and certified by the Engineer-in-charge. This shall be applicable only for the purpose of accounting the cables issued for installation.

4.4.5 While carrying out material appropriation with contractor, all the above points will be taken into account. All serviceable material returned by the contractor shall be deducted from the quantities issued for the respective sizes and categories and the balance quantity (ies) will be taken as the net quantity (ies) issued to the contractor. Material appropriation shall be done and allowable scrap quantity calculated as per wastage allowance percentage specified above. Any scrap/wastage generated by the contractor in excess of the allowable percentage shall be charged at the rates decided by the Engineer whose decision shall be final and binding on the contractor.

4.4.6 For all site-fabricated steel items such as supports, racks , frame , Canopy etc. physical measurement shall be made and then converted to tonnage . For steel material supplied to the contractor, all scrap shall be returned to BHEL stores with due accounting.

4.4.7 Every month the contractor shall submit an account for all the materials issued to him by BHEL in the standard Performa prescribed for this purpose by the site in charge.

4.4.8 The erection contractor shall make every effort to minimize wastage during erection work. Cutting and wastage allowance shall be computed on length/ weight of material actually used, measured and accepted. In any case, the wastage shall not exceed the following upper limits.

Sl No.	Item	% Wastage on issued Qty
01.	Each iron/steel section	2
02.	Each size of power cables	1
03.	Each size of control cables	2

4.4.9 If the actual wastage is more than the specified limits, cost of the excess portion will be recovered from the contractor's bill.

4.4.10 The cable take off from drums shall be planned strategically such that jointing in the run of cables and wastage are avoided. For this purpose the exact route length between various equipment/panels as per the cable schedule shall be measured and the route length recorded before laying of the cables. Depending upon the route length the type of cable required for various destinations, the cable drums should be suitably selected for cable laying. Any jointing shall be approved by the BHEL engineer. All the cut pieces/bits of cables, which are not used/unused, shall be returned to the purchaser for accounting towards wastage. The cables damaged by the contractor shall have to be replaced by the contractor at his own cost.

NOTES:
Salvageable scrap shall mean lengths of pipes, multi core cables, other cables etc., that can be used one time or other at a later date and normally they are recovered from the cut-pieces of pipes, multi core cables cables, etc.

Non - Salvageable scrap means the lengths of tubes, pipes, multi core cables, other cables etc., and they are from cut-pieces of tubes, pipes, multi core cables, other cables etc., that cannot be used at all one time or other.

4.5.0 For any items or class of work not specified herein but required for total completion of work, the same shall be carried out as per BHEL requirement. However, payment of these items/class of work shall be regulated on the basis of rate arrived at by either of the following methods:

A) Based on rate of identical/similar items in the rate schedule.

B) Based on the rate arrived from nearby items in the rate schedule.

C) Wherever any item rate for similar type of work or nearby item rate does not exist in the rate schedule, rate will be worked out on the basis of work element or from fundamentals of estimation.

Contractor shall provide necessary resources for completion of such work within the stipulated time schedule. Value of such work shall be included while computing the total value of work finally executed for all contractual purposes, particularly for contract variation purpose.

4.6.0 The contractor's scope of work is further described in the clauses hereafter:

The work will comprise of, but not limited to the following:

4.6.1 INSTALLATION OF PANELS AND HT/LT SWITCHGEAR

1. Electrical control panels, electronic control panels, unit supervisory control desk, HT/LT switchgear, 415 volt LTMCC (if applicable), Analyser panels and transmitter racks/enclosure are normally supplied in suit of either one/two/three or loose shipping sections with integral base frame or loose base frame. These panels may have to be installed as stand alone or in groups consisting of number of panels in each row, depending upon the plant layout and foundation arrangement.

2. The panels shall be transported from stores to the place of installation in vertical position. Care shall be taken such that the switches, lamps, instruments etc . mounted on the panel do not get damaged during transit.

3. Installation of panel shall include fixing of base frame, levelling, alignment, fixing of anti-vibration pads, removal of side covers, fixing of cubical interconnection hardware, interconnection of bus bar /bus bar jointing, wiring interconnection, welding and grouting of panels and base frames, mounting of panel canopy wherever supplied as part of panel, drilling of gland plates, sealing of panels/ cable entries. Where the base frame is not supplied as part of panel supply, the contractor shall fabricate the base frame from structural items at site. Payment for such fabrication will be effected on measured quantity at the rate applicable for structural steel fabrication and installation. Proper sealing of all the holes and cable entries (even if the cable has been laid by others) in the panel is in the contractor's scope.

4. Panels have to be shifted to their locations through floor openings, temporary openings like floor grills, door etc. which shall be a part of work and no claim whatsoever will be entertained with regard to non-availability of opening as per shortest route etc. Panels have to be erected at different locations and elevation in powerhouse building, LT & HT switchgear room, unit control room etc.

5. Panel and instruments once erected in position should be properly protected using necessary care to prevent ingress of dust/moisture. This will have to be periodically cleaned and surroundings have to be kept tidy.

6. Whenever the panels to be mounted on cable trenches, channel supports have to be provided across the cable trench over which the base frame of panel shall be mounted. For such work, structural steel fabrication & installation rate shall be applicable.

7. Normally the panels shall be supplied with meters, relays, electronic modules, contactors, pushbuttons, etc., mounted and pre-wired. However, if such devices are supplied loose/separately for safety in transit, contractor shall mount the same as part of panel installation work and no extra payment shall be made for this.

8. Supplier's instruction manuals, packing slips, door keys etc. received along with the panels will be handed over to BHEL's engineer on opening of the panels.

9. Regular cleaning of the panels as per the instruction of BHEL engineer till handing over of the set to customer is to be carried out by the contractor free of cost.

10. 24 / 48 Volt DC Interposing Relay along with mounting base shall be supplied separately for mounting in the various feeders of 6.6 KV HT switchgear boards and 415 Volt MCC Board / Switchgear Panel Boards for uni-directional / bi-directional drives, solenoid valves. 2 Nos. interposing relay may be required to be mounted in each feeder. Internal wiring for these relay shall be pre-wired in the feeders, wires to be terminated on relay terminals. Approximately quantity is 3500 Nos. Contractor shall mount the same and terminate the wire as part of panel installation work and no extra payment shall be made for this work.

4.6.2 STRUCTURAL STEEL FABRICATION AND INSTALLATION

A INSTRUMENT/ JUNCTION BOX FRAME/ CABLE TRAY & MISC STRUCTURES FABRICATION

1. Structural steel material like MS angles, channels, beams, flats, plates etc. shall be supplied in running meter and the same shall be used for fabrication of panel base frame, canopies for instruments/panels/ drives/JB/push buttons etc., instrument/junction box frames, impulse pipe/instrument air pipe supports and instruments etc.

2. This shall include cutting to size, contouring of ends for connections if required, welding, grinding of excess weld deposits/burrs, drilling of holes for mounting of device/instrument, installation at location, levelling, alignment, providing bracings and painting etc. No gas cut holes will be permitted. All paints, primers, etc are in the scope of the contractor.

3. All the fabricated supports/frames shall be painted as per painting specifications.

4. Frame installation at site may involve mounting either on concrete floor by grouting/using anchor fasteners or on steel structure by welding etc. All consumables including anchor fasteners shall be arranged by the contractor. Where required, as part of work, concrete floors may have to be chipped out to reinforcement depth for anchoring the frames. Wherever grouting is required, contractor shall arrange all the required material including cement/grout mix, shuttering etc., necessary labour and meet all other requirements as part of work.

5. In case, structural cable trays, bends, tees, reducers etc., are required to be fabricated from structural steel and installed, unit rate applicable for fabrication and installation of structural steel shall be applicable in such instances.

6. In certain packages, members of frames/rack for mounting of junction boxes/ instruments may be supplied readymade. These have to be assembled prior to installation. The installation rate as quoted shall include assembly of the frames.

7. Gas cutting of tray/impulse pipe support and holes in frame is not permitted. Only hacksaw cutting/ drilled hole shall be permitted

B CABLE TRAY SUPPORT

1. GI Structural material shall be supplied in standard length. The support member required for typical installation to be cut suit to site / lay out requirement from the straight length. Tray supporting members to be installed for typical installation as indicated in sectional arrangement of cable tray route plan. BHEL's customer shall provide projected dowels embedded in cable trenches for welding of supports. The support shall be either bolted or welded type as per drg. No cutting by gas shall be permitted.

2. Wherever supports needs to fixed on concrete slabs or ceiling with anchor fastener, and anchor fastener shall be arranged by contractor as part of work.

3. All galvanization damaged due to cutting / welding operation required to be carried out for the installation of cable support system shall be made good with application of cold galvanization paint (to be arranged by the contractor at his cost) immediately after completion of welding.

4.6.3 CABLE LAYING (POWER/CONTROL/INSTRUMENTATION SHIELDED CABLES/PLUG-IN CABLES/INTRA-PLANT BUS/DATA HIGHWAY, ARMOURED/UN-ARMOURED,SINGLE/MULTI-CORE,PVC/HR PVC/FRLS/TEFFLON/XLP INSULATION)

1. Cable lengths include cutting to the required length, laying in overhead/underground cable trench/through pipes/flexible conduits, dressing/clamping in tray, drilling of holes in gland plates in panels and junction box, glanding, splicing, dressing of spliced wire inside the panel and JBs, providing printed ferrules **(contractor to arrange ferrule printing machine(s) as required)**, termination by using crimp type copper tinned/aluminium lugs, insulated/un-insulated, crimp and soldering termination, plug-in connections with insert type crimping, providing identification cable tags, PVC/aluminium at both the ends and at appropriate interval throughout the route length, continuity checking, insulation resistance checking, high voltage test on HT cables.

2. Entry to the panels, JB's may be at top, side or bottom. All cables are required to be supported and clamped near to the panel.

3. Wherever cable glanding is not possible, either due to the gland plate size limitations or more number of cable entries, pre-fab plug-in cables, for such cases, cables may have to be lifted inside the panel either making cut-out in gland plate and providing rubber profile for sharp edge protection or alternatively, provide 4/6" PVC pipe coupling gland and these pipe coupling gland shall be supplied by contractor within the quoted rate of cable laying.

4. Supply of copper tinned lugs conforming to IS: 694 of various types (pin, ring, fork, snap-on) upto 4 sq.mm, PVC cable ties, printable ferrules, PVC button and tapes, cable identification tag of PVC/metal, clamping and dressing material with hardware, PVC sleeves etc. shall be supplied by contractor within the quoted rate for cable laying. The quality and make of cable lugs shall be got approved from BHEL engineer prior to their use on job.

5. All care should be taken to avoid abrasion, tension, twisting, kinking, stretching of cables during installation.

6. Cable shielding – all signal cables are supplied with bare shielded copper wire/with breaded wire shield, general sealed wire is kept isolated at instrument/field device end and continuity is maintained through JBs and getting earth at panel end only. While terminated the sealed wire either in panel or JBs, PVC sleeves is to be used to avoid two-point earthing.

7. Wherever cable runs through the duct, conduit, valves, the entry and exit points shall be sealed using fire/weather proof compound. In addition to this, cable entry in panels, MCC/HT/LT breakers, instruments, electrical actuators etc. are also required to be similarly sealed. **The required material for doing so shall be included by contractor in the cable laying.**

8. Many of the cable trays and cables have to be laid in cable trenches. For this purpose, the cover of the trenches have to be opened for working in site and whenever the cables are to be laid in existing cable tray, all safety precautions have to be observed.

9. After completing the work, the trenches have to be cleaned and covers put back into position. Contractor shall also carry out de-watering from the trenches if required and arrange pumps etc. at his cost.

10. Looping wire at terminal block of panels and electrical actuator as shown in the inter-connection diagram is to be done by contractor at no extra cost.

11. Contractor shall carefully plan the cutting schedule of each cable drum in consultation with BHEL site engineer such that wastages are minimised. Recovery will be made in case the wastages are exceeding the wastage allowances fixed in this contract.

4.6.4 POWER TRANSFORMER

The scope of work under this head is defined as below.

1. Transportation of transformers tank and accessories from BHEL site stores/ Storage yard to the transformers foundation, erection, testing & Assistance for Commissioning.

2. The transformers shall be handled in such a manner so that no jerk is transferred to the core, winding and internals of the transformer.

3. Transformers are generally supplied in partly assembled condition either filled with oil upto the core end winding level or gas filled. Accessories, like radiators, conservator tank, pipes, fittings, hardwares, gaskets, buchholz relay, marshalling box, relief vent, valves, pumps, cooling fans, cables, bushings, radiator headers/fans, rollers, tap changer drive unit, cables of various sizes for interconnection from marshalling control box to field devices, bushing turrets and oil in 205/210 ltrs. barrels shall be supplied loose.

4. Contractors have to transport the transformer tanks & accessories of transformers from BHEL stores/ Storage yard to respective foundations. The approximate distance from BHEL Stores / Storage yard is 2.0 to 3.0 KM.

5. Generator Transformers etc., tank shall be made available to the contractor 40 to 50 meters away from the respective foundation, further transport and shifting to the foundation shall be in the scope of this work. The shifting operation may require dragging, fixing of wheels, rollers and turning of transformer to a suitable location enroute to suit the layout. The contractor shall arrange wooden sleepers, winches, jacks, rails, crane etc at his cost for this operation. However accessories shall have to be shifted from stores.

6. Placement on plinth, alignment with respect to the foundation and lay out drawings.

7. Internal inspection to verify the intactness of core and winding, tap changer leads, off-load switch, measurement of core and core bolt insulation.

8. In case of large capacity of transformers when supplied partly oil filled/gas filled, after internal inspection, the transformer shall be kept under vacuum for a period (to be decided by site engineer) and treated oil to be filled upto required level.

9. Each drum of oil to be tested for BDV and if BDV is less, then each drum should be filtered separately.

10. Contractor has to arrange storage tank of 10 kilo litre capacity with internally sand blasted and coated with one coat of oil resistance paint. Oil from drums to be transferred in storage tank and filtration to be carried out to achieve the required BDV/ withstand value. This treated oil to be filled in the transformers and auxiliaries. However, for low capacity of transformer, a separate storage tank for mass filtration may not be required.

11. All the accessories shall be assembled/mounted as per OGA drawings and these should be thoroughly cleaned prior to installation.

12. Drying out of transformer and filtration of oil in cooling bank, pipe line, diverter tank of tap changer etc. to be done with ultra vacuum filtering machine of adequate capacity and adequate numbers . Drying out process shall be carried out round-the-clock and contractor shall deploy trained manpower for this purpose. If required, more than one filtration machine shall be used.

13. During dry out process, contractor has to plot the curve for insulation resistance value/time/oil temperature. Hourly reading to be recorded till completion of the dry out.

14. The criteria for deciding completion of drying out shall be breakdown value of oil, PPM value of contaminants in oil, resistively of oil, insulation resistance value and polarisation index.

15. The filter machine(s) capacity if found to be inadequate, or in case of failure of existing machine(s), alternative arrangement is required to be done to meet the required result and time.

16. Due to unforeseen reasons the commissioning of transformer is delayed after first drying out and if required, the contractor shall carry out the oil filtration of assembled transformer.

17. Contractor shall arrange required testing equipments for carrying out electrical test like voltage ratio, turn ratio, vector group, magnetic balance, winding resistance measurements, BDV value of oil, tan delta measurement of bushings & winding, insulation resistance, measurement of oil PPM, acidity, resistively and tan delta test. The contractor shall arrange oil sample testing for PPM/resistively or any other tests applicable for oil sample at approved testing laboratory at his own cost including all incidental expenses.

18. Contractor shall discuss and finalise installation and testing activity procedure with BHEL/customer prior to starting the work.

