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

No. BHE/PW/PUR/KKT-ELE/627

FOR

HANDLING AT SITE STORES/STORAGE YARD, TRANSPORTATION TO SITE OF WORK, COMPLETE ERECTION, CHECKING OF CALIBRATION, TESTING, COMMISSIONING AND HANDING OVER OF HT / LT POWER TRANSFORMERS, ISOLATED PHASE BUS DUCT FOR GENERATOR TRANSFOMER, SEGREGATED PHASE BUS DUCT FOR STATION TRANSFORMER / UNIT AUXILIARY TRANSFORMER, ELECTROSTATIC PRECIPITATOR,DIGITAL EXCITATION SYSTEM, VARIABLE FREQUENCY DRIVES FOR ID FANS, GENERATOR CONTROL & PROTECTION PANELS,STATION CONTROL & PROTECTION PANEL, 11kV/ 6.6 KV SWITCHGEAR BOARDS / MCC, SOOT BLOWER SYSTEM, CABLING, ELECTRICAL HOIST AND ASSOCIATED EQUIPMENTS FOR 1x500MW

AT

KHAPERKHEDA TPP

MAHARASHTRA STATE POWER GENERATION CO. LTD.

KHAPERKHEDA, MAHARASHTRA

PART: I - TECHNICAL BID SPECIFICATION

BHARAT HEAVY ELECTRICALS LIMITED

(A Govt. of India Undertaking)

POWER SECTOR - WESTERN REGION

345, KINGSWAY - NAGPUR 440 001

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LEGEND:

$: Included in Tender Specifications Part-I. Hosted in BHEL web page (www.bhel.com) as file titled **"NIT+GCC-627".**

@: Issued as separate hard copy booklet 'Tender Specifications Part-II (Price Bid-627)'. Hosted in BHEL web page (www.bhel.com) as file titled **"PRICE BID-627"**

Note:

Rest of the tender documents are included in Tender Specifications Part-I. Hosted in BHEL web page (www.bhel.com) as file titled "**TECH BID-627"**

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/KKT-ELE/627

NAME OF THE WORK : HANDLING AT SITE STORES/STORAGE YARD, TRANSPORTATION TO SITE OF WORK, COMPLETE ERECTION, CHECKING OF CALIBRATION, TESTING, COMMISSIONING AND HANDING OVER OF HT / LT POWER TRANSFORMERS, ISOLATED PHASE BUS DUCT FOR GENERATOR TRANSFOMER, SEGREGATED PHASE BUS DUCT FOR STATION TRANSFORMER / UNIT AUXILIARY TRANSFORMER, ELECTROSTATIC PRECIPITATOR,DIGITAL EXCITATION SYSTEM, VARIABLE FREQUENCY DRIVES FOR ID FANS, GENERATOR CONTROL & PROTECTION PANELS,STATION CONTROL & PROTECTION PANEL, 11kV/ 6.6 KV SWITCHGEAR BOARDS / MCC, SOOT BLOWER SYSTEM, CABLING, ELECTRICAL HOIST AND ASSOCIATED EQUIPMENTS FOR 1x500MW

AT

KHAPERKHEDA TPP

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EARNEST MONEY DEPOSIT: Please see Section-15 (Special Conditions of Contract)

Please obtain updated information from our web page

(www.bhel.com → Tender Notification → View Corrigendum).

THESE TENDER SPECIFICATION DOCUMENTS CONTAINING PART-I TECHNICAL BID AND PART-II PRICE BID, ARE ISSUED TO:

M/s. ……..

……

(THESE TENDER DOCUMENTS ARE NOT TRANSFERABLE)

FOR BHARAT HEAVY ELECTRICALS LIMITED

Dy. GENERAL MANAGER (PURCHASE)

PLACE: NAGPUR

DATE:

BHARAT HEAVY ELECTRICALS LIMITED

(A Government of India Undertaking)
POWER SECTOR - WESTERN REGION
345-KINGSWAY, NAGPUR 440 001

PROCEDURE FOR SUBMISSION OF SEALED TENDERS

The Bidder must submit their tenders 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 tender notice.

Part-I (Technical Bid) cover-I

Except rate schedule, all other schedules, data sheets and details called for in the specification shall be enclosed in part-I "Technical Bid" only.

Part-II (Price Bid) cover-II

All indications of price shall be given in this part-II “Price Bid".

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. Gen Manager (Purchase) at the above mentioned address before the due date as indicated. **EMD shall not be included in this cover.**

The qualified Bidder will be intimated separately about the status of their offer.

Bidder is requested to make specific note of the following conditions:

Contractor should have adequate resources including major T & Ps at his disposal for this job.

Contractor should have sound financial stability.

Bidder should meet quality requirement regarding workmanship, deployment of personnel, erection tools and necessary inspection, measurement & testing instruments.

All information as called for in various appendices and clauses of tender specification should be furnished in completeness. Please refer the checklist.

Clarification if any on tender shall be obtained by the Bidder before submitting their offer.

Offers must be submitted without any deviation.

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.

Bidder shall note that their offer will be considered subject to the approval of BHEL's customer.

PROJECT INFORMATION

(A) INTRODUCTION

Khaperkheda Thermal Power Station is owned by Maharashtra State Power Generation Co. Ltd. (MAHAGENCO). The Power Station presently has four sets of 210 MW each coal based thermal power generating sets. The capacity of the thermal power plant is presently 840 MW. This will be augmented by installation of one 500 MW set in the existing premises.

The plant is located at Khaperkheda, which is about 23 Km from Nagpur city. The approach road to the plant is tapped on the Nagpur Chhindwara. Falls under district of Nagpur, state of Maharashtra. Nearest railway station is Khaperkheda (narrow guage) and major railway station is Nagpur. Project is accessible by all season road on Nagpur-Chindwara state highway and is about 23 km from Nagpur city. Weather condition varies generally from average to extreme in summer. The project has broad guage railway siding as Khaperkheda TPS siding. The project site and BHEL store/storage yard are aprox. 2 Km from project siding. Material despatched by rails will be consigned to Khaperkheda power station railway siding.

Maharashtra State Power Generation Company Limited is going for expansion of its existing Khaperkheda Thermal Power Station by addition of **one unit of 500 MW Coal fired thermal units.**

(B) APPROACH TO SITE

The plant is located at a distance of 23 KM from Nagpur city of Maharashtra 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.

The site is approximately 23km from Nagpur city. Nagpur is located on Railways Grand Trunk route on Delhi - Chennai and Mumbai – Howrah line.

The nearest railway station is Khaperkheda on Narrow gauge line in South Eastern Railways.Khaperkheda can be accessed by road on Nagpur – Chhindwara High way

(C) CLIMATIC CONDITIONS

a. Maximum temperature	:	48-50 Deg Celcius
b. Minimum temperature	:	8-10 Deg Celcius
c) Maximum Relative Humidity	:	91%
d) Minimum Relative Humidity	:	18%
e) Average Annual rainfall	:	860 mm
f) Seismic Zone	:	II
g) Height above MSL	:	292.5 M

CHECK LIST

(VIDE PARA 1.3 OF SECTION-I OF GENERAL CONDITIONS OF CONTRACT)

1	NAME OF THE TENDERER WITH ADDRESS		
2	NATURE OF THE FIRM	LIMITED / PARTNERSHIP / PROPRIETARY	
3	EMD DETAILS (Rs. 2.0 LACS BY DD ONLY OR ONE TIME EMD)		
4	VALIDITY OF OFFER (REQUIRED 6 MONTHS FROM TENDER OPENING DATE)		
5	MOBILIZATION TIME (NOT MORE THAN ONE MONTH FROM FAX LOI)		
6	WHETHER NO DEVIATION CERTIFICATE FURNISHED	YES	NO
7	TENDERER HAS VISITED THE PROJECT SITE AND ACQUAINTED WITH THE SITE CONDITIONS	YES	NO
8	DETAILS OF CONCURRENT JOBS ARE FURNISHED (AS PER RELEVANT APPENDIX)	YES	NO
9	HEAD QUARTER'S ORGANISATION IS FURNISHED	YES	NO
10	PROPOSED SITE ORGANISATION IS FURNISHED	YES	NO
11	FINANCIAL STATUS OF THE COMPANY (ANNEXURE 'A' OF GCC) IS FURNISHED	YES	NO
12	PROFIT & LOSS ACCOUNT FOR PRECEDING THREE YEARS IS FURNISHED	YES	NO
13	LATEST SOLVENCY CERTIFICATE FROM THE BANKER IS FURNISHED	YES	NO
14	LATEST INCOME TAX CLEARANCE CERTIFICATE OR COPY OF PAN CARD ACCOMPANIED BY 'IT RETURN' COPY IS FURNISHED	YES	NO
15	MANPOWER DEPLOYMENT PLAN (AS PER RELEVANT APPENDIX) IS FURNISHED	YES	NO
16	MONTHWISE DEPLOYMENT PLAN FOR MAJOR T&P (AS PER RELEVANT APPENDIX) IS FURNISHED	YES	NO
17	ANALYSIS OF UNIT RATES QUOTED (AS PER RELEVANT APPENDIX) IS FURNISHED	YES	NO
18	POWER OF ATTORNEY ENCLOSED IN FAVOUR OF PERSON MAKING OFFER.	YES	NO
19	DETAILS OF SIMILAR WORK DONE IN LAST SEVEN YEARS (AS PER RELEVANT APPENDIX) AND SUPPORTING DOUCMENTS FURNISHED.	YES	NO

20	PROGRAMME FOR THE SUBJECT WORK FURNISHED	YES	NO
21	BIDDER HAS FMILIARIZED HIMSELF WITH ALL RELEVANT LOCAL LAWS & CONDITIONS.	YES	NO
22	WHETHER ALL THE PAGES OF THE TENDER DOCUMENTS ARE READ, UNDERSTOOD AND SIGNED	YES	NO
23	WHETHER THE FOLLOWING DETAILS PERTAINING TO YOUR BANK ACCOUNT DULY ENDORSED BY THE BANK HAVE BEEN FURNISHED {TO ENABLE BHEL RELEASE PAYMENTS THROUGH ELECTRONIC FUND TRANSFER (EFT/RTGS) AS SPECIFIED IN SECTION 12 } 1. Name of the Company 2. Name of Bank 3. Name of Bank Branch 4. City/Place 5. Account Number 6. Account type 7. IFSC code of the Bank Branch 8. MICR Code of the Bank Branch NOTE: In case Bank endorsed certificate regarding above has already been submitted earlier, Kindly submit photocopy of the same	YES	NO

NOTE : STRIKE OFF YES OR NO, AS APPLICABLE

DATE : SIGNATURE OF TENDERER

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/KKT-ELE/627 is 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 bidder and a valid power of attorney to this effect is also enclosed**.

Authorized representative's signature with
Name and address

Date:

Bidder's Name and Address

Certificate of No Deviation

Tender Specification No. BHE/PW/PUR/KKT-ELE/627

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.

Date:

Signature and Official Seal of Bidder

Section-3
Offer of the Contractor

To,
DGM (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/KKT-ELE/627 issued by Bharat Heavy Electricals Limited, Power Sector-Western Region, Nagpur, in accordance with the terms and conditions thereof.

I/we have carefully perused the following documents connected with the above work and agree to abide by the same.

1. Instructions to bidders
2. General conditions of contract
3. Special conditions of contract
4. Other sections, appendices, schedules and drawings.

I/WE HAVE DEPOSITED / FORWARDED HEREWITH THE EARNEST MONEY DEPOSIT FOR A SUM OF RS. 2,00,000/- (RUPEES TWO LAKH ONLY) DETAILS OF EMD PAYMENT ARE 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, and handing over of **Main Plant Electrical System.**

HT/LT power transformers, isolated phase bus duct for generator transformer, segregated phase bus duct for station transformer /unit aux. transformer, electrostatic precipitator, variable frequency drive for ID Fans, Generator Control & Protection Panels, 11KV/6.6KV Switchgear Boards /MCC, Soot Blower System, Digital Excitation System, Cabling, Electrical Hoist and associated equipments & Associated Auxiliaries for the following: -

1. Isolated Phase Bus Duct 21 KV
2. 11/6.6 KV Segregated Phase Bus Duct
3. Power Transformers (GT, UAT, ST)
4. Control & Relay Panels
5. Variable frequency drives
6. Digital Automatic Voltage Regulation
7. Power Transformers 11-6.6/0.433 KV
8. Electro static Precipitator
9. Cable Tray & Power /control Cable.
10. Soot Blower System
11. Above and below ground earthing.
12. 11/6.6 KV/ 0.415 KV Switch gear.
13. Other Misc. associated equipments.

4.1 GENERAL REQUIREMENTS

4.1.1
The intent of specification is to procure 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 contractor must have the experience of erection of identical work in the past as specified in the tender documents and must have executed contract of similar nature. The contractor must furnish enough evidence to establish his capacity in erection, testing & commissioning of similar equipments covered under this specification

4.1.3

The contractor will have following valid certificates.

A) Contractor Electrical Licence for Extra High Voltage System installation work.

B) Supervisory Competency Certificate to deal with Electrical High Voltage equipments for their erection, testing & commissioning. During the execution of work minimum two persons should be posted at site that has valid Supervisory Competency Certificate.

C) The contractor should have a very good engineering background and capability of carrying out erection & commissioning work as specified in this tender document.

4.1.4

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, precommissioning tests, 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 workmanship 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.

4.1.5

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

4.1.6

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.

4.1.7

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.

4.1.8
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.

4.1.9
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 in time to ensure smooth progress of work.

4.1.10
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 departmental overheads of BHEL.

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.

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
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, electronic items, SF6 breakers, switches, cables, conduits etc.

shall be stored when taken over by the contractor in appropriate manner as per BHEL's instructions.

4.1.19
Plant materials should not be used for any temporary supports / scaffolding / preparing pre-assembly bed etc.

4.1.20
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, and not limited to these for completion of the work in all respects.

4.1.21
The weight & dimension as mentioned against the individual items in Price Bid Part –II Rate Schedules or elsewhere in the tender specification 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 machined 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.

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 reshifting of erection materials, tools and plants and clearance of restrictions, filling of ditches, undulation near preassembly and switch yard 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 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.

4.1.32
The contractor should take all reasonable care to protect equipment and materials under his custody either in his stores or at site. Copper tubing, brass fittings, brass valves 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.

4.1.33
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.

4.1.34
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.

4.1.35
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.

4.1.36

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.

4.1.37
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 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 commissioning areas and they shall not be disturbed /diverted for other work. The contractor's 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 & commissioning activities for equipments to match the mile stone activities of the project.

4.3.3
The mobilization of these 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, testing equipments 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
It shall be specifically noted that the contractor may have to work round the clock and in shifts during the pre-commissioning and 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.

4.3.5
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.

4.3.6
During the 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 any extra cost. The same shall be removed after completion of the activity.

4.3.7
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.

4.3.8
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 commissioning, to demonstrate the completion of any part or whole of work performed by the contractor.

4.3.9
The pre-commissioning activities will start in phased manner to meet the various milestones and shall continue till equipments are commissioned fully with all connected equipment / devices or handed over to customer for regular operation. In this duration other erection activities such as cabling etc., shall be carried out by other agencies even though equipments are partially commissioned / 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 experienced engineer, supervisor, technician and helper in each shift 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.

4.4 INTEGRATED ELECTRICAL TESTING/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 binding 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 customer.

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

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

1. Integrated Electrical testing/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, DC resistance test & Impedance test on rotor, Brushless excitation system at the time of rotor insertion as well as during pre-commissioning stage / commissioning stage/ post commissioning stage.

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

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

4.4.1A Generator System Testing

The following major works also shall be in the scope of the Contractor

1. Generator stator winding resistance and PI value measurement / check
2. Generator rotor winding resistance, impedance, IR value measurement before and after rotor insertion.
3. Generator Bushing HV test
4. Main exciter winding resistance, IR value measurement / check
5. PMG winding resistance, IR value measurement / check
6. Testing and commissioning of generator and exciter accessories viz., heaters, blowers, stroboscope, diodes, enclosure lighting, potential measurement of bearings (TE &EE) etc
7. Meggering during drying out of generator.
8. Meggeriing of generator bushing and its accessories. This test has to be conducted many times during erection and commissioning stages

4.4.2 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 individual breakers from remote panels / MMI package(maxDNA system).

Other than the above, minor testing / checks will also be involved in the generator area, which are also in the scope of the contractor. *Any instruments / tools etc required for carrying out the above shall be arranged by the contractor within the quoted rates*.