19. Contractor should have valid electrical contractor ship licence to carry out installation of high voltage equipment.

20. Dry type transformer is supplied in sheet metal enclosure with natural/forced air-cooling. The contractor shall carry out all electrical tests as applicable for other transformer.

4.6.5 ELECTROSTATIC PRECIPITATOR

1. ESP shall have four flue gas passes and each pass comprises of rectifier transformer (silicon oil filled), Auxiliary Control Panels, electronic controller, LT Main switch board and its bus duct, Drives for Rapping/Collecting/ Gas damper screen, heating element for hopers/shaft and supporting insulator housing, ash level indicator and EP management system (software based) including computer interface and associated interlock and protection.

2. Transformer shall be erected by other agencies engaged by BHEL. Scope of work covered under this contract is oil filtration of transformers and erection and testing of various devices as enlisted in rate schedule. Contractor shall provide silicon oil filter machine as a part of scope. Contractor has also to provide operator round-the-clock for oil filtration and other necessary testing equipments. Contractor shall utilise power supply for filter machine from the source, which is given for the construction purpose, and contractor shall arrange required cables.

3. Ash level indicators are supplied loose in various components such as probe, electronic unit, **connecting wires and flexible conduit etc. The rate is inclusive of all these**. No separate rate for Flexible conduit for ash level indicator / probe etc is permissible.

4. Panel type hopper heaters shall be mounted by Mechanical agency. However **Electrical wire lead coming out of heater to be brought upto Junction box through flexible conduit by clamping it on hopper body . The rate is inclusive of heater testing & Assistance for Commissioning. No separate rate for Wiring & Conduit / clamp fixing shall be permissible** .

4.6.7 ISOLATED PHASE BUS DUCT 16.5 KV, 12KA CONTINUOUS AIR-COOLED.

1. GENERAL DESCRIPTION

   Generator isolated bus duct is connected to low voltage side of Generator transformers 315 MVA and main bus duct shall have tee off connection for unit transformer, LAVT cubicles, excitation transformer and air pressurisation equipment. Bus duct consist of round / octagonal/ box hollow aluminium alloy conductor and supported inside aluminium enclosure with post insulator. Flexible connections and expansion joints are provided at terminals and intermediate point to alleviate stresses. Ring type protection current transformer will be mounted inside the bus duct.

Isolated phased bus duct shall have tap connection for potential transformer, surge protector etc. housed in a metal clad cubicle, UAT and NG cubicle/ resistor cubicle. Various electrical tests have to be performed before and after erection.

Bus duct enclosure /conductor is a continuous welded type. Conductor, enclosure, makeup pieces, shunts pieces etc have to be welded at site.

2. The scope of for Isolated Phase Bus Duct shall includes Transportation of material from stores/ storage yard, preparatory work such as erection of supporting structure, placement of sub assemblies / equipments, alignment, edge preparation of conductor / enclosure, welding of conductor / enclosure, welding of shunt pieces & make up pieces, installation of seal of bushing & wall frame assemblies, shorting links, earthing, LAVT cubicle, copper flexibles, copper rubber bellows, weldable/ bolted flexibles, installation of air pressurising unit and its associated piping work and cable etc, testing and Assistance for Commissioning.

3. Pre-fabricated G.I. supporting members shall be supplied in loose and to be erected as per lay out drawing. Foundation pockets and embedded plate inserts shall be provided as per lay out drawing (on floor for bottom support and on bottom of concrete slabs). Contractor shall weld the supports on insert plate and shall carry out grouting(including supply of grout materials) / encasing of foundation plate etc after complete alignment/bolting of structural members. If any modification required in supporting structure due to site conditions, the same shall be carried out without any extra cost. All welded joints shall be applied cold galvanizing zinc paint (paint in the scope of the contractor).

4. Required aluminium welding of conductor, enclosures, shunt, make up pieces, aluminium flexible etc as detailed in drawings has to be carried out by contractor. MIG welding shall be applicable. Contractor shall arrange necessary welding equipment/ accessory in sufficient number, filler wire, argon gas and other required consumables at his cost. The technical specification of MIG welding machine, filler wires, etc are given in relevant sections in these specifications. Or BHEL APPROVED MAKE.

5. During erection of bus duct/enclosure, makeup pieces and shunts, if any modifications needed to match the alignment shall be part of work and no extra payment shall be made.

6. All bolted joints and flanges shall be tightened with torque wrench to the approved torque. Wherever bolted joints, the same shall be cleaned and a layer of anti-oxidation paints shall be applied. Such paints etc will be arranged by the contractor within the quoted rates.

7. Top chamber/adopter box for line and neutral side, hood assembly at UT, hood assembly at excitation transformer and at LAVT cubicle end shall have drilled hole in flange. If any mismatch of the hole in above with respect to the counter flange/welded studs provided on UAT, LAVT and excitation cubicle, the contractor shall drill new holes if required within the quoted rates.

8. Proper sequence shall be followed during erection to avoid any mismatch and alignment problem.

9. Prior to installation of bus duct assemblies in position, the various component like conductor, insulator shall be inspected and cleaned and insulation resistance to be measured and recorded. If any insulator found damaged, the same shall be replaced.

10. Electrical test on current transformers and potential transformers shall have to be carried out prior to installation & during pre-commissioning. The tests are insulation resistance measurement, winding resistance, magnetisation characteristic, ratio test, water ingress and air leak test on assembled bus- ducts.

11. Minor civil work such as chipping, levelling of foundation, providing pockets, drilling/enlargement of holes in structure, bus bar etc. which are incidental to the erection of bus duct shall not be treated as extra.

12. All miscellaneous items such as disconnecting links, flexibles, shorting bars, hardwares, conduit for wiring, marshalling box, CTs and Pts wiring through conduit, earthing materials, bus bar fish plates etc. are part of bus duct installation. Hence separate break-up quantity is not given in BOQ.

13. Round makeup pieces for main and tee off duct shall be supplied in two halves and it involves but circumferential and horizontal welding at parting plain.

14. Air tightness and water tightness test have to be carried out on completion of bus duct installation. In case of any leakages, contractor has to rectify and bring to the required level of air tightness/water tightness without any extra cost.

15. High voltage test of bus duct is to be carried out as per the instruction of BHEL engineer. Contractor shall arrange necessary test equipment/ instrument for conducting various electrical tests at his own cost.

16. Contractor has to carry out final painting as per standard colour coat recommended by BHEL. Paints and consumables shall be in contractor's scope.

17. Shunt pieces shall be supplied in two halves and to be welded between two-phase bus duct at transformer end. The shunt pieces to be welded on both the side on matching plain and bus duct circumference and horizontal plain

18. Contractor shall conduct 20 % radiography and 100% NDT test on welded joints.

19. Enclosed drawings are for estimation and tendering purpose only. Contractor has to ascertain quantum of work involved. The BOQ as furnished in this tender specification for Isolated Phase Bus Duct & Segregated Phase Bus Duct are tentative / approximate. The enclosed drawings are for tender purpose only. Contractor has to ascertain the

quantum of work involved and quote the lump-sum value, as called in the rate schedule, without any additional compensation for any variation in length or numbers of joints.

20. One end of the enclosure to be earthed to the station earth at shunt location where all three-phase enclosure is shorted. Wherever shunts are not provided, each phase should be earthed separately.

21. In case of bolted bus-ducts, phase split covers, rubber bellows, clamping earth straps to be connected to maintain the electrical continuity and in turn enclosure gets earthed at one point.

22. All other equipment such as LAVT, NG transformer/ resistor cubicle, air pressurization, CT chambers, junction boxes, etc to be earthed at two points to the earth grid.

4.6.8- 6.6 KV SEGREGATED PHASE BUS DUCT.

Each set of 6.6 KV Segregated phase bus duct shall be supplied complete with Aluminium alloy enclosure and conductor with epoxy bus support insulators arrangement, silica gel breathers, inspection windows, rubber bellows, flexible connector, bi-metallic strips etc. Galvanised iron earth bus shall be provided for enclosure continuity. All bolted joints shall have high tensile steel hardware cadmium plated. Each set of SP bus duct is meant for interconnection from low voltage side of Unit, Unit Auxiliary and Station Transformer to 6.6 KV switchgear board and bridging bus duct between the switchgear boards. The bus duct consists of rectangular conductor made of aluminium alloy supported on post insulator and housed in aluminium sheet metal rectangular enclosure. The bus bar enclosures are having bolted joints. The bus duct shall be supported either from bottom of the concrete slab with embedded insert plate/ TG building supporting structural members and pocket provided on foundations. The bus duct assemblies, supporting structures shall be pre-fabricated and to be assembled as per lay out drawing. **Other erection and testing requirement shall be similar to the isolated phase bus duct, except the welding of bus bar and enclosures.**

Each set of bus duct shall be supported with supporting structure, which shall be fabricated from standard steel section and hot dip galvanised. All structure & bus duct assemble shall be erected as per drawings.

4.6.9 6.6 KV INDOOR SWITCHGEAR BOARDS

1. The scope of work includes transportation of material from stores / storage yard to erection site installation, testing and Assistance for Commissioning of switchgear. Contractor shall carry out works like fixing of base frame, fabrication of base frame if required, placement, levelling, alignment, fixing of anti-vibration pads if applicable, fixing of inter-connecting cubicle gasket, removal of side covers, fixing of cubicle inter-connecting hardwares, bus bar jointing, wire inter-connection, fixing of safety barriers and shrouds, welding or grouting of panels with supply of grout material, drilling of holes in gland plates, ceiling of cable entry, chipping ,minor civil works etc. After completion of installation, various electrical tests to be conducted such as insulation resistance measurement, high voltage test, testing of CTs and PTs protection

relays, meters, integrated electrical testing of control and protection system, mechanical checks of individual breaker etc. Contractor shall arrange all required testing equipments and consumables at his cost.

2. All the breakers are indoor type and shall be housed in 6.6 kV switchgear room. Panels have to be shifted to their location through floor opening, temporary opening like floor grills, doors, removing and re-fixing of grills for panel lifting shall be part of the work and no claim whatsoever will be entertained with regard to non-availability of opening as per the shortest route etc.

3. Normally breakers will be supplied complete with instrument, protection relays etc. mounted and pre-wired. However, if necessary, dismantling of existing component, making wiring modification to suit to operating condition, mounting and re-wiring of new component will be carried out without any extra cost if supplied loose for safety in transit to avoid damages.

4. Wherever breakers panel to be mounted on cable trench, supports have to be provided across the cable trench over which the base frame of the panels shall be mounted.

5. The contractor has to do touch-up painting of switchgear panel wherever necessary. This includes supplies of paint.

6. The relevant erection drawing is enclosed for tendering purpose. Contractor has to ascertain the quantum of work involved and quoted lumpsum value as called in rate schedule.

7. After installation of switchgear board, for easy withdrawal of VCB truck, ISMC 75x500 mm to be grouted with suitable anchoring arrangement.

8. In addition to switchgear, which shall be installed as per layout and floor plant drawings, the following accessories shall be supplied which are required for testing and Assistance for Commissioning for maintenance purpose. Drawl of such material will be part of regular erection work. Contractor shall hand over to customer after completion of work as per the instruction of BHEL engineer without any extra cost.

    1) Set of accessories comprises of wedge type platform, spring charge handle, interlock and slow closing handle.

    2) Feeder earthing truck breaker type

    3) Bus bar earthing truck breaker type

4.6.10 SOOT BLOWER SYSTEM

Soot blower system comprises of Local Starter Boxes, Local Power distribution boxes / MCC, Micro-processor based plc panel with mimic diagram and control station, push button boxes, junction boxes, wall blowers/LRSB with drive mechanism, integral control box with limit switch and internal wiring, inter connecting cables between field blowers, Local starter boxes , Local Power distribution Boxes /MCC and PLC panel etc. The scope of work for testing, Assistance for Commissioning covers the items/devices as

per rate schedule and the testing, Assistance for Commissioning of blowers shall be carried out in close co-ordination with mechanical agencies who shall be erecting these blowers and contractor shall obtain clearance from BHEL engineer prior to start of work. The contractor shall carry out the following works under testing & Assistance for Commissioning:-

01 Pre-commissioning checks and tests on local Starter Boxes, Local Power Distribution Boxes/ MCC, blowers, PLC panels, energisation of MCC and its feeders, wiring checks, insulation resistance measurements, testing of thermal over load relays etc.

02 Adjustment of limit switches, torque switches, internal wiring checks, minor wiring modification to suit to system requirements for wall/LRSB blowers.

03 Electric operation of each blower from local, / local starter / PDB / MCC and PLC panels and from Unit control board.

04 Providing loop on terminal block of MCC individual feeders & blowers.

05 During pre-commissioning/post-commissioning of soot blower system, the component like TB's, limit switch, torque switch, over load relay, contactors etc. if found defective, contractor shall replace such components without any extra payment.

4.6.11 DIGITAL STATIC EXCITATION SYSTEM.

System comprises of regulation, field flashing, thyristor, field breaker panels, Excitation Transformer trunking cubicle along with copper bus bar/flexible connectors/air duct and blowers/blower control box including internal wiring, and associated inter connecting cables.

4.6.12 ELECTRICAL HOIST

Electrically operated hoist of capacity varying from 3 MT to 35 MT are provided for maintenance purpose for ID/FD/PA fans, Mill area, Air Heater, ESP and other area in boiler. Mechanical erections of hoist components such as runway beams, hoist carriage, drive unit, etc. shall be done by other agency. The scope of work covered in this tender specification for erection & Assistance for Commissioning is installation of DSL system and associated accessories. The scope of work for the contract in this package is as under:

1. **TEE IRON TYPE DSL SYSTEM:-** It consists of tee iron guide for cable trolley and associated supporting structural members, trailing cable, cable guide trolley, dog chain, switch fuse unit, limit switch etc.

2. **TAUT WIRE TYPE DSL SYSTEM:-** It consists of end bracket, Galvanised wire rope , turn buckle/ straining bolt, real insulator,/cable guide trolley ,cable, switch fuse unit, rope clamps, leather bands, dog chain, limit switch etc.

   DSL system shall have to be erected at higher elevation. Contractor shall take all safety measures while carrying out the work.

3. Installation of tee iron &other structural steel member, unit rate for fabrication & installation shall be applicable and other items unit rate shall be paid,

however cable dressing, fixing of leather bands, rope clamps and any incidental work such making approaches for executing the work, scaffolding etc. shall be part of work.

4. Assistance for Commissioning & testing of electrical hoists shall includes panel wiring check, IR measurement, functional check, over load relay testing, trial run, providing assistance during load test, replacement of component if required etc. However, preparatory work for load test and arrangement of load etc. shall be done by other agency.

4.6.12 A 415V MOTOR CONTROL CENTERS (MCC) & DC/AC DISTRIBUTION BOARDS

Motor control centres are double front draw –out/non-draw type consisting of circuit breakers units, contractor/starter, switch fuse units, MCC, Protection & metering relays/ instruments etc. arranged in multi tier construction. These PCC and MCC are mainly supplied to cater to the requirements of drives, valve actuators etc.

DC distribution Boards is single front non-draw out type consisting of circuit breakers, contactors, starters, fuse units, MCB etc arranged in multi-tier construction. Shall be located in LT switchgear room to cater the dc supply requirement.

The scope of work for the LT switch board and DCDB covers receipt of materials from stores, transportation to the respective location, erection, testing, Assistance for Commissioning and handing over.

Rubber mats shall be supplied by BHEL for HT/LT switchgear and the same shall be laid wherever required as part of work.

4.6.12 B ELECTRICAL LAB EQUIPMENT; The lab equipments are to be mounted in electrical lab and electrical connections are to be made. Normally supervision of equipments during erection & commissioning shall be done by supplier. Indicative details are given in section 16.