4.4.3

The scope of Testing and 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 (maxDNA system), replacement of limit/torque switches if required.

4.4.4

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

4.4.5

Contractor has to repeat any test free of cost, even if already conducted, whenever required to prove and check the healthiness of system before power flow, such test could be primary injection and primary injection in CTs. CVT, Insulation resistance of system / individual equipment, functional tests or any other tests as required by BHEL/ BHEL's client

4.5 MEASUREMENTS & WASTAGE & CUTTING ALLOWANCES:

4.5.1

For all payment purposes, measurement shall be made on the basis of the execution of drawings/physical measurements. Physical measurements shall be made by the contractor in the presence of the Engineer.

4.5.2

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

4.5.3

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.

4.5.4

All materials returned to stores should carry aluminium tag indicating the size and type. Cables more than 5 metres length is termed as serviceable material 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.

4.5.5

While carrying out material reconciliation 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 reconciliation 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.

4.5.6

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.

4.5.7
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.

4.5.8
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 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 / shielded cable	2

4.5.9
If the actual wastage is more than the specified figure, then equivalent price of the excess portion will be deducted from the contractor's bill.

4.5.10
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 and the type of cable required for various destinations, the cable drums shall be suitably selected for cable laying. Any jointing shall have to be approved by BHEL engineer. All the cut pieces/bits of cables, which are not used, 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.

4.5.11 NOTE:
Salvageable scrap shall mean lengths of pipes, multicables, 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, multicore cables, cables etc.

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

4.5.12
For any items or classes of work not specified herein but required for total completion of work, the same shall be carried out as per BHEL requirement. However, payment for 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.

4.5.13
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 STRUCTURAL 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 misc fabrication if required.

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.

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. METAL CHANNEL FLEXIBLE BOLTABLE CABLE SUPPORTSYSTEM (ESP)

Flexible GI cable support system, consisting of single/double channels, base plates, cantilever arms are as per BOQ given below in section 16. Wherever necessary, the base plate beam clamps will be supplied for bolting. Otherwise, the base plates are to be welded to the racks or beams if necessary at 90 deg.

Angle fittings, flat plate fittings, clamps for single & double channels, fasteners etc. will be supplied for fixing trays and cantilever arms and for this no separate erection charges will

be paid. Quoted Rate Rates shall be accommodated in support channel and cantilever arm erection. Brief scope of work is further defined as below:

1. Metal channel boltable GI cable support shall be supplied. Each cable rack assembly comprises of sub components such as single or double channel, base plate for single/ double channel, angle fitting, clamps, cantilever arm, anchor fastener, associated hardware (spring loaded nuts, bolts and washers) etc.

2. Channel shall be supplied in standard length of six meter. Contractor shall cut the channel and assembly the rack as per site requirement. Cantilever arm is to be fixed on channel support with spring loaded nuts / bolts as per installation drawing.

3. Base plate / angle fitting shall be continuously welded all around to steel members /plate insert if provided. Brackets / clamps shall be welded to steel surface with channel as applicable in position to ensure alignment of clamps / channels. Weld thickness shall be 6 mm minimum. In case steel surface in not available for welding, anchor bolts is to be used for fixing the base / angle fitting.

4. Main support for longitudinal cable tray run in the cable vaults shall be fixed at both ends at top as well at bottom as out lined above.

5. Galvanisation damaged due to welding / cutting shall be re-painted with cold galvanising paint (paint in contractor's scope).

6. Unit rate for **"Single / Double Channel"** shall include cutting channel in required lengths, fixing of angle fittings/ base plate / clamps / brackets / fasteners/ cantilever arms /, welding etc as required as per type of installation.

4.6.1 CABLE LAYING (POWER / CONTROL / INSTRUMENTATION SHIELDED CABLES / PLUG-IN CABLES / DATA HIGHWAY, ARMOURED / UN-ARMOURED, SINGLE / MULTI-CORE, PVC / HR PVC / FRLS / TEFLON / XLP INSULATION)

1. Cable laying includes cutting to the required length, laying in overhead / underground cable trenches, 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 (ferrule printing machines to be provided by contractor for printing necessary cross ferruling details) / PVC numerical/alphabetical ferrules (where printed ferrules not possible at all) machine engraved ferrules sleeve/ ferrule,** termination by using crimp type copper tinned/aluminium lugs, insulated/un-insulated, crimp and soldered termination, plug-in connections with insert type crimping, providing identification cable tags of PVC/aluminium at both the ends and at appropriate interval (5m) throughout the route length, continuity checking, insulation resistance checking, high voltage test on HT cables. Contractor to arrange adequate numbers of his own ferrule printing machines.

2. Entry to the panels, JB's may be at top, side or bottom. All cable are required 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, cables may have to be lifted inside the panel by making large cut-out in gland plate and providing 4 or 6 inch PVC pipe coupling glands. These pipe coupling glands shall be supplied by contractor within the quoted rates of cable lying.

4. Copper tinned lugs of various types upto 4 sqmm conforming to IS: 694 (pin, ring, fork, snap-on) for cables, PVC cable ties, PVC ferrules, PVC button and tapes, cable identification tag of PVC/metal as per site requirement, clamping and dressing material such as cable ties/ clamps etc 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 braided wire shield. Generally shield wire is kept isolated at instrument/field device end and continuity is maintained through JBs and earthed at panel end only. While terminating the shield wire either in panel or JBs, PVC sleeves are to be used to avoid two-point earthing.

7. Wherever cable runs through ducts, conduits, walls etc., 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.

12. Unit rate quoted for cable lying shall include the activities as defined above from Sl. No. 1 to 11.

4.6.2 SCOPE OF ABOVE AND BELOW GROUND EARTHING

4.6.2.1 ABOVE GROUND EARTHING

4.6.2.1.1

The contractor shall carry out above ground earthing for all Electrical equipment, which may be erected by him, or some other agency. Different type of earthing materials shall be supplied and the contractor shall lay and connect the earthing materials as per site requirement and as detailed in drawings. Unit rate for earthing material shall be paid on running meter basis.

4.6.2.1.2

All equipment shall be earthed by two separate and distinct connections. Earthing terminals will be available in all the equipment supplied by BHEL.

4.6.2.1.3

Generally risers are provided near the structure / equipment foundation, In case risers are not visible and buried below the foundation level, contractor shall carry out necessary earth excavation for connecting the above ground earthing strips. Wherever welding is involved necessary protective coating shall be applied on weld joints.

4.6.2.1.4

The earthing conductors shall be mild steel/G.I. strips/wires. All connections from the equipment to the main earthing conductors shall be made as illustrated in earthing drawings. A copy of earthing drawing shall be provided to the successful bidder.

4.6.2.1.5

A continuous earthing conductor shall be installed in all cables trays and securely clamped to each tray section by suitable connectors to form a continuous earthing system. When two or more trays supporting power cables run on parallel a continuous earthing conductors shall be provided on one tray only with tap-offs to the control cable trays. All valve and damper motor and rapping motors will be earthed to this conductor.

4.6.2.1.6

If the equipment is not available at the time of earthing conductor laying tap connections from the main earthing conductor shall be brought out up to slab equipment foundation level with at least 200 mm spare length left for further connections to equipment earthing terminals.

4.6.2.1.7

Entire system shall be earthed in accordance with the provisions of the relevant IEC recommendations/IS code of practice IS 3043-1947 and Indian Electricity Rules, so that the values of the step and contact potentials in case of faults are kept within safe permissible limits.

4.6.2.1.8

Parts of all electrical equipment and machinery not intended to be live shall have two separate and distinct earth connections each to conform to the stipulation of the Indian Electricity Rules and apparatus rated 240 V and below may have single earth connections.

4.6.2.1.9

If any outer shops and buildings as well as the electrical sub-stations and electrical rooms are also in contractor's scope, a ring main earthing system will be provided. Ring main earthing systems shall again be inter connected as a net work to power plant main earthing mat. Internal earthing ring in the electrical equipment room provided by the contractor whether equipment of the area is in their scope of not.

4.6.2.1.10

For different floors in a building, localized internal earthing ring shall be formed and connected to the ground earthing through vertical risers. The earthing mat shall be common to both power and lighting installations.

4.6.2.1.11

A minimum of two spare earth rings will be provided in each floor of the building for earthing future building.

4.6.2.1.12

Each RCC steel column of the building will be interconnected to the floor-earthing grid in basement/ground floor.

For protective earthing separate conductor shall be used for flow of earth fault current as elaborated below:

4.6.2.1.13

Contractor shall carry out minor civil i.e. chipping of floor (where earth strip is to be laid on floor), removal of topsoil for laying earth strip in switchyard area etc.

4.6.2.1.14

It is the responsibility of contractor to provide skilled manpower for periodic maintenance after the initial commissioning till handing over the system to customer. During this period the activities are to be carried out such as checking the electrolyte & specific gravity of individual battery, topping up of electrolyte, cleaning etc.

4.6.2.2 BELOW GROUND EARTHING

Supply of all items (except the electrode rod, as indicated in the drawing) including charcoal, salt, civil items is also is in the scope of the contractor. However, the contractor shall carry out tapering of one end of the above electrode rod and carry out erection / testing. 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, which are also in the scope of the contractor.

4.6.3 CABLE TRAYS/CABLE DUCTS

A Various types of sheet metal, galvanised cable tray, i.e. perforated, ladder type, sheet metal duct, solid bottom trays, pre-fabricated structural trays etc., will be supplied in standard lengths along with accessories and hardware viz coupler plate, tray covers and tray clamps etc.

B Installation of cable tray/cable duct shall include cutting, laying, jointing, fixing tee/reducers/ bends/clamps, fixing of tray covers, hardware, welding of tray supports as per tray route layout etc.

C Fabrication of bends/tee/ reducers from straight length is within the scope of work and rate quoted shall be inclusive of this. All site welds of cable trays shall be painted with approved primer and cold galvanizing paint, which shall be arranged by the contractor.

D **I**n 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.

E Cable trays/duct etc may have to be routed underground in cable trench, over head on structure, along the walls, floors etc.

4.7 PAINTING

All exposed metal parts of the equipment including supports, structures, etc., as applicable shall be painted after thoroughly cleaning the surface from dust, rust, greases, oils, scales, etc, by wire brush, scrapping, sand blasting etc; as specified in relevant erection documents. The above parts shall then be painted with specified two coats of specified paint over the shop primer/paint. Also, where the shop primer/paint has peeled off, the affected area shall be cleaned thoroughly by the specified method and then primer coat applied. Similarly, certain components may be supplied without any primer/paint coat from shop. The surface of such items shall be cleaned as per specifications, coated with suitable primer and then coated with final paint coats. The dry film thickness after final coat should be as per specification. The color, shade etc. shall be as per specification. Painting schedule will be furnished at site. The scope of painting work is for the following areas.

All the fabricated frames, racks, supports, panel base frame etc. wherever applicable shall be painted primer and with two coats of paint as specified earlier herein.

Touch-up painting of switchgear panel, 415 Volt LT MCC, Control Panels or any other equipment /devices wherever necessary.

Full painting of transformers, bus ducts with two coats of paint as per specification

Supply of paint, primers, other consumables etc for above and any other scope in these specifications shall be in Contractor’s scope.

4.7.1 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.

Colour Banding, Legend and Identification Marking, Direction Marking etc. shall be in scope of the contractor.

4.7.2 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 Primer.

4.7.3 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.

4.7.4 Primers, Paints etc.

The contractor shall provide the Primer (ROZC as per IS:2074) 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 etc required for application of ROZC Primer. All paints and thinners shall be sourced 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

Supply of paint, primers, other consumables etc for above and any other scope in these specifications shall be in Contractor's scope.

4.8

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 10000 (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.

4.9 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 electrical area. The bidder must also take this aspect into consideration.

4.10

Equipments / instruments etc., under the above scope of erection and 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 within the quoted rates.

4.11 INSTALLATION OF PANELS AND HT/LT SWITCHGEAR

1. Electrical control panels, electronic control panels, HT/LT switchgear, 415 volt LT MCC's, 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-group 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.moutnted 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 & HTswitchgear 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 are 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, and 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 terminating the wires on devices. 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. Interposing Relays (24 / 48 Volt DC) along with mounting base shall be supplied separately for mounting in the various feeders of 11KV / 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 are 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 1700 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.

4.12 POWER TRANSFORMERS & LT AUXILIARY TRANSFORMER, CTS, CVT & PTS

Under this scope of work, following category of transformer are covered

(A) Single phase 21/420 KV, 200 MVA Generator Transformer - 3 Nos.

(B) Three Phase 21/6.9 KV, 25 MVA Unit Aux. Transformer - 2 Nos.

(D) Three Phase 400/11.5/6.9 kV, 70 MVA Station Transformer - 2 Nos.

(E) LT Auxiliary Transformer 11Or 6.6 KV / 0.433 KV Oil filled & Dry type – 8 Nos.

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

1. Contractor shall transport the transformer tanks & accessories of LT power transformer and other transformers as mentioned above from BHEL stores/ Storage yard to respective foundation of unit. The approximately distance from BHEL Stores / Storage yard is 2.0 to 2.5 KM.

2. Generator Transformers (200 MVA)/ Unit Auxiliary Transformer (25 MVA) / Station Transformer tank 200 MVA (70 MVA) shall be made available to the contractor 50 to 75 Meters (approximately) 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 either on ground with suitable arrangement OR dragging after fixing of wheels on rail track. It may also require turning of transformer at suitable locations enroute to foundation. The contractor shall arrange wooden sleepers, winches, jacks, rails, crane, plates etc at his cost for this operation. However all loose accessories shall have to be shifted from stores / storage yard.

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

4. 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.

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

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

7. In case transformers are 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.

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

9. Contractor shall arrange storage tank of 10 kilo litre capacity, internally sand blasted and 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 transformer, a separate storage tank for mass filtration may not be required.

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

11. Drying out of transformer and filtration of oil in cooling bank, pipeline, diverter tank of tap changer etc. to be done with ultra vacuum filtering machine of adequate capacity. Drying out process shall be carried out round-the-clock and contractor shall deploy trained manpower for this purpose.

12. 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.

13. 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.

14. Filter machine capacity if found to be inadequate, or in case of failure of an existing machine, alternative arrangement is required to be done to meet the required result and time. **It is to be particularly noted that that as per exigencies of site working contractor will have to arrange more oil filtration machines as per site requirement.**

15. 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.

16. 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.

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

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

19. Tests are required to be conducted on Current Transformer, Potential Transformer & CVT prior to / after installation. Contractor shall also carryout oil processing / filtration to achieve the desired results before charging and handing over of the entire system.

4.13 VARIABLE FREQUENCY DRIVE (VFD) FOR I.D. FANS

VFD system comprise for each ID of Power Transformers 6.6/2.3 KV, 3250 KVA, ONAN cooled (2 Nos.), Vacuum Circuit Breaker type VM-12(2 Nos.), D.C. Series Reactor(2 Nos.), Control panels(1 NO.), Load Converter / Inverter panels(2 Set- each suit of 3 panels.), Adapter Panel (2 Nos.) and associated accessories. For detail work scope refer other relevant clause for transformer, switchgear & panels. VFD reactor enclosures may be supplied loose. Assembly of the same at site is to be carried out within the quoted rates.

4.14 ELECTROSTATIC PRECIPITATOR

1. ESP shall have four flue gas passes and each pass comprises of HT 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. HT rectifier transformer shall be erected by mechanical agencies. Scope of work covered under this contract is oil filtration of transformers and erection and testing of various devices as listed 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 shall arrange required cables.

4.15 SOOT BLOWER SYSTEM

Soot blower system comprises of motor control centre having various feeders of motor starters, 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 and MCC, PLC panel etc. The scope of work for testing, commissioning covers the items/devices as per rate schedule and the testing, 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 & commissioning:-

01 Pre-commissioning checks and tests on MCCs, blowers, PLC panels, energization 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, 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.

4.16 DIGITAL STATIC EXCITATION SYSTEM.

DIGITAL AUTOMATIC VOLTAGE REGULATOR BRUSHLESS EXCITATION SYSTEM.

System comprises of regulation, field flashing, field breaker panels; Input cable from PMG to DAVR , DAVR to Main Exciter, Q axis coil to DAVR , Mounting of Local Instrument in Exciter Enclosure, Winding resistance & IR value of PMG, Main Exciter, Q axis coil, Diode wheel, Checking healthiness of diodes / Fuses, Commissioning of stroboscope, Exciter Heater / Blower, Rotor earth fault brush checking / setting, Lighting inside exciter enclosure, Flap actuator commissioning (If provided). Any other work inside exciter enclosure, Mounting of loose components supplied for Brushless exciter system, Dummy load test of DAVR, Checking from Control desk & Field related inputs/ outputs to commission the excitation system fully operational,

No separate item rate is applicable. Rate quoted by contractor shall be inclusive of all above related to Excitation system.

System comprises of regulation, field flashing, thyristor, field breaker panels, 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.

4.17 ISOLATED PHASE BUS DUCT 21 KV, 20KA CONTINUOUS AIR-COOLED

1.GENERAL DESCRIPTION

Generator isolated bus duct is connected to low voltage side of single phase power transformers 200 MW 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 phase 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.

1.The scope of for Isolated Phase Bus Duct shall include 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 commissioning.

1.Pre-fabricated G.I. supporting members shall be supplied in loose condition and are 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 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. Supply of Paints, primers etc are in the scope of the supplier, within the quoted rates.

1. Required aluminium welding of conductor, enclosures, shunt, make up pieces, aluminium flexible etc as detailed in drgs. has to be carried out by contactor. MIG/ TIG welding shall be applicable. Contactor shall arrange necessary welding equipment/ accessory in sufficient number, filler wire, argon gas and other required consumables at his cost.

2. 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.

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

4. Top chamber/adapter 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 there is 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.

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

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

7. 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.

8. 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.

9. 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 breakup quantity is not given in BOQ.

10. 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.

11. 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.

12. 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.

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

14. 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

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

16. **Enclosed / attached 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 lumpsum value, as called in the rate schedule, without any additional compensation for any variation in length or numbers of joints.**

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

18. In case of bolted busducts, phase split covers, rubber bellows, aclamping earth straps to be connected to maintained the electrical continunity and in turn enclosure gets earthed at one point.

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

4.18 11 KV / 6.6 KV SEGREGATED PHASE BUS DUCT

11kv / 6.6 KV Segregated phase bus duct shall be supplied in loose shipping section along with hardware & other items. Each section shall be complete with AL alloy enclosure and conductor with epoxy bus support insulators arrangement. However other items such as silica gel breathers, inspection windows, rubber bellows, flexible & solid copper / aluminium connector, bi-metallic strips, GI pre-fabricated supporting structure, wall frame assembly, set of hardware etc shall be supplied loose. Galvanised iron earth bus shall be provided for enclosure continuity. All bolted joints shall have cadmium plated high tensile steel hardware.

Each set of SP bus duct is meant for interconnection from low voltage side of Unit, Unit Auxiliary and Station Transformer to 11 KV/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. **The 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.

4.19 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 & 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 consist 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 consist of end bracket, Galvanized 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.

1.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.

2.Commissioning & testing of electrical hoists shall include 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.

It shall be the responsibility of the contractor to carry out preliminary tests like checking connections, meggaring etc for LT motors commissioning, as a part of contract. These motors will generally be erected by other agencies. No separate rates are envisaged.

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 interlock.
3. Erection of HT/LT motors (except those specified herein)
4. Erection, testing and commissioning of elevators and DG sets.

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 and Tackles

The contractor shall provide all other required tools and plants, inspection, measuring and test equipments and handling & transportation equipments for the scope of work covered under these specifications. An indicative list of major T&Ps to be deployed by the contractor is given in the appendix-III. It may be noted that the referred list does not intend to exhaustively cover the contractor's responsibility with regard to T&Ps to be deployed by him. 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 programme 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 occur 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 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 the primers (ROZC as per IS: 2074), synthetic enamel paints (IS: 2932) paints for preservation of components and weld joints as specified in these specifications elsewhere.

5.4.0 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 for verification & record.

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 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.

5.5.0 **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 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.

5.6.0 **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

5.7.0 **Construction Power & Water**

5.7.1
Construction power (415 V) will be provided normally at a single point within plant premises. Additional source at the discretion of BHEL may also be provided if need arises. The contractor shall provide all necessary cables, fuses, switches, switchboards, energy meters etc, and any other installation as specified by statutory authority in this regard for further drawl of power. Obtaining approvals / clearance of such installations, prior to their being put to use or as may be specified, shall be the

responsibility of the contractor. **The contractor has to bear cess and duties, power factor surcharges (if applicable) and any other taxes/duties on the power consumed.**

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.

5.7.3
The contractor shall make his own arrangement for construction/drinking water by drilling suitable bore wells or any other arrangement at his cost.

5.7.4
In case of non-availability of customer supplied power, it is the responsibility of the contractor to make alternate arrangements. Contractor shall be adequately equipped to arrange standby diesel welding generators in the event of construction power failure. Essential welding jobs shall not be stopped on account of main construction power failure.

5.7.5
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.

5.8.0 **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. Also all other 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.

5.9.0 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 and 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.

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 Sales Tax / WCT /VAT

As regards Sales Tax / WCT /VAT on transfer of property in goods involved in Works Contract 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 / WCT /VAT 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 work, the same shall be reimbursed by BHEL at actual.

In case any 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.

5.10.0 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

Progress reports - periodically

4) Field calibration reports

BHEL at site will suggest formats for these reports.

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.

5.11 ELECTRICAL INSPECTORATE'S APPROVAL /STATUTORY INSPECTION

5.11.1

Contractor should have valid Electrical Contractor-ship License to carry out the Erection, Testing & Commissioning work on High / Low Voltage electrical equipments from the appropriate statutory authority of concern state or Central Electricity Authority, as the case may be.

5.11.2

Contractor shall arrange inspection of concerned Statutory Authority for the installation, testing & commissioning of High / Low voltage equipment covered under this tender specification and obtain their approval in appropriate format prior to charging of the equipments.

5.11.3

Contractor shall be responsible for all necessary liasioning work with Statutaory Authority towards the certification of installation / works. BHEL shall reimburse Statutory Fees as per

actual on submission of original receipt, however all incidental expenses shall be borne by Contractor. BHEL/ BHEL's Customer shall be providing technical assistance, drawing & document for submission to Statutory Authority.

5.11.4
The installation of all electrical equipments shall be carried out only by persons holding valid certificates of Competency for the voltage classes as defined in this tender specification, issued by appropriate state or central Statutory Authority. Contractor shall submit the particulars of Licenses held by him.

SECTION-6

SPECIAL CONDITIONS OF CONTRACT

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

6.1

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.

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 should be in a position to undertake specific assignments during the start up/ post start up.

The contractor shall deploy adequate 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 OF CONTRACT

7.0 Obligations of BHEL

7.1 Facilities Provided By BHEL

7.1.1 Space for Field Office

Refer section-5 in this regard.

7.1.2 Construction Water

Refer section-5 in this regard.

7.1.3 Construction Power

Refer section-5 in this regard.

7.1.4 Other Materials and Consumables:

BHEL shall not provide any material/consumables except those specifically mentioned in this tender specification.

7.1.5 Test Blanks (Plates & Pipes)

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

7.1.6 Filler Wire for TIG Welding and Welding Electrodes

All the welding consumables shall be arranged by contractor

7.1.7 Equipments – Tools & Plants

Contractor shall arrange at his cost all T&P's/ testing instruments required for transportation, erection, testing & commissioning of the equipments / systems for the work covered in this tender specification. However any special tools which are supplied by BHEL as part of maintenance tools under regular DU/DESS numbers in various product groups will be spared free to contractor and contractor shall return them after the completion of the specific work for which the tools were spared, in good working order.

Hydra crane will be made available on sharing basis at stores only for material handling. In very special cases, for major components hydra will be made available for unloading at site. However, operator and fuel shall be arranged by the contractor or contractor shall share the cost.

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Section-9

SPECIAL CONDITIONS OF CONTRACT

Safety, Occupational Health and Environmental Management

Introduction:-

BHEL PSWR has been certified for Environmental Management under ISO 14001:1996 standard and Occupational Health & Safety under OHSAS 18001 by DNV. In order to comply with the above standards, it shall be the endeavour of BHEL and all its subcontractors to meet and implement the requirements by following the guidelines issued under Environmental, Occupational Health and Safety Management (EHS) manual a copy of which will be available with the BHEL site-in-charge.

Contractor shall also enter into a "Memorandum of Understanding" as given in clause 9.9 in case of award of contract.

9.0 Responsibility Of The Contractor In Respect Of Safety Of Men, Equipment, Material And Environment.

9.1 The Contractor Shall

9.1.1
Abide by the Safety Regulations applicable for the Site/Project and in particular as mentioned in the booklet "Safe Work Practices" issued by BHEL. Contractors are also to ensure that their employees and workmen use safety equipments as stipulated in the Factories Act (Latest Revision) during the execution of the work. Failure to use safety equipment as required by BHEL Engineer will be a sufficient reason for issuance of memo, which shall become part of Safety evaluation of the contractor at the end of the Project. Also all site work may be suspended if it is found that the workmen are employing unsafe working practice and all the costs/losses incurred due to suspension of work shall be borne by contractor. A comprehensive list of National Standards from which the contractor can draw references for complying with various requirements under this section is given under 9.10

9.1.2
Hold BHEL harmless and indemnified from and against all claims, cost and charges under Workmen's Compensation Act 1923 and 1933 and any amendment thereof and the contractor shall be solely responsible for the same.

9.1.3
Be fully responsible for the identity, conduct and integrity of the personnel/workers engaged by them for carrying out the contract work and ensure that none of them are ever engaged in any anti national activity

9.1.4
Prepare a sign board giving the following information and display it near the work site:

1. Name of Contractor
2. Name of Contractor Site-in-charge & Telephone number
3. Job Description in short
1. Date of start of job
5. Date of expected completion
6. Name of BHEL Site-in-charge.

9.1.5
Abide by the rules and regulations existing during the contract period as applicable for the contractors at the Project premises.

9.1.6
Observe the timings of work as advised by BHEL Engineer-in-charge for carrying out the contract work.

9.2 SPECIAL CONDITIONS

9.2.1 Safety

9.2.1.1 Safety Plan

Before commencing the work, contractor shall submit a "safety plan" to the authorised BHEL official. The safety plan shall indicate in detail the measures that would be taken by the contractor to ensure safety to men, equipment, material and environment during execution of the work. The plan shall take care to satisfy all requirements specified hereunder.

The contractor shall submit "safety plan" before start of work. During negotiations, before placing of work order and during execution of the contract, BHEL shall have right to review and suggest modifications in the safety plan. Contractor shall abide by BHEL's decision in this respect.

9.2.1.2
The contractor shall take all necessary safety precautions and arrange for appropriate appliances and/or as per direction of BHEL or it's authorised person to prevent loss of human lives, injuries to men engaged and damage to property and environment.

9.2.1.3
The contractor shall provide to his work force and also ensure the use of Personnel Protection Equipment (PPE) as found necessary and/or as directed and advised by BHEL officials without which permission is liable to be denied.

- Safety helmets conforming to IS 2925/1984 (1990)
- Safety belts conforming to IS 3521/1989
- Safety shoes conforming to IS 1989 part-II /1986(1992)
- Eye and face protection devices conforming to IS 2573/1986(1991), IS 6994 (1973), part-I (1991), IS 8807/1978 (1991), IS 8519/1977(1991).
- Other job specific PPEs of standard ISI make as may be prescribed

9.2.1.4
All tools, tackles, lifting appliances, material handling equipment, scaffolds, cradles, cages, safety nets, ladders, equipment, etc used by the contractor shall be of safe design and construction. These shall be tested and certificate of fitness obtained before putting them to use and from time to time as instructed by authorised BHEL official who shall have the right to ban the use of any item found to be unsafe

9.2.1.5
All electrical equipment, connections and wiring for construction power, its distribution and use shall conform to the requirements of Indian Electricity Act and Rules. Only electricians licensed by the appropriate statutory authority shall be employed by the contractor to carryout all types of electrical works. All electrical appliances including portable electric tools used by the contractor shall have safe plugging system to source of power and be appropriately earthed.

9.2.1.6
The contractor shall not use any hand lamp energised by electric power with supply voltage of more than 24 volts. For work in confined spaces, lighting shall be arranged with power source of not more than 24 volts.

9.2.1.7
The contractor shall adopt all fire safety measures as per relevant Indian Standards

9.2.1.8
Where it becomes necessary to provide and/or store petroleum products, explosives, chemicals and liquid or gaseous fuel or any other substance that may cause fire or explosion, the contractor shall be responsible for carrying out such provisions and/or storage in accordance with the rules and regulations laid down by the relevant government acts, such as petroleum act, explosives act, petroleum and carbides of calcium manual of the chief controller of explosives, Government of India etc. The contractor in all such matters shall also take prior approval of the authorised BHEL official at the site.

9.2.1.9
Proper means of access must be used e.g. ladders, scaffolds, platforms etc. No makeshift access such as oil drums or pallets shall be used. Design of these will be in accordance with relevant standards and certified by competent persons before use.

9.2.1.10
Temporary arrangements made at Site for lifting , platforms, approach, access etc should be properly designed and approved before being put to use.

9.2.1.11
All excavations and openings must be securely and adequately fenced/barricaded and warning signs erected when considered necessary as per relevant code of practice.

9.2.1.12

No persons shall remove guard rails, covers or protective devices unless authorised by a responsible supervisor and alternative precautions have been taken.

9.2.1.13
Access ways, means of escape and fire exits shall be clearly marked, kept clear and unobstructed at all times

9.2.1.14
Only authorised persons holding relevant license will drive and operate site plant and equipments eg cranes, dumpers, excavators, transport vehicles etc.

9.2.1.15
Only authorised personnel are allowed to repair, commission electrical equipments.

9.2.1.16
Gas cylinders shall be handled and stored as per Gas Cylinder Rules and relevant safe working practices

9.2.1.17
All wastes generated at Site shall be segregated and collected in a designated place so as to prevent spillage/contamination/scattering at Site, until the waste is lifted for disposal to designated disposal area as advised by BHEL official.

9.2.1.18
The contractor shall arrange at his cost (wherever not specified) appropriate illumination at all work spots for safe working when natural day light is not adequate for clear visibility.

9.2.1.19
The contractor shall train adequate number of workers/supervisors for administering “FIRST AID”. List of competent first aid administers should be prominently displayed.

9.2.1.20
The contractor shall display at strategic places and in adequate numbers the following in fluorescent markings

- Emergency telephone numbers
- Exit, Walkways
- Safe working load charts for wire ropes, slings, D shackles etc
- Warning signs

9.2.1.21
The contractor shall be held responsible for any violation of statutory regulations (local, state or central) and BHEL instructions that may endanger safety of men, equipment, material and environment in his scope of work or other contractors or agencies. Cost of damage, if any, to life and property arising out of such violation of statutory regulations and BHEL instructions shall be borne by the contractor.

9.2.1.22
In case of a fatal or disabling injury/accident to any person at construction sites due to lapses by the contractor, the victim and/or his/her dependents shall be compensated by the contractor as per statutory requirements. However, if considered necessary, BHEL shall have the right to impose appropriate financial penalty on the contractor and recover the same from payments due to the contractor for suitably compensating the victim and/or his/her dependents. Before imposing any such penalty, appropriate enquiry shall be held by BHEL giving opportunity to the contractor to present his case.

9.2.1.23
In case of any damage to property due to lapses by the contractor, BHEL shall have the right to recover cost of such damages from payments due to the contractor after holding an appropriate enquiry.

9.2.1.24
In case of any delay in the completion of a job due to mishaps attributable to lapses by the contractor, BHEL shall have the right to recover cost of such delay from payments due to the contractor after notifying the contractor suitably and giving him opportunity to present his case.

9.2.1.25
If the contractor fails to improve the standards of safety in its operation to the satisfaction of BHEL after being given a reasonable opportunity to do so, and/or if the contractor fails to take appropriate safety precautions or to provide necessary safety devices and equipment or to carry out instructions regarding safety issued by the authorised BHEL official, BHEL shall have the right to take corrective steps at the risk and cost of the contractor after giving a notice of not less than seven days indicating the steps that would be taken by BHEL.

9.2.1.26 **Emergency Response**

9.2.1.26.1
BHEL will have an Emergency Response Plan for each Project Site in consultation with the Owner as the case may be, detailing the procedure for mobilization of personnel and equipment, and defining the responsibilities of the personnel indicated, in order to prepare for any emergency that may arise in order to ensure the priorities of

- Safeguard of life
- Protect assets under construction or neighbouring
- Protect environment
- Resumption of normal operations as soon as the emergency condition is called off

All Contractors shall also be part of the Emergency response Plan and the personnel so nominated shall be aware of their duties and responsibilities in an emergency response situation.