4. 6.12.C.1 BELOW GROUND EARTHING: Treated test pits , Test Links, Earth Electrodes, Column earth connections for various areas will be as per Drawing PE – DG-239 -509 –E004 Rev A sheet 01 TO 10, which is attached with these specifications. Earth rod 40 mm shall be is sued from BHEL stores. **Supply of all other items including charcoal, salt, civil items is also in the scope of the contractor. Civil works are also to be carried out by the contractor**. The contractor shall also connect this pit to the earth grid (by other agency) at nominal distances of 3 to 5 meters by 40 mm rods, Details are given elsewhere in tender.

4.6.13 PAINTING

Colour Banding, Legend and Identification Marking, Direction Marking etc. shall be in scope of the contractor for all items (Erection or Assistance for Commissioning) in the scope of the contractor.

4.6.13.1 TRANSFORMERS & BUS DUCTS

Exposed metal surfaces of Transformers and Bus Ducts erected by the contractor shall be painted with two coats of Finish Paint after thoroughly cleaning the surface from dust, rust, greases, oils, scales, etc, by wire brush, scrapping, machine buffing, water washing and any other appropriate method as specified in relevant erection documents. Bus Ducts shall first be coated with two coats of Primer before application of Finish Paint. Touch-up primer coat shall also be applied on Transformers as and where necessary. Supply of paints, etc for the above is in the scope of the contractor.

4.6.13.2 STRUCTURALS

Structural components may be supplied without any primer/paint coat from shop. The surface of such items shall be cleaned as per specifications and then coated with two coats of ROZC (IS: 2074) Primer. Supply of Primer, etc is included in the scope of the contractor.

4.6.13.3 PANELS, JUNCTION BOXES

Panels and Junction Boxes shall be Touch-up painted as and where original shop paint is peeled off. Necessary surface cleaning and preparation shall be done by the contractor as per relevant painting codes followed by two coats of Primer and two coats of Finish Paint. All necessary paints, primers, etc are to be arranged by the contractor within the quoted rates.

4.6. 14 ESTABLISHMENT OF OFFICE

The work under this scope being quite sophisticated and also quite extensive, for proper planning, monitoring, reporting, etc of ongoing works, the contractor shall establish his own computer(s) and printer(s) at his site office, along with suitable operator(s), consumables, etc*. Non-establishment of above equipment will attract penalty @ Rs 10,000 (Rs Ten thousand only) per month.*
BHEL uses its own software SOMS (Site Operation and Management System) for total project execution and billing. The contractor shall also provide adequate and suitable manpower for updating / entries into SOMS in BHEL computers at site.

4.6.15 Troubleshooting during plant operation

During pre-commissioning / commissioning stages when the plant will be under various stages of operation, it will be necessary to have continuous (day and night) presence of suitable manpower along with required tools to attend to any defects etc that may arise during such operation. The contractor will be required to put such personnel in shifts in both electrical and C&I area. The bidder must also take this aspect into consideration.

4.6.16

Equipments/instruments etc., under the above scope of erection and Assistance for Commissioning are generally despatched from BHEL's manufacturing units / vendor's works at site well before start of erection. Sometimes, such despatched materials may get stuck up with transporters/railways. The contractor shall provide support / manpower for necessary chase up for removal of such bottlenecks in transportation. Also, for smaller items, it could be necessary to depute his person

to personally carry certain items from works to site. Requirement of such activities which will be decided by BHEL engineer and chase up activities, if required, shall be performed under authorization by BHEL. The above services shall be provided without any additional price to BHEL.

4.7 EXCLUSIONS

The following are specific exclusions from this work.

1. Erection of dampers, valves, electrical actuators, pneumatic actuators.
2 Erection of ESP rectifier transformer, electrical heaters, rapping motors, mechanical interlocks.
3 Erection and Assistance for Commissioning of HT/LT motors (except those specified herein)
4 Cable tray and cabling work (except those specified herein in the rate schedule)
5 Erection, testing and Assistance for Commissioning of elevators and DG sets.

Note:
The aforesaid exclusions should not be construed as exhaustive. They are meant for general guideline. BHEL reserves the right to include or exclude any item which is required for completing the job as per rates indicated in rate schedule. Contractor should carry out all such jobs as per the instructions of BHEL engineer.

Section-5

Special Conditions of Contract

5.0 Obligations of the Contractor (Tools, Tackles, Consumables etc.)

5.1 Labour Colony

BHEL'S customer will provide the open land with single point for drinking water and electricity. Contractor shall make further arrangements for constructing the labour colony and including lighting, water distribution and suitable provisions of drainage/sanitation.

5.2 Tools & Plants and MMD

5.2.1
The contractor shall provide all required Tools and Plants, inspection, Measuring and Monitoring Devices (MMD), Handling & Transportation Equipments for the scope of work covered under these specifications in addition to the T&P indicated to be provided by BHEL in **Appendix-I**. An indicative list of major T&P and MMD to be deployed by the Contractor is given in the **Appendix-III**. It may be noted that this list does not intend to exhaustively cover the contractor's responsibility with regard to T&P to be deployed by him. BHEL will provide the services of their T & P listed in Appendix-I, free of charge, on sharing basis. Refer section-7 for further details with regard to BHEL's T&P.

5.2.2
All tools and tackles to be deployed by the contractor for the work shall have the prior approval of BHEL engineer with regard to brand, quality and specification.

5.2.3
Timely deployment of adequate quantity of T&P is the responsibility of the contractor. The contractor shall be prepared to augment the T&P at short notice to match the planned targets and to achieve the milestones.

5.2.4
Contractor shall maintain and operate his tools and plants in such a way that major breakdowns are avoided. In the event of major breakdown, contractor shall make alternate arrangements expeditiously so that the progress of work is not hampered**.**

5.2.5
In the event of contractor failing to arrange the required tools, plants, machinery, equipment, material or non-availability of the same owing to breakdown, BHEL will make the alternate arrangement at the risk and cost of the contractor.

5.2.6
The T&P to be arranged by the contractor shall be in proper working condition. The operation shall not lead to unsafe condition. The movements of cranes, and other equipment should be such that no damage/breaking occurs to foundation, equipment, material and men. All arrangements for the movement of his T&P etc, shall be the contractor's responsibility.

5.2.7
Normally, for welding only the use of welding generators/rectifiers will be permitted. The use of welding transformers will be subject to the approval of BHEL engineer.

5.2.8
The contractor at his cost shall carry out periodical testing of his construction equipments and calibration of measuring instruments (MMD) and tests. Test/ calibration certificates shall

be furnished to BHEL. MMD shall be calibrated only at accredited laboratory as per the list available with BHEL or any other laboratory approved by BHEL.

The contractor shall provide all the necessary steel scaffolding materials, temporary structures and necessary safety devices etc. during preassembly, calibration, erection, testing and commissioning of the equipment.

Contractor shall maintain and operate his tools, plants, calibrating instruments etc. in such a way that major breakdowns are avoided. In the event of major breakdown, the contractor shall make alternate arrangements expeditiously so that the progress of the work is not hampered.

5.3 Consumables

5.3.1
The contractor shall provide all consumables required for carrying out the work covered under these specifications excepting those, which are specifically indicated as BHEL scope.

5.3.2
All consumables to be used for the work shall have prior approval of BHEL engineer with regard to brand and quality specifications. Test reports/ certificates in respect of these consumables, wherever applicable, shall be submitted to BHEL engineer.

5.3.3 Primers, Paints etc.

The contractor shall provide Primer (ROZC as per IS:2074), Synthetic Enamel Paint (IS:2932) and Aluminum Paint – as necessary for respective painting area for the scope of painting work indicated in Section-4 as well as for protection of site weld joints and gas cut locations. Contractor shall also arrange to provide the required thinner and other consumables, T&P and implements etc. required for application of Primer and Paints. All primers, paints and thinners shall be sourced by contractor only from BHEL approved manufacturers. Some of them are as listed under.

1) M/s Asian Paints
2) M/s Berger paints
3) M/s Jenson & Nicholson
4) M/s Shalimar Paints
5) Any other BHEL approved manufacturers.

5.4 Welding Electrodes, Filler Wires for MIG/TIG Welding and Gases

5.4.1
Contractor at his cost shall arrange all the required welding electrodes as approved by BHEL. It shall be the responsibility of the contractor to obtain prior approval of BHEL, regarding manufacturer, type and brand name of welding electrodes etc. On receipt of the electrodes at site, it shall be subject to inspection and approval by BHEL regarding type of electrodes, batch number, date of expiry etc. Batch test certificates shall be made available to BHEL for verification & records.

BHEL reserves the right to reject the use of any electrodes, if found non-acceptable because of bad quality, deterioration in quality due to improper storage, shelf-life expiry, unapproved type/brand etc

5.4.2
All the required gases for welding and gas cutting like Oxygen, Acetylene, Argon (welding quality), Nitrogen etc. shall be arranged by the contractor at his cost.

5.4.3
If at any time during the execution of work, it is noticed that the work is suffering on account of non-availability of consumables from the contractor's side BHEL will make alternate arrangements at the risk and cost of contractor. The expenditure incurred with overheads will be recovered from the contractor.

5.4.4 TEST PIECES FOR WELDERS QUALIFICATION TEST.

Materials for Test Pieces for qualification of structural welders shall be supplied by the Contractor. Contractor shall also prepare the test coupons from such materials. All expenses in respect of **welders' qualification test and Welding Process Qualification test** shall be to the contractors account.

5.5 **Field Office**

5.5.1
The contractor shall make his own arrangements for field office and stores for accommodating necessary equipments, tools room for execution of the work. Only open space will be provided by BHEL's customer free of charges within the project premises as per the availability of space.

5.5.2
On completion of work, all the temporary buildings, structures, pipelines, cables, etc shall be dismantled and leveled and debris shall be removed as per instruction of BHEL by the contractor at his cost. In the event of his failure to do so , the same will be arranged to be removed and expenditure thereof will be recovered from the contractor. The decision of BHEL engineer in this regard shall be final. However, the scope of dismantling and leveling the area is limited only to the contractor's site office, yard and other spaces occupied by the contractor.

5.6 **Area Lighting**

Contractor shall arrange adequate floodlights, hand lamps and area lighting. Provision of distribution lines for lighting from the single point to the required place with proper distribution boards, observing the safety rules laid down by the electrical authorities of the state shall be done by the contractor including all the materials like cables, fuses, switch boards etc

5.7 CONSTRUCTION POWER & WATER

5.7.1
Construction power (three phase, 415v / 440v, 200 amps, 4-wire) will be provided at one point near the erection site free of charge. However all taxes, duties, levies, charges etc, as applicable, shall be borne by the contractor. Required energy meter, cables, fuses, distribution boards, switches, switchboards, bus bars, earthing arrangements, protection devices e.g. ELCB, if any, and any other installation as specified by Statutory Authority, Client in this regard, for drawl of construction power shall be arranged by the contractor. Obtaining approvals, payment of necessary fees, duties etc towards the clearance of such installations, if any, prior to these being put to use or as may be specified, shall be the responsibility of the contractor.

5.7.2
It shall be the responsibility of the contractor to provide, maintain the complete installation on the load side of the supply with due regard to the safety requirements at site. All cabling and installations shall comply in all respects with the appropriate statutory requirements. The installation and maintenance of this shall be done by licensed and experienced Electrician.

5.7.3
The contractor shall install necessary Capacitor Bank etc. with appropriate control mechanism to maintain the Power Factor as per the guidelines in vogue from time to time in this regard. Any levy imposed by the customer / authority for any deviation in power factor shall be passed on to the contractor.

5.7.4
Contractor shall be equipped with back-up power supply arrangement like DG set and diesel operated welding machine etc. to tackle situations arising due to failure of customer supplied power, so as to ensure continuity and completion of critical process that are underway at the time of power failure or important activities planned in immediate future.

5.7.5
The Contractor at his own cost shall arrange water for Construction purpose as well as drinking water. Customer/BHEL shall not provided any facility in this regard.

5.7.6
BHEL is not responsible for any loss or damage to the contractor's equipment as a result of variations in voltage or frequency or interruptions in power supply. Contractor shall take suitable insurance policy for such accidental loss/ damages.

5.8 Contract Labour

5.8.1
The contractor in the event of his engaging 10 or more workmen will obtain independent license under the Contract Labour (regulations and abolition) Act 1970 from the concerned authorities based on the certificate (form –V) issued by the principal employer/customer.

5.8.2 Provident Fund

Contractor will deduct the necessary amount from his employees towards provident fund and contribute equal amount as per government of India labour laws. Contractor regularly to the provident fund commissioner and get the account code will deposit this amount. Contractor shall submit the account code duly certified by pf commissioner to BHEL project in-charge.

5.8.3
Contractor shall also comply with the provisions of ESIS act in vogue and submit evidence thereof to BHEL site in-charge. All other expenses such as employees' benefits to be borne by the contractor as per the labour laws. Contractor shall produce necessary certificates towards their compliance with such statutes and payment of all statutory dues.

5.8.4
Contractor shall also comply with the requirements of local authorities/ project authorities calling for police verification of antecedents of the workmen, staff etc

5.8.5
Where applicable, provisions of workman compensation act shall be adhered to.

5.8.6
BHEL/customer may insist upon witnessing the regular payment to the labour. They may also like to verify the relevant records for compliance with statutory requirements. Contractor shall enable such facilities to BHEL/ Customer.

5.9 TAXES, DUTIES, LEVIES

Refer to Clause 2.8.4 of General Conditions of Contract. Notwithstanding anything contained therein, the following provisions shall be applicable for this contract.

5.9.1

The contractor shall pay all (save the specific exclusions as enumerated in this contract) taxes, fees, license charges, deposits, duties, tools, royalty, commissions or other charges which may be levied on the input goods & services consumed and output goods & services delivered in course of his operations in executing the contract. In case BHEL is forced to pay any of such taxes, BHEL shall have the right to recover the same from his bills or otherwise as deemed fit.

However, provisions regarding Service Tax and Value Added Tax (VAT) on output services and goods shall be as per following clauses.

5.9.2 Service Tax & Cess on Service Tax
Service Tax and Cess on Service Tax as applicable on output Services are excluded from contractor's scope; therefore contractor's price/rates shall be **exclusive** of Service Tax and Cess on Output Services. In case, it becomes mandatory for the contractor under provisions of relevant act/law to collect the Service Tax & Cess from BHEL and deposit the same with the concerned tax authorities, such applicable amount will be paid by BHEL. Contractor shall submit to BHEL documentary evidence of Service Tax registration and remittance record of such tax immediately after depositing the tax with concerned authorities. Contractor shall obtain prior written consent from BHEL before billing the amount towards such taxes.

With introduction of Cenvat Credit Rules 2004, which came into force w.e.f. 10.09.2004, Excise Duty paid on Input Goods including Capital Goods and Service Tax paid on Input Services that are used for providing the output services can be taken credit of against the Service Tax payable on output services. However BHEL may opt for availing the abatement provision in which case cenvat credit may not be available on input duty.

5.9.3 VAT (Sales Tax /WCT)
As regards Value Added Tax (VAT) on transfer of property in goods involved in Works Contract (previously known as Works Contract Tax) applicable as per local laws, the price quoted by the contractor shall be **exclusive** of the same. Where such taxes are required to be paid by the contractor, this will be reimbursed on production of proof of payment made to the authorities by the Contractor. In any case the Contractor shall register himself with the respective Sales Tax authorities of the state and submit proof of such registration to BHEL along with the first RA bill. The contractor has to take all necessary steps to **minimize tax on input goods** by purchasing the materials from any registered dealer of the concerned state only. In case contractor opts for composition, it will be with the prior express consent of BHEL. Deduction of tax at source shall be made as per the provisions of law unless otherwise found exempted. In case tax is deducted at source as per the provisions of law, this is to be construed as an advance tax paid by the contractor and no reimbursement thereof will be made unless specifically agreed to.