9.2.1.26.2

At least 5% Contractors supervisors and workmen shall undergo training in administering 'First Aid'. The trained persons should represent for all categories of work and for all areas of work. Adequate number of trained persons should be available for each shift. These first aid personnel shall be included in the emergency response team. Contractor employees and workmen are encouraged to participate in first aid training programmes whenever organised by BHEL.

9.2.2 OCCUPATIONAL HEALTH

9.2.2.1

Specific occupational health hazards will be identified through the hazard evaluation processes in consultation with BHEL engineers and the necessary prevention/reduction/elimination methods implemented.

9.2.2.2

All personnel working in an activity with a potential risk to health shall be made aware of all those risks and the actions they must take to reduce/control/eliminate the risk

9.2.2.3

Safety coordinator shall conduct periodic checks to ensure that every group of workers engaged in similar activities are aware of potential risks to health and the actions required to be taken to mitigate the risk

9.2.2.4

In order to protect personnel from associated health hazards, the following main areas will be focussed

- Issue of approved Personnel Protective Equipment
- Verification that the PPEs are adequate/maintained and worn by all staff involved in operations that are potentially hazardous to their health
- Ensure that the personnel deployed are physically fit for the operation/work concerned
- Provide hygienic and sanitary working conditions

9.2.2.5

Contractor workers employees engaged in noise risk areas shall be issued with hearing protection aids and the use of the same will be enforced. Further, these workers will be educated on the hazards of noise

9.2.2.6

Contractor workers engaged in dust environment shall be issued with necessary dust protection aids and the use of the same shall be enforced

9.2.2.7

Workers engaged in exposure to bright light/rays as in welding or radiation shall be issued with eye protection devices and the use of the same shall be enforced

9.2.2.8

Adequate arrangements shall be made to provide safe drinking water

9.2.2.9
Health monitoring records on at least sample basis for contractor employees & workmen shall be maintained for persons engaged in specified categories of work. These shall include

- Noise induced hearing loss
- Lung Function test
- Ergonomic Test
- Eye Test for Welders, Grinders, Drivers etc

9.2.3.0 HYGIENE and HOUSEKEEPING

9.2.3.1
Good house keeping and proper hygiene is one of the key requirements of Occupational Health Safety and Environment management. Towards this the contractor shall encourage his workers and supervisors to maintain cleanliness in their area of work.

9.2.3.2
The Contractor shall arrange to place waste bins/chutes at convenient locations for the collection of scrap and other wastes. The bins shall be clearly marked and segregated for metal, non-metal, hazardous and non hazardous wastes.

9.2.3.3
BHEL may take up appropriate remedial measures at the cost of the contractors if the contractors fail good house keeping and if there is an imminent risk of pollution

9.2.4 ENVIRONMENT MANAGEMENT

9.2.4.1
BHEL has a sound environmental management system, which is to be maintained and implemented by all the contractors. The system allows for project specific objectives to be set and developed sensitive to client requirements, applicable environmental legislation and BHEL's own objectives and policy. BHEL engineers will assess and monitor the environmental impact of their work and lay out objectives for their minimisation. The contractors shall implement the objectives for continual improvement of environmental performance. BHEL shall regularly audit environmental impacts and their improvements.

9.2.4.2 WASTE MANAGEMENT

9.2.4.2.1
The objective of waste management is to ensure the safe and responsible disposal of waste, ensuring that it is correctly disposed of and being able to audit the process to ensure compliance.

9.2.4.2.2
Chemical wastes if any shall be collected separately and disposed of to BHEL designated refuse yard as per BHEL advise

9.2.4.2.3
No dangerous chemicals, noxious waste products or materials will be disposed off on or off site without approval obtained through BHEL.

9.2.4.2.4
All disposal of wastes generated during construction shall be in accordance with all relevant legislation.

9.2.4.2.5
Acid and alkali cleaning wastes shall be neutralised to acceptable norms before disposal to the designated area.

9.2.4.2.6
All necessary measures shall be taken to ensure safe collection and disposal of waste oils. In particular to ensure the prevention of their discharge into surface waters, ground waters, coastal waters or drainages

9.3 SUPERVISION

9.3.1
Contractor must provide at least one full time on site safety coordinator when the manpower engaged is in excess of 50 for the contract activities in the premises. If the manpower is less than 50, the on site safety coordination responsibilities shall be assumed by any one of the contractor's other supervisory staff; however in both the cases, the contractor must specify in writing the name of such persons to the BHEL Engineer in Charge.

9.3.2
Contractor's safety coordinator or his supervisor responsible for safety as the case may be shall conduct at his work site, and document formal safety inspection and audits at least once in a week. Such documents are to be submitted to BHEL Engineer in Charge for his review and record

9.3.3
Contractor, supervisor must attend all schedule safety meetings as would be intimated to him by the BHEL Engineer in Charge.

9.3.4
Before starting work under any contract, the contractor must ensure that a job specific safety procedures/field practices as required over and above the safety permit conditions are prepared and followed .He should also ensure that all supervisors and workers involved understand and follow this procedures /field practices.

9.3.5
Contractor must ensure that in his work site appropriate display boards are put displaying signs for site safety, potential hazards and precautions required

9.4.0 **TRAINING & AWARENESS**

9.4.1
Contractor shall deploy experienced supervisors and other manpower that are well conversant with the safety and environment regulations of the Project. The electricians to be deployed on the job should have wireman license.

9.4.2
All Supervisors & Workmen of the Contractor shall undergo Fire safety training/demonstration whenever arranged by BHEL with the help of either Customer's Fire and Safety department or outside faculty so as to acquire knowledge of fire prevention and also to be able to make use of appropriate fire extinguishers.

9.4.3
Contractor must familiarize himself from BHEL Engineer in Charge about all known potential fire, explosion or toxic release hazards related to the contract. He in turn will ensure that same information has been passed to the supervisors and workmen

9.4.4
Contractor must ensure that all his supervisors are properly trained and each employee has received and understood from his supervisor necessary training and briefing about the safety requirement. Necessary document as a means to verify that employees have understood the training is to be maintained.

9.4.5
The contractor supervisors shall also give a small safety briefing to all the workmen under his charge before undertaking any new work and specially understand the safety requirements that are mandatory

9.5.0 **REPORTING**

9.5.1
The contractor shall submit report of all accidents, fires and property damage, dangerous occurrences to the authorised BHEL official immediately after such occurrence but in any case not later than twelve hours of the occurrence. Such report shall be furnished in the manner prescribed by BHEL and also to meet statutory requirement.

9.5.2
Any injury sustained by any of the contractor's employees within the Project premises must be reported to BHEL supervisor and FIRST AID should be immediately administered. The Contractor shall be responsible for keeping and maintaining proper records of Accidents to his personnel.

9.5.3
Contractor must arrange to immediately investigate, properly document and report any injury, accident or near miss involving any of his employees and take appropriate follow up action. He must furnish within 12 hours of the incident a written report to BHEL Engineer in charge and the Safety Section.

9.5.4
According to the Factory Act and the Employees state Insurance Act & regulation, any person sustaining any injury within the project premises and absenting himself from work for more than 46 hours, his accident report has to be sent to the respective Government Authorities. Therefore contractor shall inform the owner's representative such matter immediately for their needful action.

9.5.5
In addition, contractor shall submit periodic reports on safety to the authorised BHEL official from time to time as prescribed.

9.5.6
Before commencing the work, the contractor shall appoint/nominate a responsible officer to supervise implementation of all safety measures and liaison with his counterpart of BHEL.

9.6 AUDIT REVIEW AND INSPECTION

9.6.1
BHEL shall conduct audit on the contractor performance and compliance with the project specific requirements of the Environment and Occupational Health & Safety Management systems. The programme of audit shall cover all activities under the contract but will focus particularly on high-risk activities. The Construction Manager shall decide the schedule of audit. The audit findings shall be communicated to the contractors and necessary remedial action as advised by BHEL Engineers shall be under taken within the stipulated time.

9.6.2
Inspections shall be carried out regularly by the contractors and by BHEL engineers on activities, facilities, equipment, and documentation to cover the following aspects.

- Compliance with procedures and systems
- Availability, condition and use of PPEs
- Condition of maintenance tools, equipments, facilities
- Availability of fire fighting equipments and its condition
- Use of fire fighting equipments and first aid kit
- Awareness of occupational health hazard
- Awareness of safe working practices
- Presence of quality supervision
- Housekeeping

The Safety Co-ordinator shall visit and inspect work sites daily. All unsafe acts, unsafe conditions that have imminent potential for causing harm/injury/damage will be immediately corrected. He shall maintain a daily logbook giving details of unsafe acts or conditions observed and the corrective action taken and recommendations for preventing recurrence. Adequacy of corrective actions will be verified

The contractor shall take remedial measures as per the findings of each inspection

Besides the above, the contractor shall be required to carry out the following inspections

Sl no	Equipment	Scope of inspection	Inspection by	Schedule
1	Hand tools	To identify unsafe/defective tool	User	Daily
2	Power tools	To identify unsafe/defective tool	User	Daily
3	Fire Extinguishers	To check pressure and any defect	User Safety Coordinator	Daily Every month
4	Lifting equipment/ tackles	To check for defects and efficacy of brakes	User Third party	Daily Every Year
5	PPE	To check for defects	User	Daily

9.7 **NON COMPLIANCE**:-

9.7.1 NONCONFORMITY OF SAFETY RULES AND SAFETY APPLIANCES WILL BE VIEWED SERIOUSLY AND THE BHEL HAS RIGHT TO IMPOSE FINES ON THE CONTRACTOR AS UNDER **for every instance of violation noticed**:

Sl. No.	Safety	Fine (in Rs)
01	Not Wearing Safety Helmet	50/-
02.	Not wearing Safety Belt	100/-
03.	Grinding Without Goggles	50/-
04.	Not using 24 V Supply For Internal Work	500/-
05.	Electrical Plugs Not used for hand Machine	100/-
06.	Not Slinging property	200/-
07.	Using Damaged Sling	200/-
08.	Lifting Cylinders Without Cage	500/-
09.	Not Using Proper Welding Cable With Lot of Joints And Not Insulated Property.	200/-
10.	Not Removing Small Scrap From Platforms	200/-
11.	Gas Cutting Without Taking Proper Precaution or Not Using Sheet Below Gas Cutting	200/-

12.	Not Maintaining Electric Winches Which are Operated Dangerously	500/-
13.	Improper Earthing Of Electrical T&Ps	500/-
14.	Accident Resulting in Partial Loss in Earning Capacity	25,000/- per victim
15.	Fatal Accident/Accidents Resulting in total Loss in Earning Capacity	1,00,000/- per victim

Any other non-conformity noticed not listed above will also be fined as deemed fit by BHEL. The decision of BHEL engineer is final on the above. The amount will be deducted from running bills of the contractor. The amount collected above will be utilised for giving award to the employees who could avoid accident by following safety rules. Also the amount will be spent for purchasing the safety appliances and supporting the safety activity at site.

CITATION:-If safety record of the contractor in execution of the awarded job is to the satisfaction of safety department of BHEL, issue of an appropriate certificate to recognise the safety performance of the contractor may be considered by BHEL after completion of the job

9.9 Memorandum of Understanding

After Award Of Work, Contractors Are Required To Enter Into A Memorandum Of Understanding As Given Below:

Memorandum of Understanding

BHEL, PSWR is committed to Health, Safety and Environment Policy (EHS Policy) as given in the booklet titled " Safe Working Practices" issued to all contractors.

M/s _____ do hereby also commit to the same EHS Policy while executing the Contract Number _____

M/s _____ shall ensure that safe work practices not limited to the above booklet are followed by all construction workers and supervisors. Spirit and content therein shall be reached to all workers and supervisors for compliance.

BHEL will be carrying out EHS audits twice a year and M/s _____ shall ensure to close any non-conformity observed/reported within fifteen days.

Signed by authorised representative of M/s----------

Name :

Place & Date:

9.10.1
Comprehensive list of National Standards for reference and use wherever applicable in the execution of Civil, Erection and Commissioning Contracts

IS No.	YEAR	Amd. upto	*DESCRIPTION*
IS 10204	1982		PORTABLE FIRE EXTINGUISHERS MECHANICAL FOAM TYPE
IS 10245	1994		SPECIFICATION FOR BREATHING APPARATUS
IS 10291	1982		SAFETY CODE FOR DRESS DRIVERS IN CIVIL ENGINEERING WORKS
IS 10658	1983		HIGHER CAPACITY DRY POWDER FIRE EXTINGUISHERS (TROLLEY MOUNTED)
IS 10662	1992		COLOUR TELEVISION
IS 10667	1983		GUIDE FOR SELECTION OF INDUSTRIAL SAFETY EQUIPMENT FOR PROTECTION OF FOOT AND LEG
IS 11037	1984		ELECTRONIC FAN REGULATORS
IS 11057	1984		INDUSTRIAL SAFETY NETS
IS 11451	1998		RECOMMENDATION FOR SAFETY AND HEALTH REQUIREMENT RELATING TO OCCUPATION EXPOSURE TO ASBESTOS
IS 1169	1967		PEDESTAL FANS
IS 1179	1967		SPECIFICATION FOR EQUIPMENT FOR EYE AND FACE PROTECTION DURING WELDING
IS 11833	1986		DRY POWDER FIRE EXTINGUISHERS FOR METAL FIRES
IS 11972	1987		CODE OF PRACTICE FOR SAFETY PRECAUTION TO BE TAKEN WHEN ENTERING A SEWARAGE SYSTEM
IS 1287	1986		ELECTRIC TOASTER
IS 13063	1991		STRUCTURAL SAFETY OF BUILDINGS ON SHALLOW FOUNDATIONS ON ROCKS
IS 13385	1992		SPECIFICATIONS FOR FIRE EXTINGUISHERS 50 LITRE WHEEL MOUNTED WATER TYPE (GAS CARTRIDGES)
IS 13386	1992		SPECIFICATIONS FOR FIRE EXTINGUISHERS 50 LITRE MECHANICAL FOAM TYPE
IS 13415	1992		CODE OF SAFETY FOR PROTECTIVE BARRIERS IN AND AROUND BUILDINGS
IS 13416	1992		RECOMMENDATIONS FOR PREVENTIVE MEASURES AGAINST HAZARDS AT WORKING PLACE PART 1 TO PART 5
IS 13430	1992		CODE OF PRACTICE FOR SAFETY DURING ADDITIONAL CONSTRUCTION AND ALTERATION TO EXISTING BUILDINGS
IS 13849	1993		PORTABLE FIRE EXTINGUISHERS DRY POWDER TYPE (CONSTANT PRESSURE)
IS 1446	1985		CLASSIFICATION OF DANGEROUS GOODS (FIRST REVISION)

IS 1476	1979		REFRIGERATORS
IS 1641	1988		CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS (GENERAL): GENERAL PRINCIPLES OF FIRE GRADING AND CLASSIFICATION
IS 1642	1989		CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS- DETAILS OF CONSTRUCTION
IS 1643	1988		CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS (GENERAL): EXPOSURE HAZARD
IS 1646	1997		CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS (GENERAL): ELECTRICAL INSTALLATIONS
IS 1904	1986		CODE OF PRACTICE FOR DESIGN AND CONSTRUCTION OF FOUNDATIONS IN SOIL
IS 1905	1987		STRUCTURAL SAFETY OF BUILDINGS MASONARY WALLS
IS 2082	1985		ELECTRICAL GEYSERS
IS 2171	1985		PORTABLE FIRE EXTINGUISHERS DRY POWDER TYPE (CARTRIDGE)
IS 2309	1989		PRACTICE FOR THE PROTECTION OF BUILDINGS AND ALLIED BUILDINGS AGAINST LIGHTENING
IS 2312	1967		EXHAUST FANS
IS 2361	1994		SPECIFICATION FOR BUILDING GRIPS - FIRST REVISION
IS 2418	1977		TUBULAR FLUORSCENT LAMPS IS 2418 (FT-1)
IS 2750	1964		STEEL SCAFFOLDINGS
IS 2762	1964		SAFE WORKING LOADS IN KGS FOR WIRE ROPE SLINGS
IS 2878	1986		FIRE EXTINGUISHERS CARBON DIOXIDE TYPE (PORTABLE AND TROLLEY MOUNTED)
IS 2925	1984		SPECIFICATION FOR INDUSTRIAL SAFETY HELMETS
IS 3016	1982		CODE OF PRACTICE FOR FIRE PRECAUTIONS IN WELDING AND CUTTING OPERATIONS- FIRST REVISION
IS 3315	1974		DESERT COOLERS
IS 3521	1989		INDUSTRIAL SAFETY BELTS AND HARNESS
IS 368	1983		IMMERSION WATER HEATERS
IS 3696	1991		SAFETY CODE OF SCAFFOLDS AND LADDERS PART 1 TO 2
IS 3737	1996		LEATHER SAFETY BOOTS FOR WORKERS IN HEAVY METAL INDUSTRIES
IS 374	1979		CEILING FANS INCLUDING REGULATORS
IS 3764	1992		EXCAVATION WORK - CODE OF SAFETY
IS 3786	1983		METHOD FOR COMPUTATION OF FREQUENCY AND SEVERITY RATES FOR INDUSTRIAL INJURIES AND CLASSIFICATION OF INDUSTRIAL ACCIDENTS