5.9.4 Modalities of Tax Incidence on BHEL

Wherever the relevant tax laws permit more than one option or methodology for discharging the liability of tax/levy/duty, BHEL will have the right to adopt the appropriate one considering the amount of tax liability on BHEL/Client as well as procedural simplicity with regard to assessment of the liability. The option chosen by BHEL shall be binding on the Contractor for discharging the obligation of BHEL in respect of the tax liability to the Contractor.

5.9.5 New Taxes/Levies

In case the Government imposes any new levy/tax on the output service/ goods/work after award of the contract, the same shall be reimbursed by BHEL at actual.

In case any new tax/levy/duty etc. becomes applicable after the date of Bidder's offer, the Bidder/Contractor must convey its impact on his price duly substantiated by documentary evidence in support of the same **before opening of Price Bid**. Claim for any such impact after opening the Price Bid will not be considered by BHEL for reimbursement of tax or reassessment of offer.

No reimbursement/recovery on account of increase/reduction in the rate of taxes, levies, duties etc. on input goods/services/work shall be made. Such impact shall be taken care of by the Price Variation/Adjustment Clause (PVC) if any. In case PVC is not applicable for the contract, Bidder has to make his own assessment of the impact of future variation if any, in rates of taxes/duties/ levies etc. in his price bid.

5.10 Submission of Periodical Reports

Contractor shall submit periodical reports in respect of following aspects of operation:

1) Consumption of welding electrodes and gases
2) Consumption of construction power
3) Manpower reports
4) Progress reports – periodically
5) Field calibration reports

BHEL at site will inform formats for these reports.

5.11

It is the responsibility of the contractor to arrange gate pass for all his employees, T&P etc. Necessary coordination with customer officials is the responsibility of the contractor. Contractor to follow all the procedures laid down by the customer for making gate passes. Where permitted, by customer/ BHEL, to work beyond normal working hours, the contractor shall arrange necessary work permit for working beyond normal working hours.

5.12 ELECTRICAL INSPECTORATE'S APPROVAL /STATUTORY INSPECTION

5.12.1 Contractor shall have/obtain valid Electrical Contractors License to carry out the Erection, Testing & Commissioning work on High/Low Voltage Electrical Equipments from the appropriate statutory authority of the concerned state or Central Electricity Authority, as the case may be. All fees and expenses in this regard shall be in the contractor's account.

5.12.2 Contractor shall arrange inspection of concerned Statutory Authority for the installation, testing & commissioning of High / Low voltage equipments

covered under the scope of work in this tender specification and obtain their approval in appropriate format prior to charging of the equipments.

5.12.3 Contractor shall be responsible for all necessary liasioning work with Statutory Authority towards the certification of installation / works. BHEL will pay Statutory Fees in respect of inspection of installations as per demand note/challan issued by the statutory authority. All other expenses shall be borne by the Contractor. BHEL/ BHEL's Customer shall be providing technical assistance, drawing & document for submission to Statutory Authority. Contractor shall provide all logistics services in this regard.

Section-6

Special Conditions of Contract

6.1 Contractor's Obligation with Regard to Employment of Supervisory Staff and Workmen

The contractor shall deploy all the skilled/semiskilled/ unskilled labour including highly skilled workmen like high-pressure welders etc. These workmen should have previous experience on similar job. They shall hold valid certificates wherever necessary. BHEL reserves the right to insist on removal of any employee of the contractor at any time if he is found to be unsuitable and the contractor shall forthwith remove him. Contractor should furnish a tentative deployment plan of his manpower as required vide appendix-IV. Also the actual deployment will be so as to satisfy the erection and commissioning targets set by BHEL.

6.2
It is the responsibility of the contractor to engage his workmen in shifts and or on overtime basis for achieving the targets set by BHEL. This target may be set to suit BHEL's commitments to its customer or to advance date of completion of events or due to other reasons. The decision of BHEL in regard to setting the erection and commissioning targets will be final and binding on the contractor.

6.3
Contractor shall deploy only qualified and experienced engineers/ supervisors. They shall have professional approach in executing the work.

6.4
The contractor's supervisory staff shall execute the work in the most professional manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. They shall be responsible to ensure that the assembly and workmanship conform to dimensions and tolerances given in the drawings/instructions given by BHEL engineer from time to time.

6.5
The supervisory staff employed by the contractor shall ensure proper outturn of work and discipline on the part of the labour put on the job by the contractor. Also in general they should see that the works are carried out in a safe and proper manner and in coordination with other labour and staff employed directly by BHEL or other contractors of BHEL /customer.

6.6 WATCH AND WARD

Contractor has to arrange and provide watch and ward round the clock. Any theft or damage of component due to negligence of the contractor will have to be replaced/repaired by the contractor. The areas are unit control/ESP control room and field.

6.7 Industrial Relations and Labour Laws

An industrial relations supervisor shall coordinate for the implementation of local labour laws, maintenance of records as required by contract labour (regulation and

abolition) act and also coordinate with the local labour authorities and any other such authorities under whom this work falls.

6.8

If at any time, it is found that the contractor is not in a position to deploy the required engineers/supervisors/workmen due to any reason, BHEL shall have the option to make alternate arrangements at the contractor's risk and cost.

6.9 Site Organization.

Contractor shall employ only qualified and experienced engineers/supervisors for this job. They shall have professional approach in executing the work having adequate knowledge and experience in the fields of erection, erection methodology, calibration, testing and commissioning, quality control and quality assurance procedures, planning, safety etc., required to undertake the type of work as per this tender.

The contractor's supervisory staff shall execute the work in the most substantial and workmanlike manner in the stipulated time. Accuracy of work and aesthetic finish are essential part of this contract. They shall be responsible to ensure that the assembly and workmanship conform to dimensions and tolerances given in the drawings/instructions given by bhel engineer from time to time.

The supervisory staff employed by the contractor shall ensure proper outturn of work and discipline on the part of the labour put on the job by the contractor and in general, see that the works are carried out in a safe and proper manner in coordination with other labour and staff employed directly by BHEL or other contractors of BHEL or BHEL's client.

Contractor should provide a team of engineers with proven experience of erection, testing/ commissioning of electrical equipments as specified in tender specification. They shall be in a position to undertake specific assignments during the start up/ post start up/stabilization.

The contractor shall deploy adequate laboures and supervisory staff in the following areas.

A) Overall planning, monitoring & control

B) Equipments Erection

C) Welding & NDT & Stress Relieving operators, induction.

D) Testing & Commissioning

E) Quality Control and Quality Assurance

F) Materials Management

G) Safety, Fire & Security

H) Industrial Relations and Fulfillment of Labour Laws and Other Statutory Obligations.

Contractor shall furnish an organization chart indicating the staffing pattern for the above functions. Contractor shall provide the names and details of engineer/ supervisors at the time of mobilization to BHEL as per the proposed organization chart.

Section -7

Special Conditions

7.0 Obligations Of BHEL

7.1 Facilities Provided By BHEL

7.2 Space for Field Office

Refer section-5 in this regard.

7.3 Construction Water

Refer section-5 in this regard.

7.4 Construction Power

Refer section-5 in this regard.

7.5 Other Materials and Consumables:

BHEL will supply consumables free of charges as listed in **Appendix -II**.

7.6 Test Blanks (Plates & Pipes)

Test pieces for qualification of structural welders shall be supplied by the Contractor.

7.7 Filler Wire and Welding Electrodes

All the welding consumables shall be arranged by contractor.

7.8 Tools & Plants

BHEL will provide the Tools & Plants listed in **Appendix—I** free of charges on sharing basis.

BHEL will also provide any special tools that are supplied by BHEL manufacturing units/vendors/suppliers as special installation tools under regular DU/DESS numbers in various product groups free to contractor. Contractor shall return these tools after the completion of the specific task for which such tools are intended, in good working order after proper servicing/overhauling.

Section-8

Special Conditions of Contract

8.0 Inspection/Quality Assurance/Quality Control/ Statutory Inspection

8.1 Various inspection/quality control/quality assurance procedures/methods at various stages of erection and commissioning will be as per BHEL/customer quality control procedure/codes and other statutory provisions and as per BHEL engineer's instructions.

8.2 Preparation of quality assurance log sheets and protocols with customer/ consultants/statutory authority, welding logs, NDE records, testing & calibration records and other quality control and quality assurance documentation as per BHEL engineer's instructions, is within the scope of work/specification. These records shall be submitted to BHEL/customer for approval from time to time.

8.3 A daily logbook of all measurements and testing/calibration should be maintained by contractor on the job for detailing inspection details of various equipments**.**

8.4 The performance of welders will be reviewed from time to time as per the BHEL standards. Welders' performance record shall be furnished periodically. Corrective action as informed by BHEL shall be taken in respect of those welders not conforming to these standards. This may include removal/ discontinuance of concerned welder(s). Contractor shall arrange for the alternate welders immediately.

8.5 All the welders shall carry identity cards as per the proforma prescribed by BHEL only welders duly uthorized by BHEL/customer/consultant shall be engaged on the work.

8.6 Contractor shall provide all the measuring monitoring devices (MMDs) required for completion of the work satisfactorily. These MMDs shall conform to job requirement in respect of measurement range, accuracy level & any other specification. The indicative list of MMDs required for this work and to be made available by the contractor is given in appendix-III. The list will be reviewed by BHEL and the contractor shall meet any augmentation needed.

8.7 The MMDs deployed by the contractor shall, at all stages of work, have valid and current calibration. BHEL shall be done the calibration of these MMDs from the agencies accredited/ approved. Copy of calibration certificates in respect of these MMDs has to be submitted to BHEL. Periodical status report regarding validity of calibration has to be submitted to BHEL. Re-calibration/ re-validation shall be done periodically as per BHEL specifications. Contractor shall conform to the specifications of BHEL regarding storage of the MMDs.

8.8 Re-work necessitated on account of use of invalid MMDs shall be entirely to the contractor's account. He shall be responsible to take all corrective actions, including resource augmentation if any, as specified by BHEL to make-up for the loss of time.

8.9 In the course of work BHEL may counter/ finally check the measurements with their own MMDs. Contractor shall render all assistance in conduct of such counter/final measurements**.**

8.10 Total quality is the watchword of the work and contractor shall strive to achieve the quality standards, procedures laid down by BHEL. He shall follow all the

Sl. No.	Activity	Tentative Date	
01	TRANSFORMER(LT) VAT, STI Item nos A1, A2 and A3 of Rate Schedule		
02	PRE-COMMISSIONING AND ELECTRICAL TEST MECHANICAL ELECTRICAL		13%
03	PLACEMENT ON FOUNDATION ASSEMBLIES ETC.		20%
04	COLLECTION OF MATERIALS TRANSPORTATION FROM BHEL STORES TO SITE		10%
05	Steam blowing of Unit 1	AUG 07	
06	Turbine Oil flushing completion. Unit 1	SEP 07	
07	FINISH PAINTING		05%
08	Turbine Oil flushing completion. Unit 2	DEC 07	
09	TRIAL RUN AND FULL LOADING		02%
10	Synchronisation and coaling. Unit 1	OCT 07	
11	Synchronisation and coaling. Unit 2	DEC 07	
12	Trial Operation. Unit 1	NOV 07	
13	6.6 KV / 415V, DCDB, SWITCHGEAR BOARDS, GENERATOR CONTROL/ PROTECTION PANEL & ACCESSORIES Item nos 10.1 to 10.3 of Rate Schedule		
14	Name of the Company		
15	Name of Bank Branch		
16	City/place		
17	Completion Number	JUNE 08	
18	IFSC code of the Bank Branch		
19	MICR Code of the Bank Branch		

12.0 Quality Evaluation

12.0.1 Contractor shall make his site establishment and be ready to commence the work within two weeks from the date of fax Letter of Intent (LOI) or as per directions of Clause 2.6 of General conditions of contract shall be referred to as regards mode of construction manager of BHEL.

12.0.2 Quality evaluation of BHEL.

12.1 Quality Evaluation

12.1.1 The agreed rates for each item shall be applied to the actual quantities executed by the contractor and verified and recorded in the measurement books by BHEL engineer-in-charge from time to time. The contractor shall be present at the time of such measurements and shall countersign the measurement books in token of his acceptance of the measurements recorded therein. In the event of his failure to countersign the measurement books, the measurements recorded by BHEL engineer-in-charge shall be deemed to be correct and binding on the contractor.

12.1.2 The contractor has to subsequently augment his resources in such a manner that the balance work is completed as per the following tentative schedule of activities and milestones. Contractor shall plan his activities and mobilise additional resources as required to meet the following schedule of activities and milestones.

12.2 Release of Payment

12.2.1 Release of payment to the contractor shall be regulated by the value of work executed by the contractor and certified by BHEL engineer-in-charge in this regard. The decision of BHEL in this regard shall be final and binding on the contractor.

12.2.2 The contractor shall submit his bills in quadruplicate on account of work executed by him during the preceding month by the 25th of every month to the BHEL engineer-in-charge. The BHEL engineer-in-charge shall verify the bills and certify the amount to be paid to the contractor within 15 days from the date of receipt of the bills complete in all respects and after deducting therefrom such amounts as are recoverable under the terms of the contract. The BHEL engineer-in-charge shall have the right to withhold payment due to the contractor in respect of any work not executed in accordance with the contract or for any other reason for which he holds the contractor responsible under the contract.

12.2.3 Payment shall be released by BHEL engineer-in-charge to the contractor on account of work executed by the contractor only after the work is certified by BHEL engineer-in-charge as satisfactorily executed and so recorded in the measurement books. The decision of BHEL in this regard shall be final and binding on the contractor.

12.3 Quantity Variation

12.3.1 Quantity variations as mentioned in Clause 10.2 of General conditions of contract shall be applicable for this contract.

12.4 Extension of Contract Period

12.4.1 The time allowed for carrying out the work as entered in the Letter of Intent shall be strictly adhered to by the contractor. Overrun of the schedule mentioned in the Letter of Intent due to reasons not attributable to the contractor shall entitle the contractor to get extension of time for the completion of such additional work. The contractor will not be entitled to any compensation for the extension of the contract period.

12.4.2 Request for extension of the contract period should be made by the contractor in writing to the BHEL engineer-in-charge at least one month before the expiry of the contract period. Any such request received after the expiry of the contract period shall not be entertained by BHEL.

12.5 Liquidated Damages for Delay

12.5.1 In case the contractor fails to complete the work within the stipulated period or the extended period, if any, he shall be liable to pay liquidated damages as per Clause 11.1 of General conditions of contract.

12.6 Termination of Contract

12.6.1 The contract is liable to be terminated by BHEL in the circumstances mentioned in Clause 12.0 of General conditions of contract.

12.7 Arbitration

12.7.1 Any dispute or difference between the contractor and BHEL in connection with or arising out of the contract shall be settled by arbitration in accordance with Clause 13.0 of General conditions of contract.

12.8 Force Majeure

12.8.1 Force Majeure shall have the meaning assigned to it in Clause 14.0 of General conditions of contract.

12.9 Payment Terms

12.9.1 Payment shall be released by BHEL engineer-in-charge to the contractor on account of work executed by the contractor and certified by BHEL engineer-in-charge as satisfactorily executed and so recorded in the measurement books. The decision of BHEL in this regard shall be final and binding on the contractor.

12.9.2 Payment shall be released by BHEL engineer-in-charge to the contractor on account of work executed by the contractor and certified by BHEL engineer-in-charge as satisfactorily executed and so recorded in the measurement books. The decision of BHEL in this regard shall be final and binding on the contractor.