IS 3935	1966		CODE OF PRACTICE FOR COMPOSITE CONSTRUCTION
IS 4014	1967		CODE OF PRACTICE FOR STEEL TUBULAR SCAFFOLDING
IS 4081	1986		SAFETY CODE FOR BLASTING AND RELATED DRILLING OPERATIONS
IS 4082	1977	1996	STACKING AND STORAGE OF CONSTRUCTION MATERIALS AND COMPONENTS AT SITE
IS 4130	1991		DEMOLITION OF BUILDINGS - CODE OF SAFETY PART 1 TO 2
IS 4138	1977		SAFETY CODE FOR WORKING IN COMPRESSED AIR (FIRST REVISION)
IS 4155	1966		GLOSSARY OF TERMS RELATING TO CHEMICAL AND RADIATION HAZARDS AND HAZARDOUS CHEMICALS
IS 4209	1967		CODE OF SAFETY FOR CHEMICAL LABORATORY
IS 4250	1980		FOOD MIXERS
IS 4262	1967		CODE OF SAFETY FOR SULFURIC ACID
IS 4756	1978		SAFETY CODE FOR TUNNELING WORK
IS 4912	1978		SAFETY REQUIREMENTS FOR FLOOR AND WALL OPENINGS, RAILINGS AND TOE BOARDS
IS 5121	1969		SAFETY CODE FOR PILING AND OTHER DEEP FOUNDATIONS
IS 5182	1969	1982	METHODS FOR MEASUREMENT OF AIR POLLUTION
IS 5184	1969		CODE OF SAFETY FOR HYDROFLUORIC ACID
IS 5216	1982	2000	RECOMMENDATIONS ON SAFETY PROCEDURES AND PRACTICE IN ELECTRICAL WORK PART I AND II
IS 555	1979		TABLE FANS
IS 5557	1995		INDUSTRIAL AND SAFETY LINED RUBBER BOOTS (SECOND REVISION)
IS 5916	1970		SAFETY CODE FOR CONSTRUCTION INVOLVING USE OF HOR BITUMINOUS MATERIALS
IS 5983	1980		SPECIFICATION FOR EYE PROTECTORS - FIRST REVISION
IS 6234	1986		PORTABLE FIRE EXTINGUISHERS WATER TYPE (STORED PRESSURE)
IS 692	1994		CRITERIA FOR SAFETY AND DESIGN OF STRUCTURES SUBJECTED TO UNDERGROUND BLASTS
IS 6994	1973		SPECIFICATION FOR SAFETY GLOVES
IS 7155	1986		CODE OF RECOMMENDED PRACTICE FOR CONVEYOR SAFETY (PART 1 TO 8)
IS 7205	1974		SAFETY CODE FOR ERECTION OF STRUCTURAL STEEL WORK

IS 7293	1974		SAFETY CODE FOR WORKING WITH CONSTRUCTION MACHINERY
IS 7323	1994		GUIDELINES FOR OPERATIONS OF RESERVOIRS
IS 7812	1975		CODE OF SAFETY FOR MERCURY
IS 7969	1975		SAFETY CODE FOR HANDLING AND STORAGE OF BUILDING MATERIALS
IS 8089	1976		CODE OF SAFE PRACTICE FOR LAYOUT OF OUTSIDE FACILITIES IN AN INDUSTRIAL PLANT
IS 8091	1976		CODE OF PRACTICE FOR INDUSTRIAL PLANT LAYOUT
IS 8095	1976		ACCIDENTS PREVENTION TAGS
IS 818	1968	1997	CODE OF PRACTICE FOR SAFETY AND HEALTH REQUIREMENTS IN ELECTRIC AND GAS WELDING, AND CUTTING OPERATIONS
IS 8448	1989		AUTOMATIC LINE VOLTAGE CORRECTOR (STABILISER)
IS 8519	1977		GUIDE FOR SELECTION OF INDUSTRIAL SAFETY EQUIPMENT FOR BODY PROTECTION
IS 8520	1977		GUIDE FOR SELECTION OF INDUSTRIAL SAFETY EQUIPMENT FOR EYE, FACE AND EAR PROTECTION
IS 875	1987		STRUCTURAL SAFETY OF BUILDING: LOADING STANDARD PART 1 TO 5
IS 8807	1978		GUIDE FOR SELECTION OF INDUSTRIAL SAFETY EQUIPMENT FOR PROTECTION OF ARMS AND HANDS
IS 8978	1985		INSTANTANEOUS WATER HEATERS
IS 8989	1978		SAFETY CODE FOR ERECTION OF CONCRETE FRAMED STRUCTURES
IS 940	1989		PORTABLE FIRE EXTINGUISHERS WATER TYPE (GAS CARTRIDGE)
IS 9457	1980		SAFETY COLOURS AND SIGNS
IS 9679	1980		CODE OF SAFETY FOR WORK ENVIRONMENTAL MONITORING
IS 9706	1997		CODE OF PRACTICE FOR THE CONSTRUCTION OF AERIAL RPEWAYS FOR THE TRANSPORTATION OF MATERIAL
IS 9759	1981		GUIDELINES FOR DEWATERING DURING CONSTRUCTION
IS 9815	1989		SERVO MOTOR OPERATED LINE VOLTAGE CORRECTOR (SERVO STABILISER)
IS 9944	1992		RECOMMENDATIONS ON SAFE WORKING LOAD FOR NATURAL AND MAN-MADE FIBRE ROPE SLINGS
IS 996	1979		SINGLE PHASE ELECTRIC MOTORS
ISO 3873	1977		SAFETY HELMET

SECTION-10

SPECIAL CONDITIONS OF CONTRACT

10.0 DRAWINGS AND DOCUMENTS

10.1
The detailed drawings, specifications available with BHEL engineers will also form part of this tender specification. Revision of drawings/documents may take place due to various considerations as is normal in such large project. Work will have to be carried out as per revised drawings/ documents. These documents will be made available to the contractor during execution of work at site.

10.2
One set of necessary drawings/documents to carry out the erection work will be furnished to the contractor by BHEL on loan that shall be returned to BHEL after completion of the work. Contractor's personnel shall take care of these documents given to them.

10.3
The data furnished in various sections and appendices and the drawings enclosed with this tender specification describe the equipment to be installed, tested and commissioned under this specification, briefly. However, the changes in the design and in the quantity may be expected to occur as is usual in any such large scale of works.

10.4
If any error or ambiguity is discovered in the specification/information contained in the documents/drawings and tender, the contractor shall forthwith bring the same to the notice of BHEL before submission of offer.

10.5
In case an ambiguity is detected after award of work, the same must be brought to the notice of BHEL before commencement of the work/activity. BHEL's interpretation in such cases will be final and binding on the contractor.

10.6
In case of any conflict between general instructions to tenderness, general conditions of contract contained in sections 1 & 2 respectively and special conditions of contract contained in sections 4 to 15 and appendices, provisions contained in special conditions of con t in sections 4 to 15 and appendices shall prevail.

10.7
In case of discrepancy between quoted item rate and corresponding amount in the rate schedule, the **quoted item rates shall be reckoned as correct and amount recalculated**. Quoted item rates shall also prevail for arriving at the total price quoted for offer evaluation. Offers will evaluated on the total amount for the entire Rate Schedule and the work will be awarded without splitting the scope.

10.8
Bank Guarantees to be furnished by the contractor towards Security Deposit and Performance Guarantee (last 5% payment against workmanship warranty/defect liability) shall have a claim period of six months over and above the validity period required for the respective cases. BG for advance payment shall be kept valid for a period of two more months beyond the recovery period of the advance with interest thereof.

SECTION-11

SPECIAL CONDITIONS OF CONTRACT

11.0

11.1 TIME SCHEDULE - CONTRACT VARIATION - PROGRESS AND MONITORING- COMPLETION, OVER RUN- PRICE VARIATION.

11.1.1 TIME SCHEDULE

The contractor has to mobilize his resources and work force in such a manner that the entire work is completed to achieve the following mentioned milestones and time schedule:

SN	Activity	Tentative Date
01	Start of Erection	Feb' 2009
02	Boiler light up	Dec'2009
03	Alkali Boil Out	Jan'2010
04	Turbine box-up	Nov'2009
05	Steam blowing of completion	Feb'2010
06	Turbine Oil flushing completion	Jan'2010
07	Unit Synchronisation	March'2010
08	Coal firing	April'2010
09	Trial Operation	June'2010
10	PG test	July'2010

11.1.2
The contractor shall reach site and establish his site office and mobilize to commence the work as per directions of BHEL's Construction Manager. The contract shall commence from the date of erection of first equipment.

11.1.3
In order to meet above schedule in general, and any other intermediate targets set, to meet customer requirements, contractor shall arrange all necessary resources in consultation with BHEL.

11.1.4 **Contract Period**

The total contract period will be 14 (Fourteen) months from start of erection. The date of start of erection of first major equipment in its designated location shall be reckoned as date of start of contract period. Placement of smaller components like packer plates, base plates etc. shall not be considered for this purpose. However, the

contractor shall have to take up preparatory work and mobilize his resources well ahead of this event.

11.1.5 **Grace Period**

Grace period of 2 (two) months beyond the end of contract period of months is applicable.

11.2 **Progress Monitoring, Contract Extension and Overrun**

11.2.1 **Progress Monitoring**

Progress will be reviewed periodically including month-end review vis-à-vis the plans drawn to meet the Project Schedule. The contractor shall submit periodical progress reports, and other reports/information including manpower, consumables etc, as desired by BHEL.

11.2.2 **Ascertaining and Establishing the Reasons for Shortfall**

The onus probandi that the causes leading to extension in the contract period are not due to any reasons attributable to the contractor is on him (the contractor). Review of the performance as stated vide cl. 11.2.1 above will be made considering the availability of components to be erected and other constraints over which the contractor has no control. The programme will be reviewed area-wise and the following facts will be recorded in case of shortfall at the end of every month:

A) Erection/commissioning programme not achieved owing to non-availability of fronts.
B) Erection/commissioning programme not achieved owing to non-availability of materials.
C) Erection/commissioning programme not achieved owing to non-availability of tools and plants, manpower and consumables by the contractor or any other reason attributable to the contractor.

11.2.3 **Contract Extension**

If the completion of work as detailed in these specification gets delayed beyond the end of contract period and grace period then depending on the balance work left out, BHEL at its discretion may extend the contract.

11.2.4

A joint programme shall be drawn for the work to be completed during the extended contract period. Review of the program and record of shortfall as describe vide clause no. 11.2.2 shall be done during the extended period. The over run charges will be paid in proportion to the achievement of the respective month vis-à-vis the plan for the month (for assessing the performance, the agreed plan shall be reduced by shortfall attributable to the BHEL). BHEL may disallow contractor's claim for over run charges if the monthly programme as mentioned here not made by him.

11.2.5

The part of extension attributable to the contractor, if any, in total contract extension shall be exhausted first i.e. immediately after end of grace period. This shall be followed by the extension on account of force majeure conditions, if any, and then on account of BHEL.

11.2.6 **Overrun Compensation**

If the contract is extended for any reason other than those attributable to the contractor or force majeure conditions, the contractor will be compensated by payment of over run charges at the rate of Rs.40, 000/- Per Month (Rupees Forty Thousand Only). Overrun compensation will be paid for the extension attributable to BHEL. No overrun compensation will be payable for the extension on account of reasons attributable to contractor and/or force majeure conditions.

11.3 PRICE VARIATION

In order to take care of variation in cost of execution of work on either side, due to variation in the index of LABOUR, DIESEL and ELECTRODE, Price Variation Formula as described herein shall be applicable

11.3.1

85% component of Contract Value shall be permitted to be adjusted for variation in various relevant indices during execution of work. The remaining 15% shall be treated as fixed component.

11.3.2

The basis for calculation of price variation in each category, their component, Base Index, Base Date of accounting shall be as under:

.SL NO.	CATEGORY	COMPONENT ('K')	BASE INDEX	BASE DATE
A)	LABOUR (ALL CATEGORIES)	40%	CONSUMER PRICE INDEX FOR INDUSTRIAL WORKERS (GENERAL), APPLICABLE TO 'ALL INDIA' AS PUBLISHED BY LABOUR BUREAU, SHIMLA	Base date shall be calendar month of last date of submission of Tender (including extended date of submission if any)
B)	H.S. DIESEL OIL	5%	WHOLE SALE PRICE INDEX (FOR COMMODITY :HIGH SPEED DIESEL) PUBLISHED BY MINISTRY OF COMMERCE AND INDUSTRY (www.eaindustry.nic.in)	...DO...
C)	WELDING ELECTRODE	40%	WHOLE SALE PRICE INDEX (FOR COMMODITY:ELECTRODES) PUBLISHED BY MINISTRY OF COMMERCE AND INDUSTRY (www.eaindustry.nic.in)	...DO...

11.3.3

Payment/recovery due to variation in index shall be determined on the basis of the following notional formula without any initial absorption, in respect of the identified components viz LABOUR, HS DIESEL and ELECTRODE

$$A = K \times R \times \frac{(X_N - X_o)}{X_o}$$

Where

A = Amount to be paid/recovered due to variation in the Index for Labour, Electrode and HS Diesel

K = Percentage component applicable for Labour, Electrode and HS Diesel

R = Value of work done for the billing month

XN = Revised Index No for Labour, Electrode and HS Diesel for the billing month under consideration

Xo = Index no for Labour, Electrode and HS Diesel as on the Base date. Base date for each of the category is defined in the table above

11.3.4

The above Price Variation formula is applicable for the entire Contract period, Grace period, and the extended contract period if any. However for the period extended on account of reasons attributable to the contractor and/or Force Majeure conditions, the price variation will be applied based on the respective indices/prices frozen at the calendar month preceding the start of such extended period.

11.3.5

The price Variation is not applicable to Over Run Charges, Manday rates for extra works etc.

Similarly Price Variation shall not be applicable for the respective % assigned to milestone activities viz Oil Flushing, Barring Gear, Commissioning of Condensate System, Commissioning of Feed Water System and Synchronization

11.3.6

The contractor shall furnish necessary monthly bulletins for WHOLE SALE PRICE INDEX (for Commodity :ELECTRODES and HS DIESEL) Published by Ministry of Commerce and Industry (www.eaindustry.nic.in) and CONSUMER PRICE INDEX for INDUSTRIAL WORKERS (GENERAL), applicable to 'All India' as published by Labour Bureau, Shimla.

11.3.7

The contractor will be required to raise the bills for price variation payments on a monthly basis along with the running bills irrespective of the fact whether any increase/decrease in the consumer price index for Labour, HS Diesel and Electrode has taken place or not. In case there is delay in publication of bulletins (final figure), the provisional values as published can be considered for payments and arrears shall be paid/recovered on getting the final values.

11.3.8

The Total Quantum of Price Variation shall not exceed fifteen percentage (15%) of executed Contract Value. Executed Contract value for this 15% cap shall not include Overrun charges, Extra works.

11.3.9

With the above provision, the clause no. 2.15 of General Conditions of Contract section-2 is not applicable.

11.4.0 Variation In Quantity

Weight of various equipments, quantities of various items of work covered under these specifications and indicated in relevant appendices are likely to vary. Item Rates shall remain firm for any downward variation. Rates shall remain firm for upward variation up to 25% in the quantities of individual items. For any upward variations beyond this, the item rates will be subject to revision with mutual agreement.