12.9.3 Progress and monitoring of work

12.9.4 Progress and monitoring of work

12.9.5 Progress and monitoring of work

12.9.6 Progress and monitoring of work

12.9.7 Progress and monitoring of work

12.9.8 Progress and monitoring of work

6.6 KV / 415V / DCDB SWITCHGEAR BOARDS, GENERATOR CONTROL/ PROTECTION PANEL & ACCESSORIES : Item nos. D.1 to D.3 of Rate Schedule		
05	**INTEGRATED ELECTRICAL TESTING/ COMMISSIONING WITH ASSOCIATED CONNECTED EQUIPMENT**	08%
05	ENERGIZATION OF SWITCH BOARD AND TRIAL OF INDIVIDUAL FEEDERS ON LOAD	10%
06	COMPLETION OF TRIAL RUN OF MAIN TG SET/FULL LOADING	02%
07	COMPLETION OF ALL FACILITIES AND HANDING OVER	02%

EXCITATION SYSTEMS & ACCESSORIES, DAVR, GENERATOR, GT & UT PROTECTION & METERING PANELS: Item nos. F.1, G.1 to G.4 of Rate Schedule		
SN	DESCRIPTION OF ACTIVITY	PERCENTAGE
01	COLLECTION OF MATERIAL, TRANSPORTATION FROM BHEL STORE TO SITE	10%
02	PLACEMENT, ALIGNMENT, GROUTING, INTER CONNECTION OF BUS BAR AND WIRING, FIXING OF LOOSE COMPONENTS AND AIR EXHAUST OUTLET DUCT FOR REGULATION, FIELD FLUSHING AND THYRISTOR PANELS	60%
04	PRE-COMMISSIONING TESTS	13%
05	UNIT SYNCHRONIZATION AND STABILIZATION, **INTEGRATED ELECTRICAL TESTING/ COMMISSIONING WITH ASSOCIATED CONNECTED EQUIPMENT**	13%
06	TRIAL RUN AND FULL LOADING	02%
07	COMPLETION OF ALL FACILITIES AND HANDING OVER	02%

ISOLATED PHASE BUS DUCT: Item no. B.1 of Rate Schedule		
SN	**DESCRIPTION OF ACTIVITY**	**PERCENTAGE**
01	COLLECTION OF MATERIAL, TRANSPORTATION FROM BHEL STORES TO SITE	10%
02	ERECTION AND ALIGNMENT OF SUPPORTING STRUCTURE	10%
03	PLACEMENT OF BUS DUCT, SUB-ASSEMBLIES, LAVT CUBICLE, NG TRANSFORMER AND RESISTANCE CUBICLE, AIR PRESSURIZATION UNIT AND ITS PIPING AND ACCESSORIES, EXCITATION TRANSFORMER AND ITS TRUNKING CUBICLE, WALL FRAME ASSEMBLY, SEAL AIR BUSHINGS	20%
04	ALIGNMENT OF BUS DUCT ASSEMBLIES, WELDING OF CONDUCTORS, MAKEUP PIECES, SHUNTS, FLEXIBLES, CURRENT TRANSFORMERS AND VOLTAGE TRANSFORMER, SURGE PROTECTOR ETC. INSTALLATION, LINE, NEUTRAL TEE OFF DUCT CTs, WIRING UPTO MARSHALLING BOX, DPD TEST ON CONDUCTOR WELD JOINTS ETC.	25%
05	PRE-COMMISSIONING TESTS, HIGH VOLTAGE TEST	10%
06	COMPLETION OF AIR LEAKAGE TEST	03%

ISOLATED PHASE BUS DUCT: Item no. B.1 of Rate Schedule		
SN	**DESCRIPTION OF ACTIVITY**	**PERCENTAGE**
07	FINAL BOX-UP AND END TERMINATION AND MAKING READY FOR ENERGIZATION	04%
08	COMPLETION OF SHORT CIRCUIT/OPEN CIRCUIT TEST WHICH INCLUDES FIXING AND REMOVING OF CERTAIN LINK AND NORMALISATION AND SYNCHRONIZATION OF THE UNIT, **INTEGRATED ELECTRICAL TESTING/ COMMISSIONING WITH ASSOCIATED CONNECTED EQUIPMENT**	10%
09	FINISH PAINTING	05%
10	TRIAL RUN AND FULL LOADING	02%
11	COMPLETION OF ALL FACILITIES AND HANDING OVER	01%

SEGREGATED PHASE BUS DUCT: Item no. C.1 to C.9 of Rate Schedule		
SN	DESCRIPTION OF ACTIVITY	PERCENTAGE
01	COLLECTION OF MATERIAL, TRANSPORTATION FROM BHEL STORES TO SITE	05%
02	ERECTION, ALIGNMENT, GROUTING SUPPORTING STRUCTURE	15%
03	PLACEMENT, ALIGNMENT, BOLTING OF CONDUCTOR, ENCLOSURE, COPPER FLEXIBLE, WALL FRAME ASSEMBLIES, SEAL OFF BUSHINGS, CONDUIT AND WIRING FOR ANTI-CONTENTATION HEATERS, EARTHING INTER CONNECTING BRIDGING BUS DUCT BETWEEN THE SWITCH BOARD ETC.	45%
04	PRE-COMMISSIONING AND COMPLETION OF AIR LEAK TEST	10%
05	COMPLETION OF AIR PRESSURIZATION TEST	05%
06	ENERGIZATION OF INDIVIDUAL BUS DUCT AND SWITCH BOARD, **INTEGRATED ELECTRICAL TESTING/ COMMISSIONING WITH ASSOCIATED CONNECTED EQUIPMENT**	12%
07	FINISH PAINTING	05%
08	TRIAL RUN AND FULL LOADING	02%
09	COMPLETION OF ALL FACILITIES AND HANDING OVER	01%

220 VOLT BATTERY & BATTERY CHARGER		
SN	**DESCRIPTION OF ACTIVITY**	PERCENTAGE
01	COLLECTION OF MATERIAL, TRANSPORTATION FROM BHEL STORES TO SITE	15%
02	ON COMPLETIONOF ASSEMBLY OF BATTERY RACKS, PLACEMENT OF BATTERIES ON RACK, FITTING OF CELL INTERCONNECTING SHORTING LINK, NUMBER PLATES, DC FUSE BOARD ETC	55%
03	ERECTION OF BATTERY CHARGERS	10%
04	TESTING COMMISSIONING OF BATTERY CHARGER, BATTERY CHARGING /DISCHARGING, CONDUCTING THE CAPACITY TEST ETC.	15%

220 VOLT BATTERY & BATTERY CHARGER		
SN	**DESCRIPTION OF ACTIVITY**	PERCENTAGE
05	TRIAL RUN AND FULL LOADING	5%

12.1.2 OTHERS: Item nos. H.1 to H.5, J.1 to J.8, K.1 to K.11, L.1 TO L.7,M.1 TO M5, N.1 TO N.6 OF Rate Schedule)

Unit rate payment shall be made for other systems (GRP / SRP ,ESP, Soot Blower, Electrical Hoist, DCDB, & Misc. Items) as per the rate schedule and percentage break-up for erection, testing, commissioning shall be as per detailed break-up given below: -

1. 80% of the agreed unit rates on completion of erection, testing and commissioning.
2. 12% after completion of the individual system commissioning.
3. 5% after trial operation or unit handing over whichever is earlier.
4. 3% on completion of facilities and handing over.

12.1.3 Testing of Commissioning of Equipment erected by other agencies: Item nos. P.1 to P.5 of Rate Schedule

1. 80% of the agreed unit rates on completion of testing and off-load commissioning.
2. 10% after on-load commissioning of each item.
3. 5% after completion of trial operation of unit.
4. 5% on completion of facilities and handing over.

12.1.4 Cables (Item nos. Q.1 to Q.4 and R.1 to R.4 of Rate Schedule)

1. 70% after laying of cable.
2. 10% after termination.
3. 10% after testing of cables.
4. 05% after dressing of cables
5. 05% after completion of facilities and handing over.

12.1.4.1 Cable Tray (Item nos. S.1 to S.4 and T.1 to T.4 , U.1 of Rate Schedule)

1. 80% after erection of trays in position
2. 15% after completion of welding/bolting.

3. 05% after completion of facilities and handing over.

12.2 PAYMENT FOR THE WORK COMPLETED

12.2.1
For the items where the payment is to be made against unit of weight, the actual weight of items erected by contractor will be paid after assessing the weight on the basis of shipping list or standard engineering practice. BHEL engineer's decision will be final and binding on contractor in this regard.

12.2.2
The bidder shall quote separate unit rates for each item of work listed in the rate schedule.

12.3 Measurement for Payment

12.3.1
In rate schedule, unit rates called for erection, testing and commissioning for various devices and equipment and payment shall be made accordingly.

12.3.2

For all payment purpose, measurement shall be made on the basis of physical measurement. Contractor shall make physical measurement in presence of BHEL engineer. Contractor shall maintain records for utilization of material system-wise.

12.3.3

All the surplus, scrap and serviceable materials shall be returned by the contractor to BHEL's stores as per the instruction of engineer

12.3.4

Wherever additional instrumentation work has to be carried out for performance guarantee test, the same has to be executed by the contractor as per the applicable rates already provided in the rate schedule.

For the items where the payment is to be made against unit of weight, the actual weight of items erected by contractor will be paid after assessing the weight on the basis of shipping list or standard engineering practice. BHEL engineer's decision will be final and binding on contractor in this regard.

12.4 Payment for the Work Completed

12.4.1
The tenderer shall quote separate unit rates for each item as detailed in Rate Schedule. Payment will be made by BHEL according to agreed item rates, break up of stage payments and actual executed quantities.

12.4.2 Measurement for Payment

12.4.3
In rate schedules, all inclusive unit rates have been called for entire scope of work for respective item including erection, calibration, testing and commissioning as applicable

for various device and instrument and payment shall be made as per split up furnished in the table earlier in this section.

12.4.4
For all payment purpose, measurement shall be made on the basis of physical measurement. Physical measurement shall be made by contractor in presence of BHEL engineer. Contractor shall maintain records for utilization of material system-wise.

12.4.5
All the surplus, scrap and serviceable materials shall be returned by the contractor to BHEL's stores as per the instruction of engineer

12.4.6
All the cables returned to stores should carry aluminium tag(s) indicating the size and type of cables. Cable of more than five-meter length is termed as "serviceable material".

12.4.7
Any item returned to stores shall be clearly identified and tagged for its serviceability or any defects in the returned items.

12.4.8

Wherever additional instrumentation work has to be carried out for performance guarantee test, the same has to be executed by the contractor as per the applicable rates already provided in the rate schedule.

Section –13

Special Conditions of Contract

13.0 Extra Charges For Rectification And Modification

13.1
If extra works (requiring less than **40 man-hours**) for modification, rework, revamping, in brief, any work done to change the state existing to a stage desired and also fabrication, all or any, are needed due to any change in or deviation from the drawings and design of equipment, operation/ maintenance requirements, mismatching, transit damages and other allied works which are not very specifically indicated in the drawings, but are found essential for satisfactory completion of the work, are done, no extra charges will be paid. The tenderers are requested to take this aspect into account and the quoted rate should include all such contingencies.

13.2
It may also be noted that if any such said extra works arise on account of the contractor's fault it will have to be carried out by the contractor free of cost. Under such circumstances, any material and consumable required for this purpose will also have to be arranged by the contractor at his cost.

13.3
However, BHEL may consider for payment as extra, for such of those works detailed in clause 13.1 which require more than **40 man-hours** and such payment will be regulated by the terms, conditions and stipulations contained in the clauses 13.4 to13.8 and/or 14.2.1 to 14.2.10 as the case may be. It may be specifically noted that the decision of BHEL as to whether such payment is due shall be final and binding on the contractor. It may also be noted that only those works, which are identified as major and warrant extra payment and certified as such by the site engineer and accepted by the designers and/or competent authority of BHEL, will be considered for extra payment.

13.4
For extra works arising out of transit, storage and erection damages, payment, if found due, will be regulated by clauses 14.2.1 to 14.2.10.

13.5
All the extra work should be carried out by a separately identifiable gang, without affecting routine activities. Daily log sheets in the pro-forma prescribed by BHEL should be maintained and shall be signed by the contractor's representative and BHEL engineer. No claim for extra work will be considered/entertained in the absence of the said supporting documents ie. Daily log sheets. It may, however be noted that signing of log sheets by BHEL engineer does not mean the acceptance of such works as extra works. All admissible claims shall be submitted to BHEL

13.6
BHEL retains the right to award or not to award any of the major repair/rework/modification/rectification/fabrication works under clauses 13.1 to 13.6 to the contractor, at their discretion without assigning any reason for the same.

13.7
Extra works that arise on account of contractor's fault will have to be carried out by the contractor free of cost including the supply of material and consumables

13.8
After eligibility of extra works is established and finally accepted by BHEL engineer/designer, payment will be released on competent authority's approval at the following rate.

Man-day rate for eligible extra works :

Single average man-day rate, including overtime if any, and other site expenses and incidentals, including consumables, tools and tackles, for carrying out rework / repairs / rectification / modification / fabrication for a man-day of 8 hours as may arise during the course of erection will be **Rs. 240/- (Rupees Two hundred and forty only)**

As mentioned above, no payment will be made if an item of work lasts less than 40 man-hours.

Section-14

Special Conditions of Contract

14.0 Insurance

14.1 Marine, Storage cum Erection (MCE) Insurance and Repairing Damages

BHEL/client has an MCE insurance cover, inter-alia, for all the permanent project equipments/components supplied by BHEL under scope of this work under a transit and storage cum erection policy covering liability against damages/ losses etc.

14.2 Reporting Damages and Carrying Out Repairs

14.2.1
Checking all components/equipments at siding/site and reporting to transporter and /or insurance authorities of any damages/losses will be done by BHEL.

14.2.2
Contractor shall render all help to BHEL in inspection including handling, re-stacking etc, assessing and preparing estimates for repairs of components damaged during transit, storage and erection, commissioning and preparing estimates for fabrication of materials lost/damaged during transit, storage and erection. Contractor shall help BHEL to furnish all the data required by railways, insurance company or their surveyors.

14.2.3
Contractor shall report to BHEL in writing any damages to equipments/ components on receipt, storing, and during drawl of the materials from stores, in transit to site and unloading at place of work and during erection and commissioning. The above report shall be as prescribed by BHEL site management. Any consequential loss arising out of non-compliance of this stipulation will be borne by contractor.

14.2.4
Contractor shall carry out fabrication of any material lost/damaged as per instructions from BHEL engineer.

14.2.5
BHEL, however, retains the right to award or not to award to the contractor any of the rectification/rework/repairs of damages and also fabrication of components.

14.2.6
All the repairs/rectification/rework of damages and fabrication of materials lost, if any, shall be carried out by a separately identifiable gang for certification of man-hours. Daily log sheets should be maintained for each work separately and should be signed by contractor's representative and BHEL engineer. Signing of log sheets does not necessarily mean the acceptance of these as extra works.

14.2.7
All rectification, repairs, reworks and fabrication of components lost, which are minor and incidental to erection work (consuming not more than 40 man-hours on each occasion) shall be treated as part of work without any extra cost.

14.2.8
Insurance cover under this policy will generally be as per clauses 2.10.1 to 2.10.4 of General Conditions of Contract unless and otherwise specified differently in the Special Conditions.

14.2.9
in case the loss/damage is not attributable to the contractor, Payments of all extra works on account of repair / rectification / reworks of damages and fabrication of materials lost will be as per provisions of Section-13.

14.2.10
In case the repairs/rectification/rework and fabrication of materials lost, the work has been done by more than one agency including the contractor, the payment towards extra charges will be on pro-rata basis and the decision of BHEL in this regard is final and binding on the contractor.

14.2.11
In case of theft / damage / loss of materials due to negligence or failure attributable to the contractor, the expenses incurred on account of repair/ replacement of such components including BHEL's overhead expenses as applicable (presently @ 30%) in excess of the amount realized from the underwriters shall be recovered from the contractor. Recovery will be limited to Normal Deductible Franchise (DF) / Excess as per applicable Insurance (TAC) tariff guidelines. However, in case such insurance claim is summarily rejected by the underwriters due to wilful damage/loss on the part of the contractor, the total cost of repair/ replacement shall be recovered from the contractor.

14.3 Insurance by the contractor and indemnification of BHEL

BHEL have taken a third party liability insurance, indicating in the proposal for such insurance that sub-contractors will be taking part in the erection work detailed in this tender. However, the tenderer has to bear any expenses /consequences over and above the amount that may be reimbursed to BHEL by such coverage of third party liability insurance taken by BHEL.

Such additional liability will be to cover and indemnify BHEL and its customer of all liabilities which may come up and cause harm/damage to other contractors/ customer/BHEL properties/personnel or all or anybody rendering service to BHEL/customer or is connected with BHEL/customer's work in any manner whatsoever. The tenderer's specific attention is also invited to clause 2.10 of General conditions of contract.

Contractor shall obtain and operate suitable insurance policies to cover the risk pertaining to the assets/properties and personnel belonging to or deployed by him.

SECTION-15

Special Condition of Contract

15.0 Earnest Money Deposit & Security Deposit

15.1 EARNEST MONEY DEPOSIT:

EARNEST MONEY DEPOSIT FOR THIS TENDER WILL BE Rs. 2,00,000/- (RUPEES TWO LACS ONLY).

ONE TIME EMD WILL ALSO BE Rs. 2 LACS.

EMD SHALL BE DEPOSITED IN CASH (AS PERMISSIBLE UNDER INCOME TAX ACT), PAY ORDER OR DEMAND DRAFT (PAYABLE AT NAGPUR IN FAVOUR OF 'BHARAT HEAVY ELECTRICALS LIMITED') ONLY. **NO OTHER FORM OF EMD REMITTENCE SHALL BE ACCEPTABLE TO BHEL.**

15.1.1 EMD BY THE TENDERER WILL BE FORFEITED AS PER TENDER DOCUMENTS IF

I) AFTER OPENING THE TENDER, THE TENDERER REVOKES HIS TENDER WITHIN THE VALIDITY PERIOD OR INCREASES HIS EARLIER QUOTED RATES.

II) THE TENDERER DOES NOT COMMENCE THE WORK WITHIN THE PERIOD AS PER LOI / CONTRACT. IN CASE THE LOI / CONTRACT IS SILENT IN THIS REGARD THEN WITHIN 15 DAYS AFTER AWARD OF CONTRACT.

15.1.2 EMD SHALL NOT CARRY ANY INTEREST.

15.2 SECURITY DEPOSIT

15.2.1 SECURITY DEPOSIT SHOULD BE COLLECTED FROM THE SUCCESSFUL TENDERER. THE RATE OF SECURITY DEPOSIT WILL BE AS BELOW:

SN	Contract Value	Security Deposit Amount
1	Up to Rs. 10 lakhs	10% of Contract Value
2	Above Rs. 10 lakhs upto Rs.50 lakhs	1 lakh + 7.5% of the Contract Value exceeding Rs. 10 lakhs.
3	Above Rs. 50 lakhs	Rs 4 lakhs + 5% of the Contract Value exceeding Rs. 50 lakhs.

THE SECURITY DEPOSIT SHALL BE REMITTED BEFORE START OF THE WORK BY THE CONTRACTOR IN THE MANNER SPECIFIED AS FOLLOWS.

15.2.2 SECURITY DEPOSIT MAY BE FURNISHED IN ANY ONE OF THE FOLLOWING FORMS

I) CASH (AS PERMISSIBLE UNDER THE INCOME TAX ACT)

II) PAY ORDER, DEMAND DRAFT IN FAVOUR OF BHEL.

III) LOCAL CHEQUES OF SCHEDULED BANKS, SUBJECT TO REALIZATION.

IV) SECURITIES AVAILABLE FROM POST OFFICES SUCH AS NATIONAL SAVINGS CERTIFICATES, KISAN VIKAS PATRAS ETC.

(CERTIFICATES SHOULD BE HELD IN THE NAME OF CONTRACTOR FURNISHING THE SECURITY AND DULY PLEDGED IN FAVOUR OF BHEL AND DISCHARGED ON THE BACK).

V) BANK GUARANTEE FROM SCHEDULED BANKS / PUBLIC FINANCIAL INSTITUTIONS AS DEFINED IN THE COMPANIES ACT SUBJECT TO A **MAXIMUM OF 50%** OF THE TOTAL SECURITY DEPOSIT VALUE. THE BALANCE 50% HAS TO BE REMITTED EITHER BY CASH OR IN THE OTHER FORM OF SECURITY. THE BANK GUARANTEE FORMAT SHOULD HAVE THE APPROVAL OF BHEL.

VI) FIXED DEPOSIT RECEIPT ISSUED BY SCHEDULED BANKS / PUBLIC FINANCIAL INSTITUTIONS AS DEFINED IN THE COMPANIES ACT. THE FDR SHOULD BE IN THE NAME OF THE CONTRACTOR, A/C BHEL, DULY DISCHARGED ON THE BACK.

VII) SECURITY DEPOSIT CAN ALSO BE RECOVERED AT THE RATE OF 10% FROM THE RUNNING BILLS. HOWEVER IN SUCH CASES AT LEAST 50% OF THE SECURITY DEPOSIT SHOULD BE REMITTED (EITHER BY CASH/DD OR **BG FOR MAXIMUM 50%** OF TOTAL SD) BEFORE START OF THE WORK AND THE BALANCE 50% MAY BE RECOVERED FROM THE RUNNING BILLS.

VIII) EMD OF THE SUCCESSFUL TENDERER, EXCEPTING THOSE WHO HAVE REMITTED ONE TIME EMD, SHALL BE CONVERTED AND ADJUSTED AGAINST THE SECURITY DEPOSIT OR SPECIFIC REQUEST BY THE CONTRACTOR.

IX) THE SECURITY DEPOSIT SHALL NOT CARRY ANY INTEREST.

NOTE: ACCEPTANCE OF SECURITY DEPOSIT AGAINST SL. NO. (IV) AND (VI) ABOVE WILL BE SUBJECT TO HYPOTHECATION OR ENDORSEMENT ON THE DOCUMENTS IN FAVOUR OF BHEL. HOWEVER, BHEL WILL NOT BE LIABLE OR RESPONSIBLE IN ANY MANNER FOR THE COLLECTION OF INTEREST OR RENEWAL OF THE DOCUMENTS OR IN ANY OTHER MATTER CONNECTED THEREWITH.

15.2.3 SECURITY DEPOSIT SHALL NOT BE REFUNDED TO THE CONTRACTOR EXCEPT IN ACCORDANCE WITH THE TERMS OF THE CONTRACT.

SECTION –16

TECHNICAL DETAILS, BILL OF QUANTITIES & LIST OF DRAWINGS

16.1 GENERATOR TRANSFORMER

Quantity – 1 No.

SN	DESCRIPTION	GENERAL INFORMATION
1	Rating	315 MVA, 16.5/420 KV, Cooling OFAF, Three Phase, Vector group Ynd11, with OFF Load tap switch
2	Weight of core &winding	155.00 MT
3	Total weight of assembled transformer including oil	263.25 MT
4	Transportation / shipping weight (gas filled)	180.00 MT
5	Weight of tank &fitting, marshalling kiosk &wiring, cooler bank, conservator & pipe work, supports, rollers HV/LV turrets, pumps, bushings HT/LT, OFAF Coolers, Fans, Marshalling box, Cabling from marshalling box to field devices and other accessories & fittings	55.00 MT
6	Oil quantity	
	Oil in transformer tank	48160 LITRES
	Oil in cooler, conservator, &pipe work	12840 LITERS
	Total oil quantity	61000 LITRES(53 .00 MT)
7	Weight of heaviest packages	175.00 MT
8	Dimensions of assembled transformer	15.0 X 6.5 X 8.0 METERS (Approx)

16.3 STATION TRANSFORMER

Quantity– 1 No.

SL. NO	DESCRIPTION	STATION TRANSFORMER
1	Rating	3-PHASE , 50/25/25 MVA, 230/7.7/7.7 KV
2	Type of cooling	ONAN/ONAF
3	Winding connection	Ynyn0yn0
4	**WEIGHT OF ACCESSORIES**	
	Weight of core&winding	68000 KGS
	Tank & fitting including HV/LV bushings turrets, rollers	21000 KGS
	Bushings	1200KGS
	Radiator bank, fans &valves	28000 KGS
	Total weight of transformer including oil	155000 KGS
	Shipping weight of transformer (gas filled)	75000 KGS
	Untanking weight	58000 KGS
5	Nos. Of radiators	16
6	NOS.OF FANS	10
7	**OIL QUANTITY**	
	Oil in transformer tank including OLTC diverter	42000 LITRES
	Oil in radiator bank, conservator &pipe work	10000 LITRES
	Total oil quantity	**52000 LITRES**

BHEL JHANSI TRANSFORMER DATA

W.O. No. 15014A ----- TRANSFORMER

Quantity – 02 Nos. 50 MVA Standby Transformers for BESCL.

S.N	**DESCRIPTION**		
1	Rating MVA	**MVA**	**50/25-25**
	PRY VOLTS	**KV**	**230**
	SECONDARY VOLTS	**KV**	**6.9-6.9**
	PHASES	**NOS**	**2**
	TYPE OF TAP SWITCH	**ON LOAD OFF LOAD**	**on load**
2	Type of cooling		ONAF2/ONAF1/ONAN
3	Winding connection		Yn yn0 yn0
4	**WEIGHT OF ACCESSORIES**	MT	
	Weight of core & winding	MT	47000
	Tank & fitting including HV/LV bushings turrets, rollers		25
	Bushings	**MT**	1
	Radiator bank, fans &valves, pipe & fitting, Cabling between marshalling box to field devices, On load tap Chamber, etc.	MT	3
	Total weight of transformer including oil	MT	110
	Shipping weight of transformer (gas filled)	MT	72
	Untanking weight	MT	47
7	**Oil Quantity**		
	Oil in transformer tank including On Load Tap Changer, turrets	LITERS	30
	Oil in radiator bank, conservator &pipe work	MT	4
	Total oil quantity	MT	34

NOTE: The above weight is tentative. Final weight shall be calculated preparation of manufacturing drawing and to be indicated later on.

W.O. No. 15015A ----- TRANSFORMER

Quantity – 02 Nos. 50 MVA Unit Aux. Transformers for BESCL.

SL. NO	DESCRIPTION		
1	Rating MVA	**MVA**	**50**
	PRY VOLTS	**KV**	**16.5**
	SECONDARY VOLTS	**KV**	**6.9-6.9**
	PHASES	**NOS**	**3**
	TYPE OF TAP SWITCH	**ON LOAD OFF LOAD**	**off load**
2 3	Type of cooling Winding connection		ONAN/ONAF1/ONAF2 DELTA/STAR-STAR
4	**WEIGHT OF ACCESSORIES**	MT	
	Weight of core & winding	MT	45.0
	Tank & fitting including HV/LV bushings turrets, rollers		15.00
	Bushings	**MT**	0.70
	Radiator bank, fans &valves, pipe & fitting, Cabling between marshalling box to field devices, On load tap Chamber, etc.	MT	16.0
	Total weight of transformer including oil	MT	105.0
	Shipping weight of transformer (gas filled) Untanking weight	MT MT	60.0 45.0
7	**Oil Quantity**		
	Oil in transformer tank including On Load Tap Changer, turrets	LITERS	25000
	Oil in radiator bank, conservator &pipe work	MT	7000
	Total oil quantity	MT	32000

NOTE : The above weight are tentative. Final weight shall be informed later on.

W.O. No. 15016A ----- TRANSFORMER

Quantity – 02 Nos. 7.5/10 MVA Water Supply Transformers for BESCL.

SL. NO	DESCRIPTION		
1	Rating MVA	**MVA**	**10**
	PRY VOLTS	**KV**	**36**
	SECONDARY VOLTS	**KV**	**6.6**
	PHASES	**NOS**	**3**
	TYPE OF TAP SWITCH	**ON LOAD OFF LOAD**	**off load**
2	Type of cooling		ONAN/ONAF
3	Winding connection		STAR/DELTA
4	**WEIGHT OF ACCESSORIES**	MT	
	Weight of core & winding	MT	16.0
	Tank & fitting including HV/LV bushings turrets, rollers		10.0
	Bushings	**MT**	0.60
	Radiator bank, fans &valves, pipe & fitting, Cabling between marshalling box to field devices, On load tap Chamber, etc.	MT	3.0
	Total weight of transformer including oil	MT	39.0
	Shipping weight of transformer (gas filled)	MT	24.0
	Untanking weight	MT	16.0
7	**Oil Quantity**		
	Oil in transformer tank including On Load Tap Changer, turrets	LITERS	8000
	Oil in radiator bank, conservator &pipe work	LITERS	3000
	Total oil quantity	LITERS	11000

NOTE : The above weight are tentative. Final weight shall be informed later on.

W.O. No. 15019A ----- TRANSFORMER

Quantity – 08 Nos. 2000 KVA Dry TypeTransformers for BESCL.

SL. NO	DESCRIPTION		
1	Rating MVA	**MVA**	**2.0**
	PRY VOLTS	**KV**	**6.6**
	SECONDARY VOLTS	**KV**	**0.433**
	PHASES	**NOS**	**3**
	TYPE OF TAP SWITCH	**ON LOAD OFF LOAD**	**Off load**
2	Type of cooling		AN
3	Winding connection		Dyn11
4	**WEIGHT OF ACCESSORIES**	MT	6.2
	Weight of core & winding	MT	0.8
	Tank & fitting including HV/LV bushings turrets, rollers		
	Bushings	**MT**	Supplied filled with transformer
	Radiator bank, fans &valves, pipe & fitting, Cabling between marshalling box to field devices, On load tap Chamber, etc.	MT	NA
	Total weight of transformer including oil	MT	7.0
	Shipping weight of transformer (gas filled)	MT	7.0
	Untanking weight	MT	6.2
7	**Oil Quantity**		NA
	Oil in transformer tank including On Load Tap Changer, turrets	LITER	NA
	Oil in radiator bank, conservator &pipe work	MT	NA
	Total oil quantity	MT	NA

Dry type transformers are supplied in fully assembled condition.

W.O. No. 15017A ----- TRANSFORMER

Quantity – 36 Nos. 70 KVp 1200 mA HVR for BESCL.

S.NO	DESCRIPTION		
1	Rating MVA	**KVA**	**90 KVA**
	PRY VOLTS	**KV**	**53.57**
	SECONDARY VOLTS	**KV**	**0.3735**
	PHASES	**NOS**	**01**
	TYPE OF TAP SWITCH	**ON LOAD / OFF LOAD**	**NA**
2	Type of cooling		AN
3	Winding connection		-
4	**WEIGHT OF ACCESSORIES**	MT	
	Weight of core & winding	MT	0.53
	Tank & fitting including HV/LV bushings turrets, rollers, conservator, pipe work	MT	0.5
	Bushings	**MT**	Supplied filled with the transformer
	Radiator bank, fans &valves, pipe & fitting, Cabling between marshalling box to field devices, On load tap Chamber, etc.	MT	Pipe work, the box, cabling supplied filled with the transformer.
	Total weight of transformer including oil	MT	1.5
	Shipping weight of transformer (oil filled)	MT	1.5
	Untanking weight	MT	0.53
7	**Oil Quantity**		
	Oil in transformer tank including On Load Tap Changer, turrets	LITERS.	462
	Oil in radiator bank, conservator &pipe work	MT	Supplied as filled with transformer
	Total oil quantity	MT	462

HVR Transformers are supplied completely assemabled and oil filled.