11.5.0 Interest Bearing Recoverable Advance

Interest bearing (rate of interest shall be prime leading rate of SBI plus 2% per annum, on monthly reducing balance basis) recoverable advance limited to 5% of the contract value may be paid by BHEL at its discretion depending on the merit of the case against receipt & acceptance of bank guarantee from the contractor for the amount sought. This bank guarantee (BG) shall be valid at least for one year or the recovery duration. In case recovery of dues does not get completed within the aforesaid BG validity period, the contractor must renew the validity of BG or submit fresh BG for the outstanding amount and remaining recovery period. BHEL is entitled to make recovery of the entire outstanding amount in case the contractor fails to comply with the BG requirement as above.

Recovery of dues will be made minimum @ 10% of the admitted gross running bill amount from the first applicable running bill onwards till entire due (principal plus interest) is recovered. In the event sufficient time duration is not left for recovery @10%, the rate of recovery shall be suitably enhanced so that entire due is recovered by the time contractor reaches 90% billing of total value of work executed & within the contract period (including extensions granted or foreclosure if any).

11.6 **Definition Of Work Completion**

The contractor's scope of work under these specifications will be deemed to have been completed in all respect, only when all the activities are completed satisfactorily and so certified by BHEL site in charge. The decision of BHEL in this regard shall be final and binding on the contractor.

11.7 Schedule Compression

BHEL, owing to its commitment to their customer, may ask contractor to compress the total completion schedule by upto 20%. This will result in preponement of various milestones. For achieving the same, contractor shall plan his activities and mobilise additional resources accordingly to the satisfaction of BHEL engineer within the quoted rates.

Section-12

SPECIAL CONDITIONS OF CONTRACT

12.0 Terms of payment

12.1
The contractor shall submit his monthly on account bills with all the details required by BHEL on specified date every month covering progress of work in all respects and areas for the previous calendar month

12.2
Clause 2.6 of general conditions of contract shall be referred to as regards mode of payment, and measurement of the work completed.

12.3
Release of payment in each running bill will be restricted to 95% of the value of work admitted, as per the percentage break-up for the stage of work completion stipulated vide clauses hereinafter.
The 5% thus remaining shall be on account of workmanship guarantee of work executed. The same will be released after completion of the guarantee period of **12 months** from the date of completion of entire work as certified by BHEL.

However, on specific request of vendor, this amount may be released on pro rata basis for the value of work executed and accepted by BHEL, along with any RA Bill and onwards, subject to receipt and acceptance of bank guarantee of equal amount in BHEL's prescribed format. The BG shall be kept valid till completion of such guarantee period and an additional six months claim period. This is also subject to the condition that the contractor has started the work and also furnished/remitted the initial Security Deposit as per contract.

12.4
The payment for running bills will normally be released within around 30 days of submission of running bill with measurement sheets. Contractor shall make his own arrangement for making payment of impending labour wages and other dues in the meanwhile.

12.5
BHEL will release payment through Electronic Fund Transfer (EFT)/RTGS. In order to implement this system, the following details are to be furnished by the Contractor pertaining to his Bank Accounts where proceeds will be transferred through BHEL's banker:

9. Name of the Company
10. Name of Bank
11. Name of Bank Branch
12. City/Place
13. Account Number
14. Account type
15. IFSC code of the Bank Branch
16. MICR Code of the Bank Branch

BHEL may also choose to release payment by other alternative modes as suitable.

Payment will be made as follows

12.6 TRANSFORMERS, 200 MVA (GT), 70 MVA (STATION), 25 MVA (UAT), 1600 KVA/ 2000 KVA/ 1000 KVA AUX. POWER TRANSFORMER (Item No A1.1 to A1.5)

S N	DESCRIPTION OF ACTIVITY	PERCEN-TAGE
01	COLLECTION OF MATERIALS AND TRANSPORTATION FROM BHEL STORES TO SITE EXCEPT THE TRANSFORMER TANK	10%
02	POSITIONING AND ALIGNMENT TRANSFORMER TANK AS PER LAY OUT DRAWING	5%
03	INTERNAL INSPECTION OF CORE AND WINDING TAPS SWITCH OFF-LOAD/ON-LOAD, H.V./L.V. BUSHING TURRET ASSEMBLY, VACUUM PULLING, OIL FILTERATION AND FITTING OF OIL UPTO CORE AND WINDING LEVEL	15%
04	ASSEMBLY OF ALL ACCESSORIES, PIPES AND FITTINGS, CONSERVATOR TANK, COOLER BANK/RADIATOR BANK, BUSHINGS, MARSHALLING BOX, CABLING FROM MARSHALLING BOX TO FIELD DEVICES, FANS AND PUMPS ETC.	17%
05	OIL FILLING IN COMPLETE ASSEMBLED TRANSFORMERS, COMPLETION OF DRY OUT AND FILTERATION OF OIL OF COOLING BANK, ACCEPTANCE OF DRY OUT.	20%
06	PRE-COMMISSIONING CHECKS, ELECTRICAL TESTS, CALIBRATION AND PROTECTION AND INTER LOCK CHECKS	13%
07	**INTEGRATED ELECTRICAL TESTING/ COMMISSIONING WITH ASSOCIATED CONNECTED EQUIPMENT,** BACK CHARGING/FORWARD CHARGING	13%
08	TRIAL RUN AND FULL LOADING	2%
09.	FINAL PAINTING	5%

12.7 ISOLATED PHASE BUS DUCT FOR GENERATOR TRANSFORMER (Item Sl. No. B1.1)

SL. NO	DESCRIPTION OF ACTIVITY	PERCE NT-AGE
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,	25%

SL. NO	DESCRIPTION OF ACTIVITY	PERCE NT-AGE
	DPD TEST ON CONDUCTOR WELD JOINTS ETC.	
05	PRE-COMMISSIONING TESTS, HIGH VOLTAGE TEST	10%
06	COMPLETION OF AIR LEAKAGE TEST	3%
07	FINAL BOX-UP AND END TERMINATION AND MAKING READY FOR ENERGIZATION	5%
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	TRIAL RUN AND FULL LOADING	2%
10.	FINAL PAINTING	5%

12.8 SEGREGATED PHASE BUS DUCT 11 & 6.6 kV (Item Sl No C1.1 to C1.10)

SL. NO	DESCRIPTION OF ACTIVITY	PERCEN T-AGE
01	COLLECTION OF MATERIAL, TRANSPORTATION FROM BHEL STORES TO SITE	10%
02	ERECTION, ALIGNMENT, GROUTING SUPPORTING STRUCTURE	15%
03	PLACEMENT, ALIGNMENT, BOLTING OF CONDUCTOR, ENCLOSURES, COPPER FLEXIBLES, WALL FRAME ASSEMBLIES, SEAL OFF BUSHINGS, CONDUIT AND WIRING FOR ANTI-CONTENTATION HEATERS, EARTHING INTER CONNECTING BRIDGING BUS DUCT BETWEEN THE SWITCH BOARD ETC.	40%
04	PRE-COMMISSIONING AND COMPLETION OF AIR LEAK	10%
05	COMPLETION OF AIR PRESSURIZATION TEST	5%
06	ENERGIZATION OF INDIVIDUAL BUS DUCT AND SWITCH BOARD, **INTEGRATED ELECTRICAL TESTING/ COMMISSIONING WITH ASSOCIATED CONNECTED EQUIPMENT**	13%
08	TRIAL RUN AND FULL LOADING	2%
09.	FINAL PAINTING	5%

12.9 VARIABLE FREQUENCY DRIVE FOR I.D. FANS (Item Sl. No E1.1)

SL. NO	DESCRIPTION OF ACTIVITY	PERCENT-AGE
01	COLLECTION OF MATERIAL, TRANSPORTATION FROM BHEL STORES TO SITE	10%
02	PLACEMENT, ALIGNMENT, GROUTING OF LOAD CONVERTOR/INVERTOR PANELS, COMMON CONTROL PANELS, FIXING OF HOT AIR EXHAUST DUCT ETC.	13%
03	VACUUM BREAKER PLACEMENT, ALIGNMENT, SUB-ASSEMBLIES, GROUTING ETC.	15%
04	PLACEMENT, ALIGNMENT OF POWER TRANSFORMERS, ASSEMBLIES OF LOOSE ACCESSORIES AND OIL FILLING	15%
05	DRYING OUT OF TRANSFORMERS	10%
06	PLACEMENT, ALIGNMENT OF D.C. LINK REACTOR	10%
07	PRE-COMMISSIONING TESTS ON LCI, COMMON CONTROL PANEL, BREAKERS, TRANSFORMERS, REACTOR ETC.	20%
08	NO LOAD TRIAL RUN OF MOTORS	5%
09	FULL LOADING AND TRIAL RUN OF UNIT	2%

12.10 EXCITATION SYSTEMS & ACCESSORIES (Item Sl. No F1.1)

SN	DESCRIPTION OF ACTIVITY	PERCENT-AGE
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	15%
05	UNIT SYNCHRONIZATION AND STABILIZATION, **INTEGRATED ELECTRICAL TESTING/ COMMISSIONING WITH ASSOCIATED CONNECTED EQUIPMENT**	13%
06	TRIAL RUN AND FULL LOADING	2%

12.11 11 KV / 3.3KV / 415V / DCDB SWITCHGEAR BOARDS, GENERATOR/ ST/UAT /CONTROL & PROTECTION PANEL & ACCESSORIES (Item Sl No G1.1 to G1.3)

SL. NO	DESCRIPTION OF ACTIVITY	PERCENT-AGE
01	COLLECTION OF MATERIAL AND TRANSPORTATION FROM BHEL STORES TO SITE	10%

02	PLACEMENT ON FOUNDATION, ASSEMBLIES ETC.	20%
03	ADJUSTMENT, ALIGNMENT, GROUTING, ELECTRICAL INTER-CONNECTIONS,INTER PANEL WIRING AND BUS BAR, INSTALLATION OF LOOSE ACCESSORIES ETC.	35%
04	PRE-COMMISSIONING AND ELECTRICAL TEST, MECHANICAL/ELECTRICAL CHECKS INCLUDING PROTECTION, INTERLOCK TESTING AND MAKING THE SYSTEM READY BY ENERGIZATION	15%
05	**INTEGRATED ELECTRICAL TESTING/ COMMISSIONING WITH ASSOCIATED CONNECTED EQUIPMENT**	8%
05	ENERGIZATION OF SWITCH BOARD AND TRIAL OF INDIVIDUAL FEEDERS ON LOAD	10%
06	COMPLETION OF TRIAL RUN OF MAIN TG SET/FULL LOADING	2%

12.12 HT/ LT POWER & CONTROL CABLE (Item Sl No. J1.1 to J1.10 & J2.1)

SL. NO	DESCRIPTION OF ACTIVITY	PERCEN-TAGE
01	COLLECTION OF MATERIALS AND TRANSPORTATION FROM BHEL STORES TO SITE	15%
02	COMPLETION OF CABLE LAYING	50%
03	GLANDING & TERMINATION	20%
04	CLAMPING & DRESSING, PREPARATION / SUBMMISSION OF FQA LOG SHEET / ERTECTION PROTOCOL ETC	10%
05	CABLE CHECKING	5%

12.13 ABOVE GROUND EARTHING, CABLE TRAY & SUPPORTING STRUCTURE, GI LATTICE & PIPE STUCTURE (Item Sl No. K1.1 to K1.3 & L1.1 to L1.4)

SN	DESCRIPTION OF ACTIVITY	PERCEN-TAGE
01	COLLECTION OF MATERIALS AND TRANSPORTATION FROM BHEL STORES TO SITE	10%
02	ERECTION, ASSEMBLY, ALIGNMENT, EARTHING ETC AS PER DRG, FIXING OF LEBALS, DANGER BOARD, MARKING OF TOWER & GANTRY STRUCTURE, PREPARATION / SUBMMISSION OF FQA LOG SHEET / ERTECTION PROTOCOL ETC.	85%
03	ENERGISATION OF SYSTEM FROM 400 / 220 KV SIDE SYSTEM, PREPARATION / SUBMMISSION OF COMMISSIONING PROTOCOL ETC.	5%

12.14 MARSHALLING BOX, JUNCTION BOX, STRUCTURAL STEEL FABRICATION & INSTALLATION (Item Sl. No. M1.1)

SN	DESCRIPTION OF ACTIVITY	%TAGE
01	COLLECTION OF MATERIALS AND TRANSPORTATION FROM BHEL STORES TO SITE	10%

02	COMPETION OF ERECTION, PREPARATION / SUBMMISSION OF FQA LOG SHEET / ERTECTION PROTOCOL ETC	85%
03	FINAL PAINTING	5%

UNIT RATE PAYMENT SHALL BE MADE FOR OTHER SYSTEMS NOT MENTIONED ABOVE (ESP (Sl. No. **H1.1 to H1.13**), SOOT BLOWER(**Sl. No. I1.1**), ELECTRICAL HOIST(**Sl. No. O1.1**) & (**Sl. No. N1.1 to N1.8**)) AS PER THE RATE SCHEDULE. PERCENTAGE BREAKUP FOR ERECTION, TESTING, COMMISSIONING SHALL BE AS BREAKUP GIVEN BELOW: -

1. 80% OF THE QUOTED UNIT RATES ON COMPLETION OF ERECTION, CALIBRATION, TESTING AND COMMISSIONING.

2. 15% AFTER COMPLETION OF THE INDIVIDUAL SYSTEM COMMISSIONING.

3. 5% AFTER TRIAL OPERATION OR UNIT HANDING OVER TO CUSTOMER WHICHEVER IS EARLIER.

12.15

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.

12.16

WHEREVER ADDITIONAL INSTRUMENTATION WORK HAS TO BE CARRIED OUT FOR PERFORMANCE GUARANTEE TEST, THE SAME HAS TO BE EXECUTED BY THE ONTRACTOR 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 bidders 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.

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

13.7
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 any major rework/ repairs/ rectification/ modification/ fabrication of 8 hours as may arise during the course of erection. (refer clauses 13.1 to 13.8 and 14.2.1 to 14.2.10) will be **Rs. 250/- (Rupees Two hundred and fifty only)**

No payment will be made if an item of work lasts less than 40 manhours.

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SECTION-15

Special Condition of Contract

15.0 EARNEST MONEY DEPOSIT , SECURITY DEPOSIT & BANK GUARANTEE

15.1 Earnest Money Deposit:

i) EMD for this tender is Rs. 2,00,000/- (Rupes Two lakhs only).
ii) Bidders who have already deposited One Time EMD of Rs. 2.00 lakh are exempted from submission of EMD for this tender. However a copy of 'One Time EMD' certificate issued by BHEL/PSWR, Nagpur shall be enclosed along with the Offer.
iii) EMD is to be paid in cash (as permissible under Income Tax Act), Pay order or Demand Draft in favour of Bharat Heavy Electricals Limited and payable at Nagpur.
iv) No other form of EMD remittance shall be acceptable to BHEL.

15.1.1 EMD by the bidder will be forfeited as per Tender Documents if

i) After opening the tender, the bidder revokes his tender within the validity period or increases his earlier quoted rates.

ii) The bidder 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.

15.1.3 In the case of unsuccessful bidders, the Earnest Money will be refunded to them after acceptance of tender by successful bidder

15.2 Security Deposit

15.2.1 Security Deposit shall be furnished by the successful bidder. 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 should be furnished before start of the work by the contractor.

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 SD has to be remitted either by cash or in the other forms 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 bidder shall be converted and adjusted against the cash Security Deposit excepting for such bidder who has remitted One Time EMD.

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

15.3 BANK GUARANTEE

i. It is the responsibility of the bidder to get the Bank Guarantees revalidated/extended for the required period as per the advice of BHEL Site Engineer / Construction Manager. BHEL shall not be held liable for issue of any reminders regarding expiry of the Bank Guarantees.

ii. In case extension/further extensions of any Bank Guarantees are not required, the bidders shall ensure that the same is explicitly conveyed through the Construction Manager to BHEL PSWR/HQ, Nagpur

iii. In case the Bank Guarantees are not extended before the expiry date, BHEL reserves the right to invoke the same by informing the concerned Bank in writing, without any advance notice/communication to the concerned bidder.

iv. **Bidders to note that any corrections to Bank Guarantees shall be done by the issuing Bank, only through an amendment in an appropriate non judicial stamp paper.**

v. Bidders to ensure that the Bank Guarantees submitted are exactly as per format given in the Tender documents.

vi. The Original Bank Guarantee shall be sent directly by the Bank to BHEL under Registered Post (Acknowledgement Due). However, in exceptional cases, where guarantee is directly received by Vendor, the Vendor shall instruct the Bank to send an unstamped duplicate copy of the guarantee directly to BHEL under Registered Post (Acknowledgement Due).