16.06 2000KVA, 6.6KV/415 V OIL FILLED TRANSFORMERS

Common Services - 4 Nos.

Sl. No.	Description	Remarks
01	Transformer, 2000KVA, 6.6 KV/0.433 KV, Cooling type ONAN Vector Group Dyn11, On load tap changer	
02	Total weight of assembled transformer appr oximately	8.00 MT
03	Accessories like HT/LT cables, Marshalling Box, Radiator assemblies, pipe, explosion vent, conservator tank, oil in drums etc shall be supplied loose	

16.07 1600 KVA, 6.6 KV/415 V OIL FILLED TRANSFORMERS

Unit # 3 - 8 Nos.
Unit # 4 – 8 Nos.

Sl. No.	Description	Remarks
01	Transformer, 1600KVA, 6.6 KV/0.415 KV, Cooling type ONAN Vector Group Dyn11, Off Ckt tap changer	
02	Total weight of assembled transformer approximately	6.00 MT
03	Accessories like HT/LT cables, Marshalling Box, Radiator assemblies, pipe, explosion vent, conservator tank, oil in drums etc shall be supplied loose	

16.07 630 KVA, 6.6KV/415 V OIL FILLED TRANSFORMERS

Unit # 3 - 8 Nos.
Unit # 4 – 8 Nos.

Sl. No.	Description	Remarks
01	Transformer, 630KVA, 11/0.415 KV, Cooling type ONAN Vector Group Dyn11, Off Ckt tap changer	
02	Total weight of assembled transformer approximately	4.00 MT
03	Accessories like HT/LT cables, Marshalling Box, Radiator assemblies, pipe, explosion vent, conservator tank, oil in drum s etc shall be supplied loose	

16.13 220-VOLT DC BATTERY & BATTERY CHARGER (STATION)

Numbers of 220-Volt Battery System per Unit – FOUR (2) SETS.

One set of Battery System Consist of Following:-

Sl.No.	DESCRIPTION	Quantity, Dimensions , Weight
1	Type of Cell **	Ni-Cad, Translucent, Polypropylene
2	Number of Batteries in Bank	170 Nos.
3	Cell Dimension	L=350 W=195 H= 350

Sl.No.	DESCRIPTION	Quantity, Dimensions , Weight
4	Weight per Cell	70 Kg (Approx.) with electrolyte
5	Total weight of the battery including 4 racks.	4865 kg apprx.
6	Weight of one rack with 44 cells.	kg approx
7	Arrangement of one battery bank consists of 4 racks.	1. M.S Rack type 1: Length = 4405 - 3 nos. 2. M.S Rack type 2 - Length = 3805 - 1 no. 3.
8	Float cum boost charger, Dimensions: 1200 X 0750 X 1800 mm, Weight of each charger	1 No. charger per battery bank Dimensions: 1200 X 0750 X1800 MM 3500 Kg.
9	Nos. of Battery Fuse Box wall mounted Dimensions of fuse box	1 Nos./ Battery Bank. 700x 600 x1000 mm, Weight –100 Kg (approx.)
10	LOOSE ACCESSORIES 1. 2 Step 1 tier rack 2. Cell 3. Vent 4. Hex Bolt SS along with washer 5. Rack insulators 6. Equalizing Connectors 7. Inter Block Connectors 8. Cable Connectors 120 sqmm, 700 mm long 9. Cable Connectors 120 sqmm, 1000 mm long. 10. Cable Connectors 120 sqmm, 1300 mm long. 11. Cable Connectors 120 sqmm, 3000mm long. 12. Terminal strip	 4 Nos. 170 Nos. 1014 Nos. 2028 Nos. 48 Nos. 170 Nos. 966 Nos. 36 Nos. 06 Nos. 06 Nos. 06 Nos. 02 Nos.

16.13 220-VOLT DC BATTERY & BATTERY CHARGER (UNIT)

Numbers of 220-Volt Battery System per Unit – FOUR(2) SETS.

One set of Battery System Consist of Following :-

Sl.No.	DESCRIPTION	Quantity, Dimensions , Weight
1	Type of Cell **	Ni-Cad, Translucent, Polypropylene
2	Number of Batteries in Bank	170 Nos.
3	Cell Dimension	L=520 W=195 H= 410

Sl.No.	DESCRIPTION	Quantity, Dimensions , Weight
4	Weight per Cell	70 Kg (Approx.) with electrolyte
5	Total weight of the battery including 4 racks.	12450 kg apprx.
6	Weight of one rack with 44 cells.	3250 kg approx
7	Arrangement of one battery bank consists of 4 racks.	1. M.S Rack type 1: Length = 4405 - 3 nos. 4. M.S Rack type 2 - Length = 3805 - 1 no. 5.
8	Float cum boost charger, Dimensions: 1600 X 100 X 2000 mm, Weight of each charger	1 No. charger per battery bank Dimensions: 1600 X 1000 X2000 MM 3500 Kg.
9	Nos. of Battery Fuse Box wall mounted Dimensions of fuse box	1 Nos./ Battery Bank. 700x 600 x1000 mm, Weight –100 Kg (approx.)
10	LOOSE ACCESSORIES 13. 2 Step 1 tier rack 14. Cell 15. Vent 16. Hex Bolt SS along with washer 17. Rack insulators 18. Equalizing Connectors 19. Inter Block Connectors 20. Cable Connectors 120 sqmm, 700 mm long 21. Cable Connectors 120 sqmm, 1000 mm long. 22. Cable Connectors 120 sqmm, 1300 mm long. 23. Cable Connectors 120 sqmm, 3000mm long. 24. Terminal strip	 4 Nos. 170 Nos. 1014 Nos. 2028 Nos. 48 Nos. 170 Nos. 966 Nos. 36 Nos. 06 Nos. 06 Nos. 06 Nos. 02 Nos.

16.3 STATION TRANSFORMER

Quantity– 1 No.

SL. NO	DESCRIPTION	STATION TRANSFORMER
1	Rating	3-PHASE , 50/25/25 MVA, 230/7.7/7.7 KV
2	Type of cooling	ONAN/ONAF
3	Winding connection	Ynyn0yn0
4	**WEIGHT OF ACCESSORIES**	
	Weight of core&winding	68000 KGS
	Tank & fitting including HV/LV bushings turrets, rollers	21000 KGS
	Bushings	1200KGS
	Radiator bank, fans &valves	28000 KGS
	Total weight of transformer including oil	155000 KGS
	Shipping weight of transformer (gas filled)	75000 KGS
	Untanking weight	58000 KGS
5	Nos. Of radiators	16
6	NOS.OF FANS	10
7	**OIL QUANTITY**	
	Oil in transformer tank including OLTC diverter	42000 LITRES
	Oil in radiator bank, conservator &pipe work	10000 LITRES
	Total oil quantity	**52000 LITRES**

LIST OF ELECTRICAL LABORTARY EQUIPMENTS (DOC NO PE-DC-239-556-E001 REV 01)

S NO	ITEM DESCRIPTION	QTY
01	INSULATION TESTER (MEGGER)	
	i) 5.0 kv	2
	ii) 2.5 kv	2
	iii) 1000 volts	5
	iv) 500 volts	10
02	BATTERY OPERATED INSULATION TESTER (MEGGER)	4
03	MEGA OHM METER 10 KV	2
04	CLIP ON METER	
	i) AC CLIP ON METER	5
	ii) DC CLIP ON METER	2
05	DIGITAL DUCTOR OHMMETER	2
06	ANALOG MULTIMETE (AVO METER)	5
07	UNIVERSAL TONG TESTER	4
08	PORTABLE DIGITAL SUBSTANDARD FREQUENCY METER	2
09	DIGITAL TME COUNTER	2
10	HV DISCHARGE ROD	
	i) UP TO 39.5 KV	5
	ii) FROM 132 KV TO 420 KV	6
11	PORTABLE CABLE CORE IDENTIFICATION KIT	2
12	PHASE SEQUENC INDICAOR	5
13	PORTABLE RECORDING METERS	2
14	MOVING IRON AMMETERS (0 -5 A RANGE)	6
15	MOVING IRON AMMETERS (0 -100 A RANGE)	6
16	PRECISON PORTABLE DIGITAL FREQUENCY METER	2
17	PORTABLE MULTI RANGE CAPICITANCE METER	2
18	DIGITAL TACHOMETER 9NON CONTACT TYPE) (PHOTO ELECTRICAL OPTICAL)	2
19	RELAY REPAIR KIT TOOL	3
20	NUMERICAL RELAY TEST KIT	1
21	UNIVERSAL BRIDGE (LCR-Q BRIDGE0	1
22	STANDARD CURRENT TRANSFORMER	4
23	STANDARD POTENTIAL TRANSFORMER	2
24	PRIMARY INJECTION KIT	1
25	SECONDARY INJECTION KIT	3
26	SINGLE PHASE AUTO TRANSFORMER (VARIAC) 0-10 A	10
27	THREE PHASE AUTO TRANSFORMER (VARIAC) 0-30 A	10
28	DIELECTRIC LOSS FACTOR TEST SET (TAN DELTA TEST KIT)	1
29	EARTH RESISTANCE METER	2
30	90 KV AUTOMATIC OIL BREAK DOWN VOLTAGE TEST SET	1
31	CLAMP ON WATTMETER	2
32	HIGH VOLTAGE TESTING KIT	4
33	DC EARTH FAULT LOCATER	2
34	PORTABLE DIGITAL MULTIMETERS	10
35	PORTABLE THREE PHASE SUBSTANDARD METER	6
36	DC MILLIAMPERE METER	2
37	DC MILLI VOLT METER	2
38	DC MOVING COIL MICRO AMMETER	2
39	DC MOVING COIL MILLI AMMETER	2
40	PORTABLE LIGHT INTENSITY METER	2
41	AC VOLTAGE / CURRENT SOURCE	2
42	PORTABLE HAND HELD INFRARED TEMPERATURE SCANNER	2
43	PORTABLE REFERENCE METER AND PHANTOM LOAD TEST SET	1
44	TRANSFORMER TURNS RATIO TESTER (WITH VECTOR GROUP)	1
45	THREE PHASE SHIFTER	1
46	KELVIN DOUBLE BRIDGE	1
47	PORTABLE CABLE FAULT LOCATER	1
48	SET OF RHEOSTAT	1
49	DIGITAL SOUND LEVEL INDICATOR	1
50	EQUIPMENT REQUIRED FOR TESTING FIBRE OPTICAL CABLE	1

GENERATOR ISOLATED PHASE BUS DUCT

BUS DUCT–1 SET

A.1	**Cross section of Main Bus duct** Enclosure OD	**MM**	**1070**
	Enclosure Thickness	MM	8.0
	Conductor OD	MM	530
	Conductor Thickness	MM	16
	Phase to Phase Distance	MM	1300
A.2	**Cross section of Tap off bus duct**		
	Enclosure OD	**MM**	**780**
	Enclosure Thickness	MM	6.35
	Conductor OD	MM	2x152.4 box channel
	Conductor Thickness	MM	8.1
	Phase to Phase Distance	MM	1000 / 930
A.3	**Main section**		
	No of main sections	NOS.	40appx.+1(Star)+1(Chamber)
	Main Section(L X B X H) EACH	MM X MM XMM	5000x1300x1300(Approx) 4000x4000x1300(Star) 4000x3000x5000(Chamber)
	Weight of Each main section	MT	500Kg (appox) of duct 800Kg (appox) of star 1000Kg(appox) of top chamber
	Enclosure welding joints	NOS.	34 No make-up pieces (welding circumferential/longitudinal)
	Bolted joints	NOS.	24 Nos appox.
A.4	**Tap off s ection**		
	No of main sections	NOS.	10 Nos appox.
	Main Section (L X B X H) EACH	MM XMM XMM	5000 x 900 x 900
	Weight of Each main section	MT	450Kg (Approx)
	Enclosure welding joints	NOS.	10 Nos appox. (welding circumferential/longitudinal)
	Bolted joints	NOS.	10 No

	Length of Bus duct per phase	MM	75 Mtrs appox.(main)
	Length of tap off BD per phase	MM	11 Mtrs appox
A.5	**Air pressurization units**		
	No of APU	NOS.	One no
	Dimensions L XB X H	MM XMM XMM	3000 x 2500 x 3500
	WEIGHT OF APU	MT	900KG (APPROX)
A.6	**LAVT and NGT Cubicle**		
	Qty of each set	NOS (EACH)	1No- NG Cubicle 3Set single phase - Cubicle of LAVT
	Enclosure welding joints	NOS.	Nil
	Enclosure welding joints	NOS.	Nil
	Conductor weld joints	NOS.	Nil
	Bolted joints	NOS.	30 Nos inside cubicle
A.7	Structural steel	MT	50 MT(Approx)

RECOMMENDATION FOR WELDED JOINTS (FOR ENCLOSURE, BOX CONDUCTOR, MAKE UP PIECES, SHUNT AND FLEXIBLE JOINT ETC)

	TYPE OF WELDING	**MIG / TIG WELDING**	
	FILLER WIRE	mm DIA. (NG WITH % SILICON	1.6mm dia (NG:21 with 5% Silicon)
	ANGLE	TO DEG. FOREHEADS	10 to 15 Degree forehead
	CLEANING	DEGREASE AND SCRATCH BRUSH	Degrease and Scratch brush
	CURRENT SETTING	DEPENDED ON THICKNESS	250A-320A,28-30V(Dependent on thickness)
	GAS SUPPLY/ PURITY	Cu. FT/ HR ARGON / 99.98%	10-12Lits / Min. Argon

GENERAL INFORMATION

1. CONTACT PRESSURE

FOLLOWING TORQUE ARE NORMALLY RECCOMMENDED EOR VARIOUS BOLTS.

BOLT SIZE	RECOMMENDED TORQUE	TORQUE SPANNER CAPTY.
M10	0.85 TO 1.3 NM (20-30 Ft - lb)	0.85 TO 1.3 NM
M12	1.3 TO 1.7 NM (30-40 FT-lb)	0.85 TO 4.3NM
M16	1.7 TO 2.1NM (40 –50 FT-lb)	0.85 TO 4.3 NM

M20	2.1 TO 2.5 NM (50 –60 FT-lb)	0.85 TO4.3 NM

Alternatively tightening the nut till Belleville washer becomes flats. Then unscrew the nut by 1/8th turn. Exact method and extent of tightening shall be done as per instructions of BHEL site engineer / as per equipment supplier's recommendation.

16.5 6.6 KV SEGREGATED PHASE BUS DUCTS

General data of 6.6 KV 2500 Amp SPBD

SN	Connection		Bus duct cross section (mm)	No of sections	Length in Meters (Approximate)
	From	To			
BD-1A	UAT	SWG 1CA10	400X1200	20	60
BD-2A	UAT	SWG 2CA16	400X1200	20	60
BD-1B	UAT	SWG 1CB12	400X1200	23	66
BD-2B	UAT	SWG 2CB6	400X1200	23	66
BD-1C	STN	OCA -9	400X1200	42	130
BD-2C	STN	OCC -3	400X1200	45	140
BD-1D	STN	SWG OCB7	400X1200	42	135
BD-2D	STN	SWG OCD13	400X1200	45	145
BD-1E	1CA-1	OCA-15	400X1200	5	10
BD-2E	2CA-1	OCC-15	400X1200	5	08
BD-1F	1CB17	OCB1	400X1200	5	10
BD-2F	2CB-18	OCD-1	400X1200	5	08
BD-1G	OCA-5	OCC-9	400X1200	27	95
BD-1H	OCB-11	OCD-8	400X1200	27	96
Weight of structure : 60MT					
Weight of Misc Items 20MT					

Note: - Considering the layout of the bus ducts as mentioned above for interconnection between the transformer and 6.6KV switchgear boards and bridging bus duct in between the switchgears boards, it is not possible to the segregate the quantity of structural support materials for individual area, hence the quantity mentioned above is common for all.