SECTION -16

TECHNICAL DETAILS, BILL OF QUANTITIES & DRAWINGS

16.6 GENERATOR TRANSFORMER

Quantity Per Unit – 3 Nos.

SN	DESCRIPTION	GENERAL INFORMATION
1	Rating	200 MVA, 21/420 KV, Cooling OFAF, Single Phase, Vector group YN011, with OFF Load tap switch
2	Weight of core &winding	158.00 MT
3	Total weight of assembled transformer including oil	237.00 MT
4	Transportation / shipping weight (gas filled)	175.00 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	230.00 MT
6	Oil quantity	
	Oil in transformer tank	50000 LITRES
	Oil in cooler, conservator, &pipe work	22000 LITERS
	Total oil quantity	72000 LITRES(62 .00 MT)
7	Weight of heaviest packages	175.00 MT
8	Dimensions of assembled transformer	13.5 X 7.7 X 10.8 METERS

16.7 UNIT AUX TRANSFORMER

Quantity per unit – 2 Nos.

SL. NO	DESCRIPTION	UNIT TRANSFORMER
1	Rating	25MVA, 3-PHASE 21/6.9 KV
2	Type of cooling	ONAF/ ONAN
3	Winding connection	Dyn1
4	**WEIGHT OF ACCESSORIES**	
	Weight of core & winding	26 MT

	Tank & fitting including HV/LV bushings turrets, rollers	11 MT
	Bushings	0.25 MT
	Radiator bank, fans &valves, pipe & fitting, Cabling between marshalling box to field devices, On load tap Chamber, etc.	6 MT
	Total weight of transformer including oil	64 MT
	Shipping weight of transformer (gas filled)	40 MT
	Untanking weight	36 MT
5	**Oil Quantity**	
	Total oil quantity	23159 LITRES

16.8

STATION TRANSFORMER 70 MVA, 400 / 11.5 /6.9 KV(5B)

Quantity per unit – 1 Nos.

SNO	DESCRIPTION	STATION TRANSFORMER
1	Rating	70MVA,3-PHASE 400/11.5 / 6.9 KV
2	Type of cooling	ONAN/ONAF/OFAF
3	Winding connection	Ynyn0yn0
4	**WEIGHT OF ACCESSORIES**	
	Weight of core&winding	62.5 MT
	Tank & fitting including HV/LV bushings turrets, rollers	16.5 MT
	Bushings	4 MT
	Radiator bank, fans &valves, Marshalling box, cables etc.	18 MT
	Total weight of transformer including oil	140 MT
	Shipping weight of transformer (gas filled)	76 MT
	Untanking weight	62.5 MT
5	**OIL QUANTITY**	
	Oil in transformer tank including OLTC diverter	36000 LITRES
	Oil in radiator bank, conservator &pipe work	9000 LITRES
	Total oil quantity	45000 LITRES

16.9 1600KVA, 6.6 KV/0.433 KV DRY TYPE CAST RESIN TRANSFORMERS:

Quantity– 8 Nos.

Sl. No.	Description	Remarks
01	Dry Type Cast Resin Transformer, 1600KVA, 6.6 KV /0.433 KV, - 8 Nos., Cooling type AN, Vector Group Dyn11, housed in metal enclosure with loose accessories such as rollers, HT & LT cable box etc..	
02	Total shipping weight	6.6.00 MT

16.10 GENERATOR BUS DUCT ISOLATED PHASE BUS DUCT

BUS DUCT SET PER UNIT –1

EACH SET COMPRISES OF THE FOLLOWINGS: -

Description	Main Run	Delta Run	Tap-Off Run
Weight per meter	800 Kg	450 Kg	250 Kg
Conductor Material	GR 19501	GR 19501	GR 63401
Enclosure Material	GR 19501	GR 19501	GR 31000/63401
Conductor Shape	ROUND	OCTAGONAL	BOX formation (2 Chennels)
Conductor size	37800 Sqmm	19200 Sqmm	7455 Sqmm
Phase Spacing	1750	1250	1000
Outside Diameter	1500	1000	780
Thickness	8	8	4.78
Phase to earth Clearance	220MM	220MM	220MM
Bus insulator (no per sup)	3	3	3
Grounding Material	10x60 GI	10x60 GI	10x60 GI

Bill of material (Quantity per Unit)

S.No	DESCRIPTION	Qty (approx.)	APPROXIMATE WEIGHT
A	**Main Bus Duct (Phase Side)**		
	a) Single phase length of line side bus duct b) Single phase bends: c) Single phase neoprene rubber bellows: d) Single phase epoxy seal off bushings: e) Current transformer: f) No of wall frame assemblies: 01nos	150 Mtrs 12 Nos. 6 Nos. 6 Nos. 12 Nos. 2 Nos.	120.0 MT
B	**Main Bus Duct (Neutral Side)**		
	a) Single phase length of line side bus duct b) Single phase bends c) Single phase neoprene rubber bellows d) Single phase epoxy seal off bushings e) Current transformer No of wall frame assemblies	20 Mtrs 02 Nos. 02 Nos. 03 Nos. 1 Nos. Nil	15.0 MT
C	**Delta Bus Duct**		
	a) Single phase length of delta bus duct b) Single phase bends c) Single phase neoprene rubber bellows d) Single phase epoxy seal off bushings e) Current transformers	85 85 Mtrs. 2 Nos. 06 Nos. 06 Nos. Nil	40.0 MT
D	**Tap off Bus Duct (UT)**		
	a) Single phase length of tap off bus duct b) Single phase bends c) Single phase neoprene rubber bellows d) Single phase epoxy seal off bushings e) Current transformers	35 Mtrs 06 Nos. 03 Nos. 03 Nos. 09 Nos.	9.0 MT
E	**Tap off Bus Duct (SP and VT Cubicle)**		
	a) Single phase length of tap off bus duct	06 Mtrs	

	b) Single phase bends c) Single phase neoprene rubber bellows **d)** Single phase epoxy seal off bushings	Nil 03 Nos.	1.5 MT

F	**Tap off Bus Duct (Star Point to Neutral Grounding Cubicle)**		
	a) Single phase length of line side bus duct b) Single phase neoprene rubber bellows c) Single phase seal off bushing	1.0 Mtrs 01 No. 01 No.	0.3 MT
G	SP and VT Cubicle consist of epoxy cast dry type VT –9 Nos., Lighting arrestor –03 Nos, Surge Capacitor –03 Nos, etc Weight of Cubicle approx. 3.5 MT, Dimension 4300 x 2250 x 2740 mm	1 Set	4.5 MT
H	**Neutral Grounding Cubicle consist of :-** a) Dry type epoxy cast NG transformer b) NG Resistor c) Dimensions 2000x 1250 x1800 mm	1 Set	1.5 MT
J	**Make up pieces** Main Bus Duct Delta Bus Duct Tap Off Bus duct		30 Nos. 25 Nos. 12 Nos
K	**Supporting Structural steel**	1 Lot	40 MT
L	Air pressuring system comprising of compressor, panel, and piping: Approximate wt	1 Set	15 MT
M	Misc Items such as weldable flexibles, bolted flexibles, shorting links, weldable shunt pieces, Earthing Material GI flats 50 x 6 mm etc.	One Lot	

16.17 GENERAL INFORMATION

1. CONTACT PRESSURE

FOLLOWING TORQUE ARE NORMALLY RECCOMMENDED EOR VARIOUS OF BOLTS.

BOLT SIZE	RECOMMENDED TORQUE	TORQUE SPANNER CAPTY.
M10	0.85 TO 1.3 NM(17-30 Ft- lb)	0.85 TO 1.3 NM
M12	1.3 TO 1.7 NM(30-40 FT-lb)	0.85 TO4.3NM
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.

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

TYPE OF WELDING	**MIG WELDING**
FILLER WIRE	1.6 mm DIA. (NG 21 WITH 5% SILICON)
ANGLE	10 TO 15 DEG. FOREHEADS
CLEANING	DEGREASE AND SCRATCH BRUSH
CURRENT SETTING	DEPENDED ON THICKNESS
GAS SUPPLY/ PURITY	50 Cu. FT/ HRS ARGON /99.98% WELDING
SHIELD	5/8'' dia.

16.18 11 KV & 6.6 KV SEGREGATED PHASE BUS DUCTS

AA) TECHNICAL DETAILS

SN	Item Description	Technical details
01	Conductor Conductor Shape & Cross Section	AL Alloy GR 63401 Box Channel Conductor 2 Nos.(12.7 x 47.88 x8.05 mm)
02	**Enclosure** Material Shape Size (Approximate) Thickness Barrier Thickness Weight of Seal off bushing Average weight of Bus Duct	 Al Grade 31000 Rectangular (1) 11 KV, 1600 Amps - 1350 x 450 mm, (2) 6.6KV, 2500 Amps 1200 x 450 mm (3) 6.6 KV, 3000 amps – 1350 x 450 mm 3.15 mm 2.00 mm 20 Kg. 110 Kg / meter (approx.)

BB) Bill of Material

Sl no	Connection		Rated Voltage	Length in Meter (Approx
	From	To		
1	SP Bus Duct from Unit Auxiliary Transformer (25 MVA -5CAT01	Switchgear Board # 5CA	6.6 KV,2500 Amps	104 Meters
2	Unit Auxiliary Transformer (25 MVA -5CBT01	Switchgear Board # 5CB	6.6 KV,2500 Amps	94 Meters
3	SP Bus Duct from Station Transformer (220/11/6.6 KV, 63 MVA, - 5A	Switchgear Board # OCA	6.6 kV ,3000 AMPS	57 Mtrs
4	SP Bus Duct from Station Transformer (220/11/6.6 KV,63 MVA - 5A	Switchgear Board # OBA	11 kV,1600 AMPS	43 Mtrs
5	SP Bus Duct from Station Transformer (400/11/6.6 KV,63 MVA - 5B	Switchgear Board # OCB	6.6 kV, 3000 AMPS	47 Mtrs
6	SP Bus Duct from Station Transformer (400/11/6.6 KV, 63 MVA - 5B	Switchgear Board # OBB	11 kV, 1600 AMPS	33 Mtrs
7	Tie SP Bus Duct from Unit Switchgear Board # 5CA	to SWSB # OCA	6.6 kV, 2500 AMPS	30 Mtrs
8	Tie SP Bus Duct from Unit Switchgear Board # 5CB	SWSB # OCB	6.6 kV, 2500 AMPS	30 Mtrs
9	Tie SP Bus Duct from Station Switchgear Board # OCA	SWSB # OCB	6.6 kV ,3000 AMPS,	63 Mtrs
10	Tie SP Bus Duct from Station Switchgear Board # OBA	SWSB # OBB	11 kV,1600 AMPS	63 Mtrs

CC - MISC COMMAN ITEMS FOR 11 KV & 6.6 KV SP BUS

S	Description
01	Bends 11 KV
02	Bends 6.6 KV
03	Copper / Al flexible connection 11 KV 3.3 KV
04	Seal Off Bushing 11 KV 6.6 KV
05	Wall frame assembly 11 KV 6.6KV
06	GI Support Structural Steel –35 MT approximately
07	Conduit, wiring, Earthing Materials for continuous running along the lengths of bus duct. Expansion Bellows, Thermostat control heating elements, Rain hoods for out door joints, flexible connectors, Junction boxes, breather assemblies, shorting link etc.

Note: - Considering the layout of the bus dusts as mentioned above for interconnection between the transformer and 11 /6.6 KV 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. Quantity & dimension given are tentative and are likely to vary.

16.19
VARIABLE FREQUENCY DRIVES FOR ID FANS

ID Fan per Unit - 2 Nos.
Nos. of Channel per ID Fan – 2 Nos.
Each set Of Variable Frequency Drive Consist of the following

Sl.No.	Description of Components/ Devices	Quantity per ID Fan set	Total Quantity for one Unit
(1)	(2)	(3)	(4)
A	3250 KVA,6.6 /2.3 KV, ONAN Cooled Power Transformers, Accessories like radiators, conservator tank, marshalling box, buchhloz relay, HT/LT cable boxes, Oil in drums etc shall be supplied loose. Total weight of each transformer 8.00 MT (approx.). Transformer tank shall be supplied partial filled with oil.	2 Nos.	4 Nos.
B	Air Core Natural Cooled DC Link Reactor, Dimension 2200 x1500x2000 mm (approx.) Weight of each reactor – 1500 Kg	2 Nos.	4Nos.
C	3.3 KV Vacuum Circuit Breaker Type VM12 Overall dimensions 2360 x1835 x1650 mm, Weight 1400 KG	2 Nos.	4 Nos.
D	Load Inverter Converter Panel, Overall Dimensions 3700x1450 x2330 mm , Weight per panel –3.0 MT. Cylindrical air duct , exhaust fan & fan guard for each fan shall be supplied loose along with each panels and to be mounted at site on top of the panels.	2 Nos.	4nos.
E	Control Panel, Over dimension 1450 x 800 x2300 mm, weight per panels-600 Kg.	1 No.	2 Nos.
F	Adopter Cubicle Overall dimensions 1450 x 580		

	x 2330 MM, Weight per panel –200Kg.	2	4 Nos.
G	O & M Panels, Overall dimensions 600 x 600 x 1050 mm, Weight per panel –100 Kg.		1 Nos.
F	LOOSE SUPPLY ITEMS ARE AS BELOW / BOILER		
	1. PRINTER ON VFD PANEL		2 Nos.
	2.METERS 96x96 MM		8 Nos.
	3. SIX ELEMENT FLAG		4 Nos.
	4. One Computer (for each unit) consist of CPU, Monitor, Key Board along with printer and accessories shall be loose for installation in Unit Control Board /room		2 Nos.

16.20 DIGITAL VOLTAGE REGULATOR PANELS

Sl.No.	DESCRIPTION	Quantity per unit
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.	1 Nos

16.21 GENERATOR, GT & UT PROTECTION AND METERING PANELS

Sl.No.	DESCRIPTION	Quantity per Unit
	Generator, Generator Transformer, Station & Unit Transformers, **"Control / Protection & Metering Panels",**. Protection relay shall be numerical of Alstom / ABB / Siemens / or equivalent. 1. Generator, Generator & Unit Auxiliary Transformer Control, Protection &Metering Panel(size 2600(H) x 1200(W) x 1200(D) mm) – 4 Nos. 2. Station Transformer Control & Protection Panel (size 2600(H) x 1200(W) x 1200(D)) – 1 Nos. 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 Nos.	5 Nos.

APPENDIX-I

T&P TO BE PROVIDED BY BHEL FREE OF CHARGE (ON SHARING BASIS, BASED ON AVAILABILITY)

i. EOT crane in TG floor will be made available on sharing basis for handling panels when required

ii. Hydra crane will be made available on sharing basis at stores only for material handling. In very special cases, for major components hydra will be made available for unloading at site. However, operator and fuel shall be arranged by the contractor or contractor shall share the cost

While all efforts 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 Metallic Cable glands

02 Lugs above 4 sq. mm. size

APPENDIX-III

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

A. T&P FOR ELECTRICAL WORKS

SL. NO.	DESCRIPTION	QUANTITY
01	TRANSFORMER OIL PURIFICATION PLANT WITH VACUUM PUMP FOR EVACUATION TRANSFORMER ALONGWITH ACCESSORIES & HOSES. A) CAPACITY 750/1000 LTR. PER HOUR	2 NOS.
02	PRIMARY INJECTION KIT UPTO 10000 AMPS WITH PAIR OF LEADS & CLAMPS FOR TESTING CTS	1 SET
03	SECONDARY INJECTION KIT WITH INTEGRAL TIMER FOR RELAY TESTING WITH CABLES LEADS & BANNA PLUGS SELECTIVE RANGE 5 AMPS & 1 AMPS RANGE (FOR RELAY TESTING)	1 SET
04	CFB & ZFB KIT OR EQVIVALENT FOR TESTING OF RELAY & DISTANCE PROTECTION	1 No. EACH
05	PPM TESTER FOR TRANSFORMER OIL	1 No.
06	METERS FOR TIME MEASUREMENT OF BREAKER OPENING & CLOSING TIME	1 No.
07	3 PHASE VARIAC 15 Amps	2 NO.
08	SINGLE PHASE VARIAC 28 AMPS	2 NO.
09	TRANSFORMER TURNS RATIO TEST KIT	1 NO.
10	HV TEST KIT AC, 0 –50 KV &DC, 0- 100 KV PREFERSBLY WITH DRY TYPE TRANSFORMER	1 NO. EACH
11	TRANSFORMER OIL BDV TEST KIT 0-100 KV WITH 2.5MM AIR GAP.	1 NO.
12	PORTABLE AIR COMPRESSOR WITH DRIER AND REGULATOR MAKE "TOSHNIWAL"/"KHOSLA" RATED FOR 7/10 KG/CM2	2 NO.
13	SOLDERING IRON "SOLDRON" MAKE 25 WATT	3 NOS.
14	VACUUM PUMP	1 NO.
15	MULTIMETRES	
16	DIGITAL "MOTWANE" MAKE 3.1/2 DIGIT OR HIL MAKE ANALOG MOTWANE MAKE DIGITAL 4.1/2 DIGIT Accuracy +/- 1% (HIL/MOTWANE/ Fluke make)	4 NOS. 4 NOS. 2NOS.
17	STANDARD MILLI AMPS/MILLIVOLTS SOURCE MAKE RANGE 0 TO 60 mA AND 0 TO 100 mV	2 NO.
18	INSULATION TESTER MOTORISED OPERATED / ELECTRONIC WITH SELECTIVE RANGE 0F 1000 / 2500/ 5000 VOLT. Range 0.5 Mega ohms to 10000 Mega ohms	1 No.
19	INSULATION TESTER MAINS OPERATED/ ELECTRONIC 500 volt & 1000	3 NO.