Flexible joints, seal off bushings, rubber bellows, space heaters and their wiring, conduits/GI pipes breather tapping etc, etc are accessories and form a part of the system.

16.7 DIGITAL VOLTAGE REGULATOR PANELS

SN	DESCRIPTION	Quantity
1.	Digital Voltage Regulator panels consist of Regulation Cubicle, Thyristor Cubicle and Field suppression cubicle, Overall dimension 3050 x 800 x 2230 mm, Total weight - 1.5 MT. DVR console assembled or loose components are to be mounted on Unit Control Desk. FIELD BREAKER CUBICLE AND FIELD FLASHING CUBICLE EXCITATION TRANSFORMER 3125 KVA (APPROX)	1 SET

16.8 GENERATOR, GT & UT PROTECTION AND METERING PANELS

SN	DESCRIPTION	Quantity per Unit
I	Generator, Generator Transformer, Unit Transformers, **"Control / Protection & Metering Panels",** Over all dimension of each panels 1000 x 1000 x 2330 mm, Panel are to be erected in row, fixing of inter panel fasteners/ gasket, inter panel wiring, jointing of bus bar etc. Following items along with each unit panels shall be supplied loose for mounting in the panels / Unit Control Board 1. PC –2 Nos. 2. Replay S/W on CD –1 No. 3. Colored Inkjet printer – 2 Nos. 4. Antenna with 6 mtr cable 5. Cables for antenna- 60 m 6. UPS for PC – 2 Nos. 7. Hub between PCs & DR – 1 No. 8. Cable DR to Hub – 2 Nos 9. Cable from Hub to PC – 2 Nos. 10. Disturbance Recorder (DR) – 2 Nos. 11. Energy Meter along with power pack unit & chargers – 1 No.	8 Nos.

16.9 24V DCDB

Each 24V DC supply and battery system consists of battery charger, distribution panel, battery 2X20 Nos, suitable battery racks (to be assembled). App dimension 850x750x2100 for each section. Lumpsum rate per set is to be quoted.

Appendix-I

List of **T&P** to be made available **by BHEL** free of hire charges on sharing basis.

01	EOT crane in TG hall	1 no
02	Tyre-Mounted Crane 8 MT Capacity	1 no.

Note:

Above T&P will be provided on sharing basis as per allocation decided by BHEL site. While taking delivery, contractor shall check for proper working of the equipment and the same shall be returned after the work is completed to BHEL stores in good working condition subject to normal wear and tear.

Tyre-mounted crane will be made available on sharing basis for loading/ unloading at stores and site for handling heavier components.

Operator (for both cranes), fuel & lubricants (for tyre-mounted crane) shall be arranged by the contractor or contractor shall share the cost. BHEL will provide spare parts in case of breakdown not attributable to the contractor (accidental damage, regular wear & tear). Contractor shall carry out regular preventive maintenance. Filters for Fuel and Oil will be provided by BHEL.

While all effort will be made for amicable sharing of the above, non-availability of the above due to any reason shall not absolve the contractor of performing his responsibilities in time. The contractor shall undertake sufficient pre-planning and arrange his own handling/transport equipment as deemed necessary.

APPENDIX-II

CONSUMABLES/ITEMS TO BE PROVIDED BY BHEL FREE OF CHARGE

01) C ABLE GLANDS

02) LUGS BEYOND 4 sq. mm. SIZE.

APPENDIX-III

Tentative List of Major T&P and MMD to be deployed by the Contractor

A. T&P FOR ELECTRICAL WORKS

SN	DESCRIPTION	MINIMUM QUANTITY
01	TRANSFORMER OIL PURIFICATION PLANT WITH VACUUM PUMP FOR EVACUATION OF TRANSFORMER ALONGWITH ACCESSORIES & HOSES.	
	A) CAPACITY 5000/6000 LTR PER HOUR	1 NO.
	B) CAPACITY 2000/2500 LTR.PER HOUR	1 NO.
	C) CAPACITY 750/1000 LTR. PER HOUR	1 NO.
02	SILICON OIL FILTERING MACHINE FOR ESP RECTIFIER TRANSFORMERS	1 NO.
03	TRANSFORMER OIL TRANSFER/STORAGE TANK WITHSTANDING FULL VACUUM CAP. 10 KILOLITRES	2 NOS
04	PRIMARY INJECTION KIT UPTO 10000 AMPS	1 NO.
05	SECONDARY INJECTION KIT WITH INTEGRAL TIMER FOR RELAY TESTING	1 NO.
06	3 PHASE VARIAC	1 NO.
07	SINGLE PHASE VARIAC 28 AMPS	1 NO.
08	TRANSFORMER TURNS RATIO TEST KIT	1 NO.
09	H V TEST KIT AC, 0 –50 KV &DC, 0- 100 KV PREFERSBLY WITH DRY TYPE TRANSFORMER	1 NO. EACH
10	TRANSFORMER OIL BDV TEST KIT 0-100 KV WITH 2.5MM AIR GAP.	1 NO.
11	PORTABLE AIR COMPRESSOR WITH DRIER AND REGULATOR MAKE “TOSHNIWAL”/”KHOSLA” RATED FOR 7/10 KG/CM2	1 NO.
12	SOLDERING IRON “SOLDRON” MAKE 25 WATT	2 NOS.
13	VACUUM PUMP	1 NO.
14	MULTIMETRES	
	DIGITAL 3 1/2 DIGIT OF REPUTED MAKE b. ANALOG MOTWANE MAKE c. DIGITAL 4 1/2 DIGIT OF REPUTED MAKE	4 NOS. 3 NOS. 1NO.
16	STANDARD MILLI AMPS/MILLIVOLTS SOURCE MAKE RANGE 0 TO 60 mA AND 0 TO 100 mV	1 NO.
17	INSULATION TESTER HAND OPERATED 25OV/500V/1000 V RATED MAINS/BATTERY OPERATED	1 NO. EACH
18	INSULATION TESTER MAINS OPERATED 2500/5000V	1 NO.

SN	DESCRIPTION	MINIMUM QUANTITY
19	DC POWER SUPPLY 0 TO 250 V DC, 5 A MAKE “APLAB” OR EQUIVALENT (VARIABLE SOURCE)	1NO
20	PHASE SEQUENCE INDICATOR	1 NO.
21	FREQUENCY SOURCE 45 TO 55 HZ WITH 110V	1 NO.
22	TONG TESTER AC 5/10, 25/60/300 AMP RANGE REPUTED MAKE	1 NO. EACH
23	TONG TESTER DC 30/60/300 AMP	1 NO.
24	STOP WATCH	1 NO.
25	CONTAINER FOR TRANSFORMER OIL SAMPLING	10 NOS.
26	TARPOLIN FIRE PROOF	As required
27	DC SHUNT 400 AMP 75 MV	1 NO.
28	3 PHASE SHIFTER	1 NO.
29	INDUSTRIAL TYPE VACUUM CLEANER	1 NO.
30	MICRO OHM METER	1 NO.
31	DECADE RESISTANCE BOX	2 NOS.
32	TELETALK 2 WIRE SYSTEM	6 SETS
33	PORTABLE BLOWER WITH HEATING ARRANGEMENT	1 NO.
34	TORQUE WRENCH (12-60Nm, 50-225 Nm)	1 NO EACH
35	WATTMETER AC/DC 0-125-250V, 0-5-10A	1 NO
36	OSCILLOSCOPE	1 NO
37	TACHOMETER	1 NO
38	TAN DELTA TEST KIT	1 NO
39	OIL SPECIFIC GRAVITY AND PPM MEASURING INSTRUMENT	1 NO
40	RHEOSTAT	3 NOS
41	POLARITY TEST KIT	1 NO
42	NON – CONTACT TYPE DIGITAL THERMOMETER	1 NO
43	RELAY TESTING KIT	1 NO
44	FERRULE PRINTING MACHINE	1 NO

B. T&P FOR MECHANICAL WORK

SN	DESCRIPTION	MINIMUM QUANTITY
	HANDLING EQUIPMENTS	
1	TURN BUCKLES	AS PER REQMT
2	'D' SHACKLES	AS PER REQMT
3	STEEL WIRE ROPES	AS PER REQMT
4	MANILA ROPES	AS PER REQMT
5	CHAIN PULLEY BLOCK/TIRFUR	AS PER REQMT
	MAJOR T&P	
1	PIPE BENDING MACHINE – 2" SIZE	2 NOS
2	GRINDING MACHINE	2 NOS
3	DRILLING MACHINES 1/4", 1/2", 3/4" & 1"	1 NO. EACH
4	COPPER TUBE BENDER AND CUTTER SIZES 6MM, 8MM, 1/2", 1/4"	1 NO. EACH
5	DYE SETS FOR THREADING UPTO 2" PIPE.	2 NOS
6	SPIRIT LEVEL	2 NOS.
7	TAP SETS FOR BOTH BSP AND MPT THREADS UPTO 1" EACH	1 SET EACH
8	MEASURING INSTRUMENTS LIKE MICROMETRES AND CALIPERS	1 SET EACH
9	WELDING GENERATORS	1 NO.
10	WELDING TRANSFORMER	1 NO.
11	TIG WELDING SET	1 NO.
12	MECHANICAL TOOL KIT FOR FITTERS	4 NOS.
13	ELECTRICIAN TOOL KIT	4 NOS.
14	CRIMPING TOOL UPTO 2.5 SQ.MM CABLE	4 NOS.
15	FLOOD LIGHT FITTINGS	2 NOS.
16	FIRE EXTINGUISHERS	3 NOS.
17	DISTRIBUTION BOARDS WITH POWER CABLE COMPLETE AS REQUIRED	1 SET
18	PAINTING BRUSH	AS PER REQMT.
19	FIRE PROOF TARPAULIN	AS PER REQMT.
20	SAFETY BELTS AND SAFETY HELMETS	AS PER REQMT
21	24V A/C TRANSFORMER & HAND LAMPS	4 NOS.
22	MIG WELDING MACHINE WITH ACCESSORIES AIR COOL TYPE	2 NOS.
23	CRIMPING TOOL HYDRAULIC UPTO 600 SQ.MM	1 NO.
24	TORQUE WRENCH SET	1 SET
25	HYDRAULIC JACKS 250T CAPACITY/100T	4 NOS.EACH
26	TUFFER CAPACITY 15T	2 NOS.
27	CHAIN PULLEY BLOCKS 5/10T	1 NO.EACH

OTHER THAN THE ABOVE, ONE COMPUTER, PRINTER AND OTHER NECESSARY PERIPHERALS WILL HAVE TO BE MAINTAINED BY THE CONTRACTOR IN HIS SITE OFFICE.

NOTE:

THE LIST OF INSTRUMENTS / EQUIPMENTS TO BE BROUGHT BY THE CONTRACTOR AS SHOWN ABOVE SECTIONS A AND B ARE ONLY INDICATIVE. ANY OTHER INSTRUMENTS / EQUIPMENTS REQUIRED FOR THE EXECUTION OF THE WORK IS TO BE NECESSARILY ARRANGED BY THE CONTRACTOR WITHIN THE QUOTED RATES.

THE TESTING/CALIBRATION INSTRUMENTS WHICH ARE USED TO BE DULY CALIBRATED IN THE INTERVAL PRESCRIBED BY BHEL ENGINEERS FROM THE REPUTED AGENCIES DECIDED BY BHEL AND TEST CERTIFICATE TO BE FURNISHED.

APPENDIX -IV

MONTHWISE MANPOWER DEPLOYMENT (NUMBER TO BE INDICATED CATEGORY-WISE IN EACH MONTH) BY THE CONTRACTOR.

SL. NO.	CATEGORY	MONTHS																	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	so on
01.	RESIDENT MGR																		
02.	ENGINEERS																		
03.	SUPERVISORS																		
04.	RIGGERS																		
05.	FITTERS																		
06.	HP WELDERS																		
07.	STRUCT. WELDERS																		
08.	TIG WELDERS																		
09.	MIG WELDERS																		
10.	ELECTRICIANS																		
11.	INSTRUMENT TECHNICIANS																		
12.	STORE KEEPER																		
13.	SEMISKILLED & UNSKILLED WORKERS																		
14.	WATCHMEN/SECURITY																		

NOTE: 01. MONTHWISE MINIMUM NUMBER OF PERSONS TO BE INDICATED.

02 ABOVE DEPLOYMENT PLAN WILL BE DISCUSSED PRIOR TO START OF WORK AND NECESSARY CHANGES SHALL HAVE TO BE MADE BY CONTRACTOR AS REQUIRED. ANY ADDITIONAL DEPLOYMENT REQUIRED DURING EXECUTION OF WORK SHALL HAVE TO BE MADE BY CONTRACTOR FOR MEETING VARIOUS SCHEDULES/TARGETS SET BY BHEL WITHOUT ANY ADDITIONAL COMPENSATION.

SIGNATURE OF TENDERER WITH SEAL

APPENDIX-V

ANALYSIS OF UNIT RATE QUOTED

Sl. No.	DESCRIPTION	Percentage of Unit Rate Quoted	Remarks If Any
01	SITE FACILITIES VIZ., ELECTRICITY, WATER, WORKSHOP AND OTHER INFRASTRUCTURE.		
02	SALARY & WAGES		
03	CONSUMABLES		
04	DEPRECIATION & MAINTENANCE FOR T&P/INSTRUMENTS AND OTHER ITEMS		
05	ESTABLISHMENT & ADMINISTRATION EXPENSES OF SITE		
06	RETRENCHMENT BENEFIT		
07	EXTRA WORK INCIDENTAL TO ERECTION		
08	OVERHEADS		
09	PROFIT		

SIGNATURE OF THE TENDERER WITH SEAL

APPENDIX–VI
Contractor's T&P/MMD Deployment Plan

SN	DESCRIPTION & CAPACITY OF T&P	MONTHS													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14 and so on*
01															
02															
03															
04															
05															
06															
07															
08															
09															
10															

SIGNATURE OF THE BIDDER
DATE:
* Please use additional sheet if needed.

APPENDIX-VII
CONCURRENT COMMITMENTS

SN	FULL POSTAL ADRESS OF CLIENT AND NAME OF OFFICER IN-CHARGE	DESCRIPTIO N OF THE WORK	VALUE OF THE CONTRACT	COMMENC -EMENT DATE	SCHEDU-LED COMPLE-TION	% COMPL-TD. AS ON DATE	ANTICIP A-TED COMPLN . DATE	REMARKS

SIGNATURE OF THE BIDDER DATE:

APPENDIX–VIII

DETAILS OF SIMILAR WORK DONE DURING THE LAST SEVEN YEARS

SN	FULL POSTAL ADDRESS OF CLIENT & NAME OF OFFICER IN CHARGE	DESCRIP-TION OF WORK	VALUE OF CONTRACT (Rs.)	DATE OF AWARD OF WORK	DATE OF COMMENCE MENT OF WORK	TIME SCHEDULE (MONTHS)	DATE OF ACTUAL COMPLETION OF WORK	REMARKS

SIGNATURE OF BIDDER WITH SEAL

- PLEASE USE ADDITIONAL SHEET IF NEEDED BUT **IN THE SAME FORMAT.**
- **PLEASE ENCLOSE COPIES OF WORK ORDERS INCLUDING DETAILED BILL OF QUANTITIES, COMPLETION CERTIFICATES IN SUPPORT OF THIS STATEMENT**.