SL. NO.	DESCRIPTION	QUANTITY
	Volts Range 0.5 Mega ohms to 1000 Mega ohms	
20	VARIABLE DC POWER SUPPLY 0 TO 250 V DC, 10 A MAKE "APLAB" OR RQUIVALENT(VARIABLE SOURCE)	2NO
21	PHASE SEQUENCE INDICATOR	1 NO.
22	FREQUENCY SOURCE 45 TO 55 HZ WITH 110V	1 NO.
23	DIGITAL TONGUE TESTER A/C 5/10, 25/60/300 AMP RANGE AC KEW SNAP MAKE	1 NO. EACH
24	DIGITAL TONGUE TESTER D/C 30/60/300 AMS	1 NO.
25	DIGITAL TONGUE TESTER 0-1 / 5 AMPS AC	1 NO.
26	STOP WATCH	1 NO.
27	CONTAINER FOR TRANSFORMER OIL SAMPLING	10 NOS.
28	TARPOLIN FIRE PROOF	As required
29	DC SHUNT 400 AMS 75 MV	1 NO.
30	3 PHASE SHIFTER	1 NO.
31	INDUSTRIAL TYPE VACUUM CLEANER	1 NO.
32	MICRO OHM METER/DUCTER (mV volt Drop Test Kit) 0-200 A DC , 0-2000 Micro ohms with suitable calibrated cable leas for current injection & mv drop	1 NO.
33	CAPACITANCE METER HAVING RANGE 20 pf –100MFD +/- 1%	1 NO.
34	DECADE RESISTANCE BOX	2 NOS.
35	TELETALK 2 WIRE SYSTEM	6 SETS
36	PORTABLE BLOWER WITH HEATING ARRANGEMENT	1 NO.
37	TORQUE WRENCH (12-60Nm, 50-225 Nm)	1 NO EACH
38	WATTMETER AC/DC 0-125-250V, 0-5-10A	1 NO
39	OSCILLOSCOPE 100 MHZ	1 NO
40	TACHOMETER (NON CONTACT TYPE)	1 NO
41	CAPACITANCE & TAN DELTA TEST KIT 12 KV	1 SET
42	OIL SPECIFIC GRAVITY AND PPM MEASURING INSTRUMENT	1 NO
43	RHEOSTAT	3 NOS
44	POLARITY TEST KIT	1 NO
45	NON – CONTACT TYPE DIGITAL THERMOMETER	1 NO
46	RELAY TESTING KIT	1 NO
47	TWO WAY INTERCOM SET WITH 50 to 100 MTRS CABLES FOR CHECKING THE CABLES CONTINUTITY	2 Sets
48	PROTECTIVE EARTH ROD SUITABLE FOR 220 / 400 KV SYSTEM HAVING LEAKAGE CURRENT METER, 70 SQMM CABLE & CLAMPS ANY REPUTED MAKE	2 Nos.
49	PHANTOM LOAD TEST KIT	1 No
49	OTHER PROTECTIVE DEVICES	AS REQUIRED

B. T&Ps FOR MECHANICAL WORKS

SL. NO.	DESCRIPTION	QUANTITY
	II. HANDLING EQUIPMENT	
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/TURFER	AS PER REQMT
6	NYLON SLINGS	AS PER REQMT
7	CRANES / TRUCKS	AS PER REQMT
	III. 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	DIE 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	2 NO.
10	WELDING TRANSFORMER	1 NO.
11	TIG/MIG WELDING SET	1 EACH.
12	MECHANICAL TOOL KIT FOR FITTERS	4 NOS.
13	ELECTRICIAN TOOL KIT	4 NOS.
14	CRIMPING TOOL UPTO 4.0 SQ.MM CABLE	4 NOS.
15	FLOOD LIGHT FITTINGS	2 NOS.
16	FIRE EXTINGUISHERS	AS REQD.
17	DISTRIBUTION BOARDS WITH POWER CABLE COMPLETE AS REQUIRED	AS REQD.
18	PAINTING BRUSH	AS REQD.
19	FIRE PROOF TARPAULIN	AS REQD.
20	SAFETY BELTS AND SAFETY HELMETS	AS REQD.
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
28	CABLE ROLLERS	AS REQD.
29	SHEARING MACHINE	AS REQD.
30	DYNAMOMETERS	AS REQD.
31	HYDRAULIC CRIMPING TOOL FOR CONDUCTOR / SHIELD WIRE	AS REQD.
32	TORQUE WRENCH OF DIFFERENT RANGES	AS REQD.

NOTE:

THE LIST OF INSTRUMENTS / EQUIPMENTS TO BE BROUGHT BY THE CONTRACTOR AS SHOWN ABOVE IS ONLY INDICATIVE. ANY OTHER INSTRUMENTS / EQUIPMENTS REQUIRED FOR THE EXECUTION OF THE WORK IS TO BE NECESSARILY ARRANGED BY THE CONTRACTOR.

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, SEPARATELY FOR PARTS A AND B.

SL. NO.	CATEGORY	MONTHS								
		1	2	3	4	5	6	7	8	& so on
01.	RESIDENT MGR									
02.	ENGINEERS									
03.	SUPERVISORS									
04.	A) MECHANICAL B) ELECTRICAL C) INSTRUMENTATION D) INDUSTRIAL RELATION/SAFETY									
05.	RIGGERS									
06.	FITTERS									
07.	HP WELDERS									
08.	STRUCT. WELDERS									
09.	TIG WELDERS									
10.	ELECTRICIANS									
11.	INSTRUMENT TECHNICIANS									
12.	STORE KEEPER									
13.	SEMISKILLED & UNSKILLED WORKERS									
14.	WATCHMEN/SECURITY									

NOTE:

01. MINIMUM NUMBER OF PERSONS TO BE INDICATED MONTHWISE.

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

SIGNATURE OF BIDDER 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 BIDDER 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
01															
02															
03															
04															
05															
06															
07															
08															
09															
10															

DATE : SIGNATURE OF THE BIDDER

APPENDIX-VII

CONCURRENT COMMITMENTS

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

SIGNATURE OF THE BIDDER
DATE:

APPENDIX–VIII

DETAILS OF SIMILAR WORK DONE DURING THE LAST SEVEN YEARS

SL. NO.	FULL POSTAL ADDRESS OF CLIENT & NAME OF OFFICER IN CHARGE	DESCRIP-TION OF WORK	VALUE OF CONTRACT	DATE OF AWARD OF WORK	DATE OF COMMENCEMENT OF WORK	TIME SCHEDULE (MONTHS)	DATE OF ACTUAL COMPLETION OF WORK	REMARKS

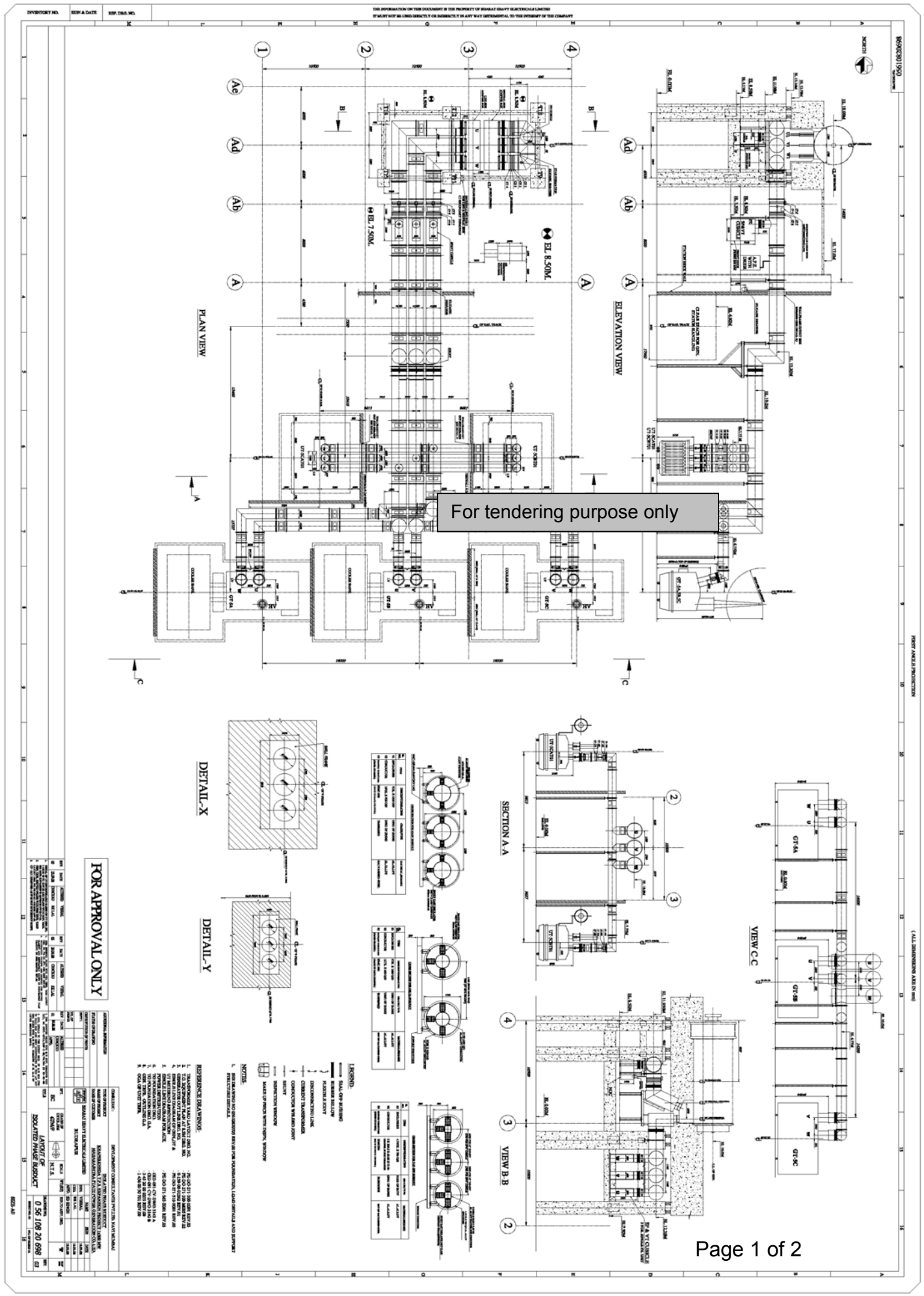
SIGNATURE OF BIDDER WITH SEAL

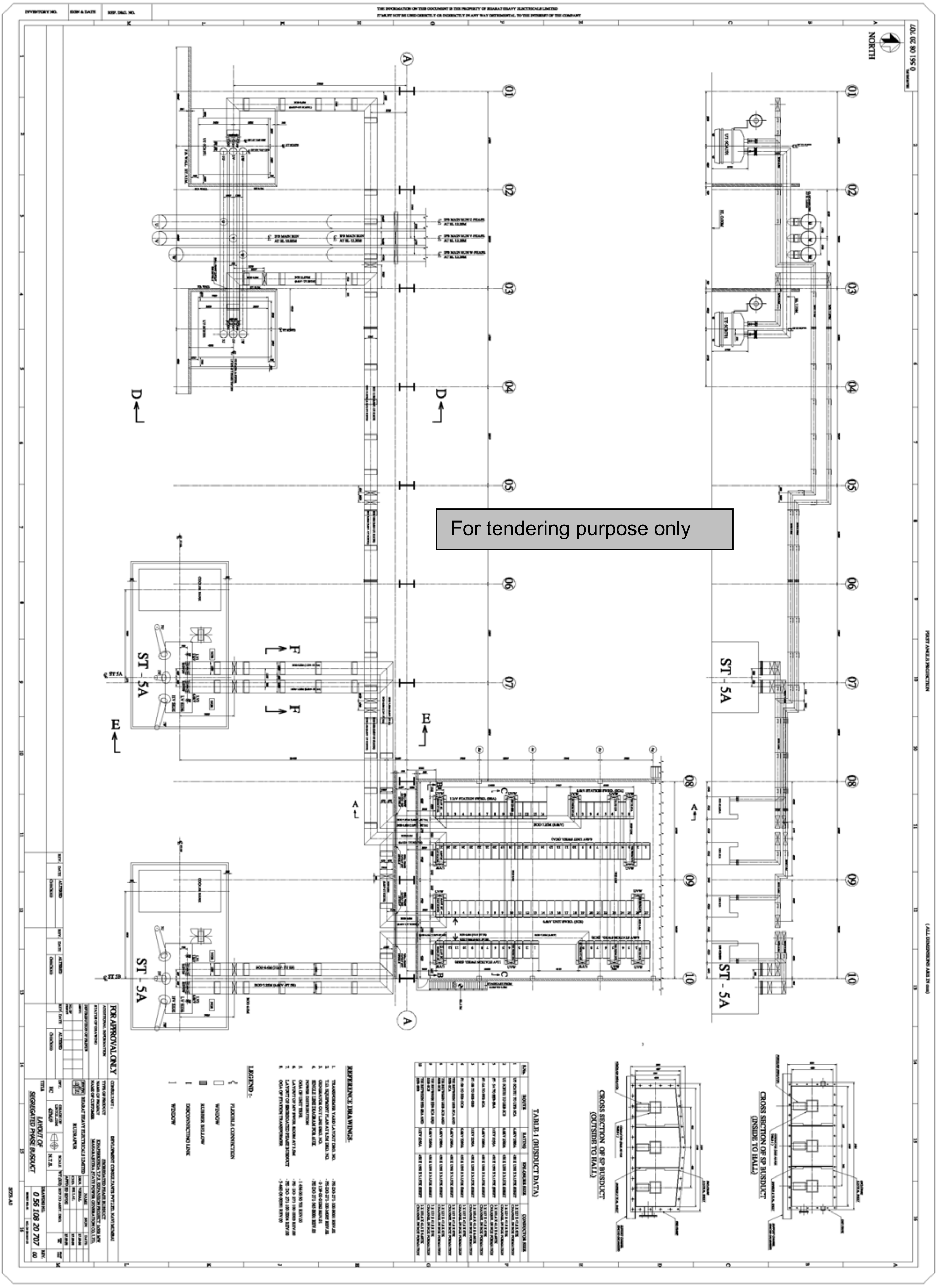
- PLEASE USE ADDITIONAL SHEET IF NEEDED **IN THE SAME FORMAT.**
- **PLEASE ENCLOSE COPIES OF WORK ORDERS INCLUDING DETAILED BILL OF QUANTITIES, COMPLETION CERTIFICATES IN SUPPORT OF THIS STATEMENT**.

APPENDIX-IX

DRGS FOR TENDERING PURPOSE ONLY

1. Layout of Segregated Phase Bus Duct- Drg No: 0 56 108 20 707 –Rev 00.
2. Layout of Isolated Phase Bus Duct- Drg No: 0 56 108 20 698 –Rev 03.


PLAN VIEW
ELEVATION VIEW
For tendering purpose only
DETAIL-X
DETAIL-Y
SECTION A-A
VIEW B-B
VIEW C-C
FOR APPROVAL ONLY
LAYOUT OF ISOLATED PHASE BUSDUCT
Page 1 of 2



For tendering purpose only

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